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DEPARTMENT OF SCHOOL EDUCATION AND LITERACY

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DIET KOLAR

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ಮುನ್ನುಡಿ

ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ತರಗತಿ ನಿರ್ದಿಷ್ಟ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಕಲಿಕೆಯನ್ನು ಉಂಟುಮಾಡಲು ಹಾಗೂ ರಾಷ್ಟ್ರ ಮತ್ತು ರಾಜ್ಯ ಮಟ್ಟದ ಸಾಧನಾ ಸಮೀಕ್ಷೆಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕಾ ಸಾಧನೆಯನ್ನು ಉತ್ತಮಪಡಿಸುವ ಮೂಲಕ ಶಾಲಾ ಶೈಕ್ಷಣಿಕ ವ್ಯವಸ್ಥೆಯನ್ನು ಬಲಪಡಿಸಲು ಹಾಗೂ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ತರಗತಿ ಪ್ರಕ್ರಿಯೆಗಳನ್ನು ಪರಿಣಾಮಕಾರಿಗೊಳಿಸಲು ರಾಜ್ಯಮಟ್ಟದಲ್ಲಿ ಹಲವಾರು ಉಪಕ್ರಮಗಳನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ತರಗತಿ ಪ್ರಕ್ರಿಯೆ, ಮೌಲ್ಯಾಂಕನ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಗಳನ್ನು ಸಾಮರ್ಥ್ಯಧಾರಿತ, ಕಲಿಕಾಫಲ ಆಧಾರಿತವಾಗಿ ನಿರ್ವಹಿಸಲು ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ನಿರೀಕ್ಷಿತ ಕಲಿಕಾ ಸಾಮರ್ಥ್ಯಗಳನ್ನು ಬೆಳೆಸಲು ರಾಜ್ಯ ಶೈಕ್ಷಣಿಕ ಸಂಶೋಧನೆ ಮತ್ತು ತರಬೇತಿ ಇಲಾಖೆ (DSERT) ಯಿಂದ ಕ್ರಮಗಳನ್ನು ಕೈಗೊಳ್ಳಲಾಗುತ್ತಿದೆ. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ 2026-27ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿಗೆ ಒಂದನೇ ತರಗತಿಯಿಂದ ಹತ್ತನೇ ತರಗತಿಯವರೆಗೆ 'ಗಣಿತ' ವಿಷಯದಲ್ಲಿ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನಕೋರಿಯನ್ನು (LBA) ರೂಪಿಸಲಾಗಿದೆ.

ಪ್ರತಿ ತರಗತಿಗೆ ಸಂಬಂಧಿಸಿದ ಕಲಿಕಾ ವಿಷಯಗಳಲ್ಲಿ, ಕಲಿಕಾ ಸಾಮರ್ಥ್ಯಗಳು ಹಾಗೂ ಕಲಿಕಾ ಫಲಗಳ ಆಧಾರದಲ್ಲಿ ಪ್ರಶ್ನೆಗಳನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಗಣಿತ ವಿಷಯದಲ್ಲಿ ಪರಿಕಲ್ಪನಾತ್ಮಕ ಜ್ಞಾನ, ತಿಳಿವಳಿಕೆ, ಕೌಶಲ, ಅನ್ವಯ, ಸಮಸ್ಯಾ ಪರಿಹಾರ ಕೌಶಲಗಳು, ಗಣಿತೀಯ ಅನ್ವಯನ, ಸೃಜನೆ ಹಾಗೂ ಉನ್ನತ ಮಟ್ಟದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕೆಯನ್ನು ಮೌಲ್ಯಾಂಕನ ಮಾಡುವ ಉದ್ದೇಶದಿಂದ ವಸ್ತುನಿಷ್ಠ, ಸಂಕ್ಷಿಪ್ತ, ವಿವರಣಾತ್ಮಕ, ಅನ್ವಯಿಕ, ಕೌಶಲಾಧಾರಿತದಂತಹ ವಿವಿಧ ಸ್ವರೂಪದ ಪ್ರಶ್ನೆಗಳನ್ನು ರಚಿಸಲಾಗಿದೆ. ಇವು ಕಲಿಕಾರ್ಥಿಗಳಲ್ಲಿ ಉನ್ನತ ಮಟ್ಟದ ಚಿಂತನಾ ಕೌಶಲಗಳನ್ನು ಮೂಡಿಸಲು ಉಪಯುಕ್ತವಾಗಿವೆ.

ಕಲಿಕಾಫಲ / ಸಾಮರ್ಥ್ಯ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನವು ಕೇವಲ ವಿದ್ಯಾರ್ಥಿಗಳ ಶೈಕ್ಷಣಿಕ ಸಾಧನೆಯನ್ನು ಅಳೆಯುವ ಸಾಧನವಲ್ಲ; ಬದಲಾಗಿ ಕಲಿಕೆಯ ಗುಣಮಟ್ಟವನ್ನು ವೃದ್ಧಿಸುವ, ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಪರಿಣಾಮಕಾರಿಯಾಗಿಸುವ ಹಾಗೂ ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿಯ ಕಲಿಕಾ ಪ್ರಗತಿಯನ್ನು ನಿರಂತರವಾಗಿ ಗುರುತಿಸಿ, ಅಗತ್ಯ ಶೈಕ್ಷಣಿಕ ಬೆಂಬಲ ಒದಗಿಸುವ ಪ್ರಮುಖ ಶೈಕ್ಷಣಿಕ ಸಾಧನವಾಗಿದೆ. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಸದರಿ ಪ್ರಶ್ನಕೋರಿಯನ್ನು ತರಗತಿಪ್ರಕ್ರಿಯೆ, ಮೌಲ್ಯಾಂಕನ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಗಳಲ್ಲಿ ನಿರಂತರವಾಗಿ (CCE) ಬಳಸುವುದು ಅತ್ಯವಶ್ಯಕವಾಗಿದೆ.

ರಾಜ್ಯದ ಎಲ್ಲಾ ಶಾಲೆಗಳಲ್ಲಿ ಗಣಿತ ಬೋಧನಾ-ಕಲಿಕಾ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಮತ್ತಷ್ಟು ಉತ್ತಮಗೊಳಿಸುವಲ್ಲಿ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಕಲಿಕೆಯನ್ನು ಉನ್ನತೀಕರಿಸುವಲ್ಲಿ ಈ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನಕೋರಿಯು ಉಪಯುಕ್ತವಾಗಿದೆ. ಸದರಿ ಕಾರ್ಯದಲ್ಲಿ ಭಾಗವಹಿಸಿದ ವಿಷಯ ಪರಿಣಿತರು, ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು, ಶಿಕ್ಷಣ ತಜ್ಞರಿಗೆ ಇಲಾಖೆಯು ಕೃತಜ್ಞತೆಗಳನ್ನು ಸಲ್ಲಿಸುತ್ತದೆ.

ನಿರ್ದೇಶಕರು

ಡಿ.ಎಸ್.ಇ.ಆರ್.ಟಿ, ಬೆಂಗಳೂರು

ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನಕೋಠಿಯನ್ನು ಬಳಸಲು ಅನುಸರಿಸಬೇಕಾದ ಸೂಚನೆಗಳು

- ಇದು ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನಕೋಠಿಯಾಗಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಸಾಧ್ಯವಿರುವ ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳನ್ನು ಸಿದ್ಧಪಡಿಸಿ ಇದರಲ್ಲಿ ನೀಡಲಾಗಿದೆ.
- ಇದನ್ನು ಶಿಕ್ಷಕರು ತಮ್ಮ ದೈನಂದಿನ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ
- ಈ ಪ್ರಶ್ನೆ ಕೋಠಿಯು ಬಹುಆಯ್ಕೆ, ಒಂದು ಅಂಕ, ಎರಡು ಅಂಕ, ಮೂರು ಅಂಕ, ನಾಲ್ಕು ಅಂಕ ಮತ್ತು ಐದು ಅಂಕದ ಪ್ರಶ್ನೆಗಳನ್ನು ಒಳಗೊಂಡಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಅನ್ವಯಿಸುವಂತೆ ಸಿದ್ಧಪಡಿಸಿದ್ದು, ಅವುಗಳನ್ನು ಅಧ್ಯಾಯವಾರು ನೀಡಲಾಗಿದೆ.
- ಸದರಿ ಪ್ರಶ್ನಕೋಠಿಯು ಎಲ್ ಓ ಆಧಾರಿತ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಪ್ರತಿ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೂಕ್ತವಾದ ಉತ್ತರವನ್ನು ಸಹ ನೀಡಲಾಗಿದೆ. ಇಲ್ಲಿ ನೀಡಲಾದ ಉತ್ತರವನ್ನು ಹೊರತು ಪಡಿಸಿ ಬೇರೆ ವಿಧಾನದಿಂದಲೂ ಬಿಡಿಸಲು ಸಾಧ್ಯವಿದ್ದರೆ, ಅದನ್ನು ತರಗತಿಯ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಚರ್ಚಿಸಲು ಅವಕಾಶವಿದೆ.
- ಇದನ್ನು ತರಗತಿಯ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ನಿರಂತರವಾಗಿ ಮತ್ತು ಸಮಗ್ರವಾಗಿ ಪ್ರತಿ ಮೌಲ್ಯಮಾಪನದ ಸಂದರ್ಭದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ.
- ಸದರಿ ಸಾಮಗ್ರಿಯನ್ನು ಶಿಕ್ಷಕರು ಒಂದು ಸಂಪನ್ಮೂಲವಾಗಿ ಬಳಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದ್ದು, ಇದನ್ನು ಪ್ರತಿ ಮಗುವಿಗೆ ರುರಾಕ್ಸ್ ಮಾಡಿ ನೀಡಲೇ ಬೇಕೆಂದು ತಿಳಿಸಿರುವುದಿಲ್ಲ. ಮಕ್ಕಳಿಗೆ ಎಲ್ ಓ ಆಧಾರಿತ ಕಲಿಕೆಯು ಖಾತರಿ ಪಡಿಸಿಕೊಳ್ಳಲು ನಡೆಸುವ ನಿರಂತರ ಮತ್ತು ಸಮಗ್ರ ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದೆ.
- ಇಲಾಖೆಯು ಹಮ್ಮಿಕೊಳ್ಳುವ ಎಲ್ಲಾ ತರಗತಿವಾರು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಸದರಿ ಪ್ರಶ್ನಕೋಠಿಯಲ್ಲಿ ನೀಡಲಾದ ಎಲ್ ಓ ಗಳನ್ನು ಆಧಾರವಾಗಿ ಯೋಜನೆಯನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನಡೆಸಲಾಗುವುದು.

Curricular Goals.	Competencies	Learning Outcomes	Name of the chapter
C.G-1 Understands numbers and sets of numbers (whole numbers, fractions, integers, rational numbers, and real numbers), looks for patterns, and appreciates relationships between numbers.	C-1.1 Develops the ability to read, write, compare, estimate, and perform operations with large whole numbers up to 10 digits, and expresses them in scientific notation using exponents and powers.	1. Explain the meaning of exponents, simplify the expressions involving exponents using the laws of exponents; apply the laws of exponents in problem-solving. 2. Express large numbers in scientific notation. Solve word problems and puzzles on exponents	2. Power Play
	C-1.2 Discovers, identifies, and explores number patterns (e.g., multiples of 7, powers of 3, prime numbers) and explains relationships between different patterns.	5. Identify the patterns and properties of square numbers and cube numbers and solve problems 6. Find squares, square roots, cubes, and cube roots by the method of prime factorization. 7. Estimate the square roots of the given numbers by looking at the patterns in the digits. 8. Solve daily-life problems involving square roots and cube roots.	1. A Square and A Cube
	C-1.3 Learns about zero and negative numbers and performs arithmetic operations on them as described by Brahmagupta.		
	C-1.4 Explores sets of numbers such as whole numbers, fractions, integers, rational numbers, and real numbers, and visualizes them on the number line.		
	C-1.5 Explores the concept of percentages and	9. Explain the meaning of percentages. Express fractions in decimal and percentage forms;	8. Fractions in Disguise

	applies it to solve problems.	convert decimals to percentages and percentages to decimals. 10. Estimate the percentage of a given quantity 11. Solve problems related to percentage increase/decrease, profit and loss, taxes, compounding, and depreciation encountered in daily life.	
	C-1.6 Explores and applies fractions, both as ratios and decimals, in everyday situations.	12. Explain the meaning of Ratio and proportion. Check whether the given ratios are in proportion or not. 13. Solve problems using Trirashika rule. Apply this rule to solve problems in daily life situations. 14. Share the given quantity according to the given ratio. Solve various daily life problems.	7. Proportional Reasoning – 1
		15. Identify the situations of inverse proportion and solve various direct and inverse proportion problems.	10. Proportional Reasoning – 2
C.G-2 Understands the concepts of variable, constant, coefficient, expression, and (one-variable) equation, and uses these concepts to solve meaningful daily-life problems with procedural fluency.	C-2.1 Understands equality between numerical expressions and checks arithmetic equations.		
	C-2.2 Extends number representation using variables and algebraic expressions.	16. Express a given number as the sum of consecutive numbers. 17. Quickly check the divisibility of numbers. 18. Solve cryptarithms and integrate arithmetic with algebra.	5. Number Play
	C-2.3 Forms and manipulates algebraic expressions using variables, coefficients, and constants.	19. Perform quick multiplication and write products in a single step; expand products using the distributive law. Find the amount of increase or decrease in the product using distributive property. 20. Explain visually the identities $(a+b)^2$, $(a-b)^2$, $(a+b)(a-b)$	6. We Distribute, Yet Things Multiply

		21. Find the area of shaded regions using algebraic identities and apply algebraic identities to determine required areas in daily life.	
	C-2.4 Forms and solves linear equations to find unknown values, including in puzzles and word problems.	22. Investigate number patterns and visual patterns and generalise them using suitable identities.	13. Algebra Play
	C-2.5 Develops personal methods for solving puzzles and problems using algebraic thinking.	23. Solve number-based puzzles, tricks, and games using algebraic thinking	13. Algebra Play
C.G-3 Understands, formulates, and applies properties and theorems regarding simple geometric shapes (2D and 3D).	C-3.1 Describes, classifies, and understands relationships among different 2D and 3D shapes using their properties.	24. Compare the properties of different quadrilaterals. 25. Classify the quadrilaterals based on their properties 26. Construct appropriate quadrilaterals based on given data.	4. Quadrilaterals
	C-3.2 Explains the properties of lines, angles, triangles, quadrilaterals, and polygons and applies them in problem-solving.	27. Solve problems related to quadrilaterals	4. Quadrilaterals
	C-3.3 Identifies attributes of 3D shapes, constructs them using materials, and uses 2D representations to visualize and solve problems.	28. Construct solid figures using suitable nets. 29. Draw isometric projections of various solid shapes using isometric grid paper. 30. Solve problems based on visualizing solids.	11. Exploring Some Geometric Themes

	C-3.4 Draws and constructs geometric shapes such as lines, parallel and perpendicular lines, angles, and simple triangles using a compass and straightedge.	31. Construct appropriate quadrilaterals based on given data.	4. <i>Quadrilaterals</i>
	C-3.5 Understands congruence and similarity and identifies similar and congruent triangles.		14. Area
C.G-4 Develops understanding of perimeter and area for 2D shapes and uses them to solve day-to-day life problems.	C-4.1 Discovers and uses formulas for the area of squares, triangles, parallelograms, and trapeziums, and finds areas of composite shapes.	32. Derive the formula to find the area of triangle, rectangle, parallelogram, rhombus, trapezium and apply them to solve problems. 33. Calculate the area by dividing complex polygons into simpler figures such as triangles and rectangles. <i>Transform one figure into another figure of equal area using the dissection method.</i>	
	C-4.2 Learns the Baudhayana–Pythagoras theorem, explores geometric proofs, and studies related constructions from the Sulba-Sutras.	34. Construct a square whose area is equal to the sum or difference of two given squares. 35. Deduce the Baudhayana-Pythagoras theorem for right triangles. 36. Solve problems by applying the Baudhayana-Pythagoeran theorem 37. Prove that $\sqrt{2}$ has non terminating decimal expansion	9. The Baudhayana-Pythagoras Theorem
	C-4.3 Creates tiling designs using 2D shapes and appreciates their use in Indian and world art.		

	C-4.4 Develops familiarity with fractals and recognizes their appearance in nature and art.	39. Extend the patterns and discuss fractal patterns; Solve problems based on fractals 40. Draw fractal designs such as Sierpensi Triangle, Koch snowflake and appreciate fractals in daily life.	11. Exploring Some Geometric Themes
C.G-5 Collects, organises, represents (graphically and in tables), and interprets data/information from daily-life experiences.	C-5.1 Collects, organizes, and interprets data using mean, median, and mode.	40. Calculate mean and median in raw data, dot plots, and frequency tables; apply them in daily life and analyze how they change on varying the data. 41. Solve problems related to mean and median with frequencies	
	C-5.2 Selects, creates, and uses graphs such as pictographs, bar graphs, histograms, line graphs, and pie charts to interpret data.	42. Draw, Interpret and visualize various data representations including pie charts, line graphs, clustered bar graphs, and infographics 43. Work individually/collaboratively on projects involving data collection, organisation, visualization and share their observations and inferences.	12. Tales by Dots, Bars, and Lines
C.G-6 Develops mathematical thinking and the ability to communicate mathematical ideas logically and precisely.	C-6.1 Uses inductive and deductive reasoning to formulate definitions, make conjectures, and develop proofs in algebra, number theory, and geometry.	44. Create conjectures based on factors and multiples 45. Solve problems and puzzles based on properties of multiples, factors, and their generalisation 46. Justify the rationale behind the divisibility tests for 3, 9, and 11.	
C.G-7 Engages with puzzles and mathematical problems and develops own creative methods and strategies to solve them.	C-7.1 Demonstrates creativity in discovering solutions to puzzles and appreciates different approaches by others.	47. Solve simple cryptarithm puzzles based on multiplication	
	C-7.2 Engages in and appreciates the creativity and		

	aesthetics of puzzle-making and puzzle-solving.		
C.G-8 Develops basic skills and capacities of computational thinking, namely, decomposition, pattern recognition, data representation, generalisation, abstraction, and algorithms in order to solve problems where such techniques of computational thinking are effective.	C-8.1 Applies programmatic thinking, including iteration, symbolic representation, logical operations, and algorithmic problem-solving.		
	C-8.2 Learns systematic counting, listing, reasoning, pattern recognition, data representation, and algorithm design, while understanding correctness and efficiency.	48. Explain and appreciate the effectiveness and efficiency of Hindu number system in representing big and small quantities	3. Story of Numbers
C.G-9 Knows and appreciates the development of mathematical ideas over a period of time and the contributions of past and modern mathematicians from India and across the world.	C-9.1 Recognizes the historical development of mathematical concepts across different civilizations.	49. Represent a quantity in a given number system (the base numeral-quantity mapping is provided) 50. Explain the advantages and disadvantages of a particular number system and appreciate the evolution of numerals across various civilizations 51. Appreciate the significance of place value system and the discovery of zero	3. Story of Numbers
	C-9.2 Knows and appreciates the contributions of Indian mathematicians such as Aryabhata, Brahmagupta, Bhaskara, Ramanujan, and others.	52. Appreciate the contributions of Baudhayana related to Sulba-sutras and constructions	9. The Baudhayana-Pythagoras Theorem

C.G-10 Knows about and appreciates the interaction of Mathematics with each of their other school subjects.	C-10.1 Recognizes connections between Mathematics and subjects such as Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.	53. Appreciate the connections and integration of mathematics with other subjects.	
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CHAPTER 1 : SQUARES AND CUBES

LO No	Learning Outcomes	Question Numbers
5	Identify the patterns and properties of square numbers and cube numbers and solve problems.	1, 2, 3, 4, 6, 9, 10, 12, 14, 16, 17, 21, 22, 23, 25, 26, 27, 29, 30, 31, 33, 34, 36, 45, 49, 50, 51, 53, 55, 57, 63, 64, 66.
6	Find squares, square roots, cubes, and cube roots by the method of prime factorization.	5, 7, 13, 15, 19, 20, 24, 28, 32, 35, 37, 38, 39, 40, 42, 43, 44, 52, 58, 59, 61, 62,
7	Estimate the square roots of the given numbers by looking at the patterns in the digits.	11, 47, 65,
8	Solve daily-life problems involving square roots and cube roots.	8, 18, 41, 46, 48, 54, 56, 60, 67, 68

EASY	AVERAGE	DIFFICULT	TOTAL
21	35	12	68

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- The square of 10 is (EASY)
 A) 10 B) 100 C) 20 D) 10000
- The square numbers from 1 to 10 are (EASY)
 A) 1 , 8 B) 1 , 4 , 8 C) 1, 4 , 9 D) 1, 5 , 10
- The sum of first 'n' odd natural numbers is (AVERAGE)
 A) n B) n^2 C) $n + 1$ D) 2n
- The number having '9' in its unit place after squaring the number is (EASY)
 A) 9 B) 10 C) 17 D) 81
- The least number to be multiplied to make 243, a perfect cube number is (AVERAGE)
 A) 1 B) 3 C) 5 D) 7
- A number that ends with these digits is not a perfect square (EASY)
 A) 0 , 1, 5 , 6 B) 2 , 4, 5 , 7 C) 4 , 5, 6, 9 D) 2 , 3, 7, 8

7. The value of $\sqrt{441}$ is (EASY)
 A) 11 B) 21 C) 31 D) 41
8. If area of a square is 81cm^2 , then its perimeter is (DIFFICULT)
 A) 36 cm B) 9cm C) 18 cm D) 162 cm
9. If the square of a number is subtracted from the cube of a number the result is 100. Then, the number is (AVERAGE)
 A) 1 B) 2 C) 4 D) 5
10. The number of cube numbers that lie between 10 and 26 is (EASY)
 A) 0 B) 1 C) 2 D) 3
11. If $\sqrt[3]{5832}=18$, then $\sqrt[3]{5832000}$ is (AVERAGE)
 A) 18 B) 180 C) 1800 D) 18000
12. The digits that can occupy in the unit place of any cube number is (AVERAGE)
 A) 0, 1, 2, 3 B) 4, 5, 6, 7 C) 7, 8, 9, 0 D) 0,1,2,3,4,5,6,7,8,9
13. The smallest number by which 53240 can be divided to make it a perfect cube is (AVERAGE)
 A) 5 B) 10 C) 15 D) 20
14. The value of $\sqrt{121} - \sqrt{9}$ is (EASY)
 A) 14 B) 13 C) 10 D) 8
15. If $x = 2^3 \times 3^3$ then the cube root of the x is (AVERAGE)
 A) 6 B) 7 C) 8 D) 9
16. The perfect cube number among these numbers is (EASY)
 A) 18 B) 100 C) 125 D) 2729
17. The number of perfect cube numbers from 1 to 100 is (AVERAGE)
 A) 4 B) 9 C) 10 D) 11
18. The smallest Taxicab number is (AVERAGE)
 A) 4104 B) 13832 C) 1729 D) 1000
19. In prime factorisation, a number is a perfect square if (AVERAGE)
 A) all its prime factors occur in odd powers B) all its prime factors occur in even powers
 C) it has more than 2 prime factors D) it always has odd factors
20. Which of the following expression is not a perfect cube (AVERAGE)
 A) $27 \times 125 \times 64$ B) $1331 \times 125 \times 8$ C) $15 \times 8 \times 25$ D) $1 \times 8 \times 343$

II. Answer The Following (One mark questions)

21. If $4^2 + 5^2 + 20^2 = 21^2$ then find the value of $5^2 + 6^2 + 30^2$ (AVERAGE)
22. Write the general form of n^{th} odd number. (EASY)
23. Write 25 as the sum of consecutive odd numbers. (EASY)
24. Express 64 as the product of its prime factors. (AVERAGE)
25. Find the perfect square number between 30 and 40. (EASY)
26. Find the value of $(4.2)^2$. (AVERAGE)
27. Express the Hardy Ramanujan number 1729 as the sum of two cube numbers in two Different ways. (AVERAGE)
28. Find the value of $\sqrt[3]{216} \times \sqrt[3]{125}$. (EASY)
29. How many digits are there in the decimal part of $(13.08)^3$? (EASY)
30. Write the first two cube numbers that has 4 in its unit place. (EASY)
31. Observe the pattern given below ,write the appropriate number in the space provided. (EASY)

$$7^2 = 49$$

$$67^2 = 4489$$

$$667^2 = 444889$$

$$6667^2 = \underline{\hspace{2cm}}$$

32. If $b \times b \times b = 125$, then find the value of 'b' (AVERAGE)
33. 'n' is any natural number and its square is 'm' . Express 'n' interms of 'm'. (AVERAGE)
34. Observe the pattern and comple the sequence. (EASY)
- 121 , 144, 169 , 196 , 225 , _____, _____
35. Check whether 216 is a perfect cube. (AVERAGE)
36. In a triangular numbers which is the 7th triangular number? (AVERAGE)

III. Answer the following questions (Two marks questions)

37. Using prime factorisation method check whether 368 is a perfect square. (AVERAGE)
38. Find the square root of 1764 using prime factorisation method & write the digit that comes in the unit place of the square root of that number. (EASY)
- 39 Find the value of $\sqrt{248 + \sqrt{52 + \sqrt{144}}}$ (DIFFICULT)
- 40 Find the square root of 49 by repeated subtraction method. (EASY)
- 41 If the perimeter of a square frame is 48 cm, then find the length of its side. (AVERAGE)

42. Find the smallest number by which 500 must be multiplied to make it a perfect cube. (AVERAGE)
43. Find the smallest number by which 270 must be divided to make it a perfect cube. (AVERAGE)
44. Find the cube root of 5832 using prime factorisation method. (AVERAGE)
45. Find the sum of the cubes of the first three positive multiples of 2. (AVERAGE)
46. If the length of the edge of a cubical box is 13cm, then find its volume. (AVERAGE)
47. Given that $\sqrt{4096} = 64$, then find the value of $\sqrt{4096} + \sqrt{40.96}$ (AVERAGE)
48. How many cuboids each having the dimension 5cm, 2cm, 5cm are needed to form a cube. (AVERAGE)
49. Show that the sum of the 3rd & 4th triangular numbers is a perfect square. (DIFFICULT)
50. In the square numbers 64^2 , 108^2 , 292^2 , and 36^2 , which of these numbers has the digit '4' in its units place? (EASY)
51. Given that $125^2 = 15625$, what is the value of 126^2 ? (EASY)
52. Find the cube root of 27000 (EASY)
53. How many numbers lie between the squares of 16 and 17? (AVERAGE)

IV . Answer the following questions (Three marks questions)

54. A gardener wants to arrange plants in a triangular shape . In the first row there is 1 plant, in the second 2 & so on . If he has 36 plants , how many rows can he form ? (AVERAGE)
55. The second Taxicab number is 4104. Express this number as the sum of two different cube numbers. (AVERAGE)
56. In a group of students it was decided to collect as many rupees from each member as the number of members in the group . The total amount collected was ₹ 5929. Find the number of students in that group. (AVERAGE)
57. The sum of the squares of two numbers is 145. If the square root of one number is 3, then find the other number. (DIFFICULT)
58. Check whether 46656 is a perfect cube. (AVERAGE)
59. Find the smallest square number that is divisible by 8 , 15 and 20. (DIFFICULT)
60. The principal of a School wants to arrange 1200 students in the form of a large square for a parade. Find the least number of students to be excluded so that the remaining students form a perfect square. How many students will be there in each row? (DIFFICULT)

V. Answer the following questions (Four marks questions)

61. Find the smallest number by which 9408 must be multiplied so that it becomes a perfect square. Also, find the square root of the product number so obtained. (DIFFICULT)

62. Find the smallest number to be multiplied to make 1008 a perfect square. Then, also find the square root of the number which is going to be perfect square after multiplication.

(DIFFICULT)

63. Three numbers are in the ratio 2 : 3: 4 .The sum of their cubes is 33957. Find these numbers.

(DIFFICULT)

64. 13 and 31 are strange pair of numbers so that their squares are 169 and 961 respectively (169 becomes 961 when the digits are reversed in order), which are mirror images of each other. Find other two such pair of numbers.

(AVERAGE)

65. You know that 1331 is a perfect cube. Can you guess its cube root without prime factorization? What is its cube root? Similarly, guess the cube roots of 4913, 12167, and 32768.

(DIFFICULT)

66. Which of the following is the largest? Explain with reasons: i) $67^3 - 66^3$ ii) $43^3 - 42^3$
iii) $67^2 - 66^2$ iv) $43^2 - 42^2$.

(AVERAGE)

VI. Answer the following questions (Five marks questions)

67. A group of students decided to contribute money for a charity. The total amount collected was a perfect square number, 9216. Each student contributed as many rupees as there are students in the group. Find the following.

(DIFFICULT)

a) Find the number of students in the group.

b) If the students decide to pack the total money in to small cubical boxes where the volume of each box is 64 cm^3 , find the length of the edge of the box.

68. An army general wants to arrange 4500 soldiers in a perfect square grid formation (where the number of rows equals the number of coloumns)

(DIFFICULT)

a) Determine the number of soldiers left out after forming the largest possible square grid.

b) If the general wants to add more soldiers to form the next immediate square grid size then find how many additional soldiers must be recruited.

CHAPTER-2 POWER PLAY

LO No	Learning Outcomes	Question Numbers
1	Explain the meaning of exponents, simplify the expressions involving exponents using the laws of exponents; apply the laws of exponents in problem-solving.	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 72, 73, 75, 76, 77, 78, 80, 84, 85, 91, 96.
2	Express large numbers in scientific notation. Solve word problems and puzzles on exponents.	8, 19, 20, 21, 22, 50, 53, 70, 71, 74, 79, 81, 82, 83, 86, 87, 88, 89, 90, 92, 93, 94, 95

EASY	AVERAGE	DIFFICULT	TOTAL
46	31	19	96

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- In 2^5 the base is (EASY)
 A) 5 B) 2 C) 10 D) 25
- In 7^4 '4' indicates (EASY)
 A) base B) multiple C) index D) product
- The value of 5^1 is (EASY)
 A) 0 B) 1 C) 5 D) 25
- The value of 15^0 is (EASY)
 A) 0 B) 15 C) -15 D) 1
- The value of 1^8 is (EASY)
 A) 8 B) 1 C) 0 D) 64
- The value of 10^3 is (EASY)
 A) 100 B) 1000 C) 10 D) 300
- The exponential form in the following is (EASY)
 A) $2 \times 2 \times 2$ B) $2+2+2$ C) 2^3 D) $\frac{6}{2}$
- If the thickness of the paper is 'V' units, then the thickness after it is folded 8 times (in units) is (AVERAGE)
 A) $2^8 V$ B) $8+V$ C) $8V$ D) $8^2 V$

9. The simplified form of $2^3 \times 2^2$ is **(EASY)**
 A) 2^5 B) 4^5 C) 2^6 D) 4^4
10. If a and b are two rational numbers then, $a^5 \times b^5$ is equal to **(EASY)**
 A) $(a \times b)^0$ B) $(a \times b)^{10}$ C) $(a \times b)^5$ D) $(a \times b)^{25}$
11. The simplified form of $\frac{7^5}{7^2}$ is **(EASY)**
 A) 7^2 B) 7^3 C) 7^2 D) 7^7
12. The simplified form of $(3^2)^2$ is **(EASY)**
 A) 3^4 B) 3^3 C) 6^2 D) 9^2
13. The value of $(-3)^2 \times (-5)^2$ is **(AVERAGE)**
 A) -60 B) +60 C) -225 D) +225
14. $\frac{2}{m^{-1}}$ can be written as **(AVERAGE)**
 A) $2m$ B) $\frac{2}{m}$ C) $\frac{m}{2}$ D) $\frac{m^{-1}}{2}$
15. The simplified form of $x^{-1} \times x^0$ is **(EASY)**
 A) x^1 B) x^0 C) 0 D) $\frac{1}{x}$
16. The value equal to 10^{-2} is **(EASY)**
 A) 0.01 B) -20 C) 8 D) 100
17. If $a^3 = 125$ then, the value of a is **(EASY)**
 A) 4 B) 5 C) 6 D) 25
18. If $x = 2^3$ then, the value of x^2 is **(AVERAGE)**
 A) 32 B) 64 C) 16 D) 128
19. The scientific form of 100000 is **(EASY)**
 A) 10^4 B) 1.0×10^5 C) 1.0 D) 5.0×10^5
20. The scientific form of 0.00032 is **(EASY)**
 A) 3.2×10^{-3} B) 3.2×10^{-4} C) 32×10^{-4} D) 0.32×10^{-3}
21. If $314200000 = 3.142 \times 10^n$ then, the value of 'n' is **(EASY)**
 A) 5 B) 8 C) 9 D) 10
22. The mass of one proton is $\frac{1673}{1,000,000,000,000,000,000,000,000}$ g, the representation of this in scientific form is **(AVERAGE)**
 A) 1.673×10^{-24} g B) 1.673×10^{24} g C) 16×10^{-24} g D) 16×10^{24} g

II. Answer The Following questions (One mark questions)

23. Write $6 \times 6 \times 6 \times 6$ in exponential form (EASY)
24. Write $x \cdot x \cdot x \cdot x \times y \cdot y$ in exponential form. (EASY)
25. Write the exponential form of $3 \cdot x \cdot x$ (EASY)
26. Write the numerical value of 2×10^3 (EASY)
27. Represent $\frac{1}{512}$ in exponential form (EASY)
28. Find the value of 2^5 (EASY)
29. Represent in the exponential form $a \times a \times b \times c \times c \times c \times c \times d \times d$ (EASY)
30. Find the numerical value of 5×10^2 (EASY)
31. Find the numerical value of 4.83×10^7 (EASY)
32. Write equivalent form of 5^{-2} (EASY)
33. Find the value of $(-2)^7$ (AVERAGE)
34. Simplify:- $\frac{x^7}{x^3}$ (EASY)
35. What is $\frac{2^{100}}{2^{25}}$ in powers of 2 (EASY)
36. Simplify:- $\frac{p^{-3}}{p^{-6}}$ (AVERAGE)
37. Simplify:- $\frac{x^{-6}}{x}$ (AVERAGE)
38. Simplify and write the answer in the exponential form $3^2 \times 3^{-5} \times 3^6$ (EASY)
39. Simplify $(x^3)^4$ (EASY)
40. Simplify $(x^5)^{-2}$ (EASY)
41. Expand $(3 \times 2)^3$ (EASY)
42. Expand $(2 \times x)^4$ (EASY)
43. Simplify:- $\left(\frac{2}{x}\right)^3$ (EASY)
44. Simplify:- $p^3 \times p^{-10}$ (EASY)
45. Expand 152 in using powers of 10 (EASY)
46. Write 10,000 in the exponential form with base 10 (EASY)
47. Simplify: $8^p \times 8^q$ (EASY)
48. Find the value of $(3^{-1} + 4^{-1} + 5^{-1})^0$ (AVERAGE)
49. If $2^6 = 8^a$ then, find the value of 'a' (EASY)
50. Write one million in scientific form. (EASY)
51. Write the difference between Linear growth and Exponential growth. (EASY)
52. Express 8^{14} in the form of $(a^m)^n$ exponential form. (AVERAGE)
53. There are 5 bottles in a container, every day a new container is brought in. How many bottles would be there after 40 days? (AVERAGE)

III. Answer the following questions (Two marks questions)

54. Write the product of prime factors of 2025 in exponential form. (AVERAGE)
55. Express 3600 as product of powers of their prime factors in exponential form. (AVERAGE)
56. Simplify by operations with exponents $3^2 \times 3^4 \div 3^3$ (EASY)
57. Simplify $(x^3 \times y^5)^2$ (EASY)

58. Simplify $(2p^2)^3$ (EASY)
59. Simplify $(a^2 \times b^{-3})^3$ (AVERAGE)
60. Simplify $(5x^{-3} \times y^{-2})^3$ (AVERAGE)
61. Simplify and express in exponential form $\frac{10^4}{5^4}$ (AVERAGE)
62. Simplify the following $[(2^2)^2]^2$ (AVERAGE)
63. Find out the units digit in the value of $\frac{2^{224}}{4^{32}}$ (hint $4 = 2^2$) (DIFFICULT)
64. Simplify and write in the exponential form $m^5 n^{12} (mn)^9$ (AVERAGE)
65. Expand 172 as power of 10. (EASY)
66. In $6^{15} = (6^5)^3$ OR $6^{15} = 6^{5^3}$, which one is correct. Justify your answer (DIFFICULT)
67. In $(5^5)^2$ and 5^{5^2} which one is bigger? (DIFFICULT)
68. Represent hundred thousand in exponential form of base 10 (AVERAGE)
69. Write 8^6 in two different ways as power of powers $[(a^m)^n]$ (AVERAGE)
70. Represent i) 65950 ii) 3435000 in scientific form. (AVERAGE)
71. Write the standard form of scientific form representation. (AVERAGE)
72. In 2^8 OR 8^2 which number is bigger? (EASY)
73. If $12^2 = 144$ then, find the value of $(1.2)^2$ and $(0.12)^2$ (AVERAGE)
74. The world population of sheep in(2024) is about 10^9 , and that of goat is also about the same.
What is the total population of sheep and goats? (AVERAGE)

IV. Answer the following questions (Three marks questions)

75. Simplify the following $\frac{3^5 \times 2^2 \times 7^{-3}}{7^{-2} \times 3^{-3} \times 2^4}$ (DIFFICULT)
76. Simplify the following $\frac{15^4 \times 14^2}{21^3 \times 10^3}$ (DIFFICULT)
77. If $3^m \times 3^2 = 3^5$ then, find the value of m. (AVERAGE)
78. Write 32^{-5} as the product of two or more powers in three different ways. The powers can be any integer. (DIFFICULT)
79. A dairy plans to produce 8.5 billion packets of milk in a a year. They want a unique ID(identifier) code for each packet. If they choose to use the digits 0 – 9, how many digits should be the code consists of? (DIFFICULT)
80. If $14^2 = 196$ then, find the values of the following. (AVERAGE)
- (i) $(1.4)^2$ (ii) $(0.14)^2$ (iii) 140^2
81. A digital locker has an Alphanumerie(it can have both digits and letters) passcode of length 5. Some example codes are G89P0, 38098, BRJKW, and 003AZ. How many such codes are possible? (DIFFICULT)
82. The estimated number of trees (2023) globally stands at 3 trillion (3×10^{12}). If each tree had about 10^4 leaves, find the total number of leaves on all the trees in the world. (DIFFICULT)
83. Write. a) 5672 b) 465.943 in Scientific notation. (AVERAGE)
84. Write 9^{14} in three different ways as power of powers $[(a^m)^n]$. (AVERAGE)

85. Write 64^3 in three different ways as power of powers $[(a^m)^n]$. (the powers may be any integer)
(DIFFICULT)
86. What is scientific notation? Represent 450000 in scientific form
(AVERAGE)
87. A Bacteria become double for every hour, previously if it was 8 in number then, what is their number after 3 hours?
(AVERAGE)
88. There are about 100 million Beehives in the world. If each beehive has 50,000 bee's. Find the number of bee's and represent in scientific form.
(DIFFICULT)
89. The size of Red Blood Cell is $0.000007m$ and the size of Plant cell is $0.00001275m$. Which one is larger in these? And find how much larger it is?
(DIFFICULT)
90. The diameter of the Sun is $1.4 \times 10^9 m$ and the diameter of the Earth is $1.275 \times 10^4 km$ Compare the diameters and write.
(DIFFICULT)

V. Answer the following questions (Four marks questions)

91. Simplify the following (i) $(3^2)^4 \div 3^5$ (ii) $\frac{(2^3)^4 \times 2^{-2}}{2^6}$ (DIFFICULT)
92. Thickness of a sheet is 0.001 cm the distance between earth and moon is 3.84400 km. If you stacked sheets of paper on top of each other. How many would you need to reach the moon?
(DIFFICULT)
93. The estimated population of ants globally is 20 quadrillion (2×10^{16}) and a global human population of about 8×10^9 . How many ants are there for every human in the world.
(DIFFICULT)
94. The distance between Earth and Sun is about $1.497 \times 10^8 km$. If light travels by the speed of $3 \times 10^5 km/s$, find the time taken by the light to reach the earth.
(DIFFICULT)
95. If the stars are counted one per every second. What is the total number of stars counted in one year ? Represent the counted number of stars in scientific form.
(DIFFICULT)
96. Using power line for 6 answer the following (DIFFICULT)

(i) 1296×36

(ii) $\frac{7776}{216}$

(iii) $46656 \times \frac{1}{216}$

(iv) $\frac{1}{36} \times \frac{1}{216}$

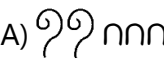
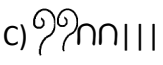
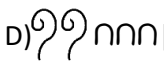
6^6	46656
6^5	7776
6^4	1296
6^3	216
6^2	36
6^1	6
6^0	1
6^{-1}	$\frac{1}{6}$
6^{-2}	$\frac{1}{36}$
6^{-3}	$\frac{1}{216}$
6^{-4}	$\frac{1}{1296}$
6^{-5}	$\frac{1}{7776}$

CHAPTER-3 A STORY OF NUMBERS

LO No	Learning Outcomes	Question Numbers
48	Explain and appreciate the effectiveness and efficiency of Hindu number system in representing big and small quantities	1, 3, 15
49	Represent a quantity in a given number system (the base numeral-quantity mapping is provided)	13, 26, 27, 28, 29, 30, 31, 32, 34, 35
50	Explain the advantages and disadvantages of a particular number system and appreciate the evolution of numerals across various civilizations	4, 6, 7, 8, 9, 11, 12, 17, 17, 18, 19, 20, 21, 22, 23, 24, 25
51	Appreciate the significance of place value system and the discovery of zero.	2, 5, 10, 14, 16, 33

EASY	AVERAGE	DIFFICULT	TOTAL
25	06	04	35

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- The first Mathematician to fully explain and elaborate scientific computations with the Indian system of 10 symbols is (EASY)
 A) Al-Khwarizmi B) Aryabhata C) Al-Kindi D) Fibonacci
- The symbol used by Mayan to place holder for zero is (EASY)
 A) Dot B) Bar C) Seashell D) Circle
- The script written by Brahmagupta in 628 CE is (EASY)
 A) Brahmasphuti Sidhantha B) Aryabhatiya Sidhantha
 C) Brahma Sidhantha D) Decimal Sidhantha
- In Egyptian Number system 231 is written as (EASY)
 A)  B)  C)  D) 
- The Indian Mathematician to frame Arithmetic laws for zero is (EASY)
 A) Aryabhata B) Brahmaguptha C) Fibonacci D) Laplace

6. The Value of 'L' in the Roman system is (EASY)
 A) 10 B) 100 C) 50 D) 500
7. The measurements influenced by Mesopotamian base-60 system are (EASY)
 A) Length and Weight B) Time and Angles C) Money and Trade D) Mass and Energy
8. In Egyptian number system the symbol  represent the number (EASY)
 A) 10^3 B) 10^4 C) 10^7 D) 10^5
9. The value of Ukasar of Australian local people Gumulgal is (EASY)
 A) 1 B) 2 C) 3 D) 4
10. The Modern system of writing the numbers using 0 – 9 was born first in the country (EASY)
 A) Greece B) Rome C) India D) Egypt
11. The Gumulgal called as Ros for the number greater than (EASY)
 A) 7 B) 6 C) 9 D) 2
12. The value of 'M' in the Roman system is (EASY)
 A) 100 B) 1000 C) 500 D) 50

II. Answer the following questions (One mark questions)

13. What is Number system? (EASY)
14. The term Algorithm is named after which Arab Persian Mathematician? (EASY)
15. Writing the numbers using ten digits for the first time occurs in which manuscript? (EASY)
16. Which Mathematician made the case to Europe to adopt Indian Numerical digits? (EASY)
17. What do we call for the method of making marks(notches) on the surface of Bone or a wall of the Caves? (EASY)
18. Where did Ishango bone was discovered? (EASY)
19. Where did Lombobo bone was discovered? (EASY)
20. Multiply: $\infty \times \infty$ (AVERAGE)
21. What are Numerals? (EASY)
22. In Roman number system new symbols are used to represent bigger numbers what do we call such bigger numbers with new symbols? (EASY)
23. What is the name of the Mesopotomian System used in the measure of time? (EASY)
24. Write 302 in Roman System of numbers. (EASY)
25. Which are the two types of symbols used in Chinese System of representing the numbers? (EASY)

III. Answer the following questions (Two marks questions)

26. Write the numbers represented by Land mark symbols of Roman system. (EASY)

- i) D ii) M iii) C iv) L

27. Expand 2367 in land mark system, and represent in Roman system. (AVERAGE)

28. Add these Roman numbers without converting to Hindu numerals. (AVERAGE)

$$CCXXXII + CCCXIII$$

29. Add the Egyptian system numbers:       | | | (DIFFICULT)

  and  | | |

30. Expand 3743 in land mark system of Roman number system. (AVERAGE)

31. Write these numbers in Roman system (AVERAGE)

- i) 1222 ii) 2999

32. Represent the given numbers in Mesopotamia system (DIFFICULT)

- i) 200 ii) 60

IV. Answer the following questions (Three marks questions)

33. Write these numbers in Egyptian base-5 system (DIFFICULT)

- i) 15 ii) 147 iii) 651

34. Write the numbers represented by these digits (AVERAGE)

(i)  

 | | | | |

ii)    

  | |

35. Write these numbers in Mesopotamin system of numbers (DIFFICULT)

- i) 77 ii) 361 iii) 7210

CHAPTER-4 QUADRILATERALS

LO No	Learning Outcomes	Question Numbers
24	Compare the properties of different quadrilaterals.	1, 2, 3, 4, 6, 7, 8, 10, 12, 13, 14, 19, 20, 21, 43, 44, 45,
25	Classify the quadrilaterals based on their properties	5, 9, 11, 15,
26	Construct appropriate quadrilaterals based on given data.	28, 29, 36, 38, 39, 41,
27	Solve problems related to quadrilaterals	16, 17, 18, 22, 23, 24, 25, 26, 27, 30, 31, 32, 33, 34, 35, 37, 40, 42, 46,

EASY	AVERAGE	DIFFICULT	TOTAL
10	24	12	46

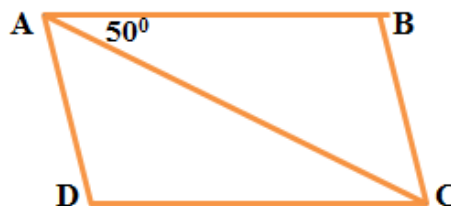
I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- The sum of the adjacent angles of a parallelogram is (EASY)
 A) 90° B) 180° C) 270° D) 360°
- The sum of all the interior angles of a quadrilateral is (EASY)
 A) 180° B) 270° C) 360° D) 540°
- The number of diagonals that can be drawn in a quadrilateral is (EASY)
 A) 1 B) 2 C) 3 D) 4
- The opposite angles of a parallelogram are always (EASY)
 A) Supplementary B) Equal C) Half D) 90°
- A quadrilateral in which all sides are equal and each angle is equal to 90° is (EASY)
 A) Rectangle B) Rhombus C) Square D) Trapezium
- The sum of all the exterior angles of a regular polygon is (EASY)
 A) 90° B) 180° C) 270° D) 360°
- The measure of the angle formed at the intersection of the diagonals of a rhombus is (AVERAGE)
 A) 90° B) 180° C) 270° D) 360°

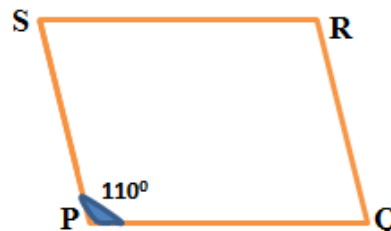
8. The correct statement regarding a rhombus is **(AVERAGE)**
 A) Diagonals are equal B) Diagonals bisect each other at right angles
 C) All angles are 90° D) Opposite sides are unequal
9. If each angle of a parallelogram is 90° , then it is a **(AVERAGE)**
 A) Square B) Rectangle C) Parallelogram D) trapezium
10. The angle formed at the point where the two diagonals of a square intersect is **(AVERAGE)**
 A) 45° B) 90° C) 120° D) 180°
11. A quadrilateral having only one pair of parallel sides is **(EASY)**
 A) Rhombus B) Square C) Trapezium D) Kite
12. The correct statement regarding a parallelogram is **(AVERAGE)**
 A) Opposite sides are equal but not parallel.
 B) Diagonals bisect each other.
 C) Opposite angles are always supplementary.
 D) Diagonals are unequal and do not bisect each other.

II. Answer The Following questions **(One mark questions)**

13. What is the sum of any two adjacent angles of a parallelogram? **(EASY)**
 14. Write any one property of the diagonals of a rectangle. **(AVERAGE)**
 15. What is an isosceles trapezium? **(AVERAGE)**
 16. In the figure, ABCD is a parallelogram. **(AVERAGE)**
 If $\angle BAC = 50^\circ$ find the measure of $\angle DCA$



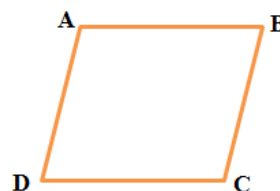
17. If three angles of a quadrilateral are 55° , 115° , and 70° , then what is the measure of the fourth angle? **(AVERAGE)**
18. In the figure, PQRS is a parallelogram. **(AVERAGE)**
 If $\angle P = 110^\circ$, then find the value of $\angle Q$.



III. Answer the following questions (Two marks questions)

19. Observe the given figure and name the following (any one pair) **(AVERAGE)**

- i) Opposite sides
- ii) Opposite angles
- iii) Adjacent sides
- iv) Adjacent angles



20. Write any two properties of a rhombus. **(EASY)**

21. Write any two properties of a square. **(EASY)**

22. In a parallelogram, if one angle is 60° , find the measures of the other three angles.

(AVERAGE)

23. The adjacent angles of a parallelogram are in the ratio 2:3. Find the measure of each angle.

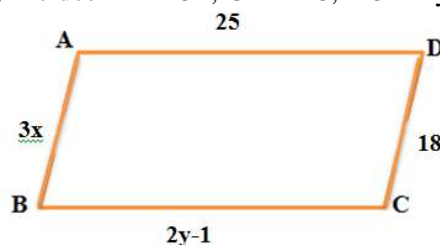
(AVERAGE)

24. In a parallelogram ABCD, if $\angle A = 75^\circ$ find the measures of the remaining angles $\angle B$, $\angle C$ and $\angle D$.

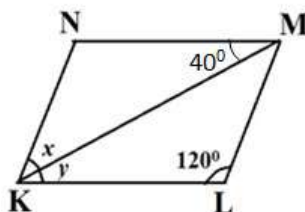
(AVERAGE)

25. In the following figure, if sides $AB = 3x$, $CD = 18$, $BC = 2y - 1$, and $AD = 25$, then find the values of x and y .

(AVERAGE)

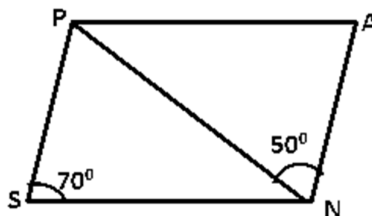


26. In the figure, KLMN is a parallelogram. Find the values of ' x ' and ' y '. **(AVERAGE)**



27. In the figure, SNAP is a parallelogram. $\angle PSN = 70^\circ$ and $\angle PNA = 50^\circ$, find the measures of $\angle APN$ and $\angle SPN$.

(DIFFICULT)

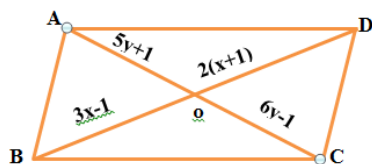


28. Construct a quadrilateral with diagonals of length 6 cm and the angle between the diagonals being 60° . **(DIFFICULT)**

29. Construct a parallelogram with adjacent sides 4 cm and 5 cm and the angle between them being 50° . **(DIFFICULT)**

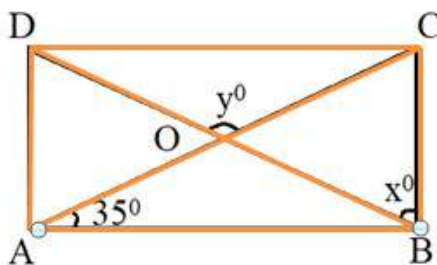
30. A tabletop is in the shape of a trapezium, where side AB is parallel to side CD. If $\angle A = 100^\circ$ and $\angle B = 120^\circ$, find the measure of $\angle C$ and $\angle D$. **(DIFFICULT)**

31. In parallelogram ABCD, if one angle is 50° , find the values of x and y . **(DIFFICULT)**

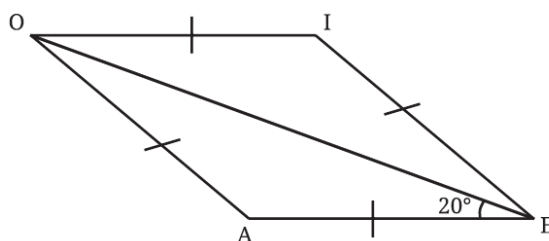


IV. Answer the following questions (Three marks questions)

32. The ratio of the four angles of a quadrilateral are in the ratio $1 : 2 : 3 : 4$. Find the measures of the angles. **(AVERAGE)**
33. The four angles of a quadrilateral are $(x + 10)^\circ$, $(2x - 20)^\circ$, $(3x - 30)^\circ$ and $(x + 50)^\circ$. Find the value of x and the measure of each angle. **(DIFFICULT)**
34. The adjacent angles of a parallelogram are $(3x + 4)^\circ$ and $(3x - 10)^\circ$. Find all the angles of the parallelogram. **(DIFFICULT)**
35. The ratio of three angles of a quadrilateral is $4 : 6 : 3$, and the fourth angle is 100° . Find the measures of the remaining three angles. **(AVERAGE)**
36. Construct a square with a diagonal of length 4 cm without using a protractor. **(AVERAGE)**
37. In the given figure, ABCD is a rectangle. Find the values of x and y . **(DIFFICULT)**



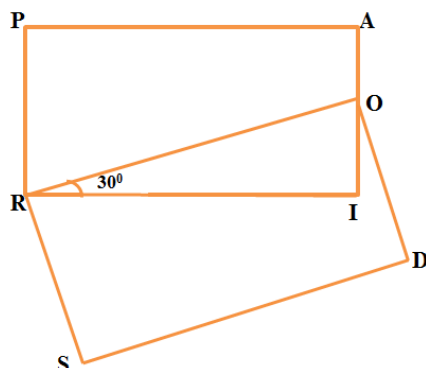
38. Draw a quadrilateral whose diagonals have equal lengths of 8 cm that bisect each other, and intersect at an angle of 40° **(AVERAGE)**
39. Draw a parallelogram with adjacent sides of lengths 4cm and 5cm and an angle of 30° between them **(AVERAGE)**
40. In the figure, find the remaining angles in the following quadrilateral, given $\angle AEO = 20^\circ$ **(AVERAGE)**



41. Using the diagonal properties, construct a rhombus whose diagonals are of lengths 4cm and 5cm. **(AVERAGE)**

V. Answer the following questions (Four marks questions)

42. If PAIR and RODS are two rectangles, then find the measures of $\angle IOD$ and $\angle IRS$.
(DIFFICULT)

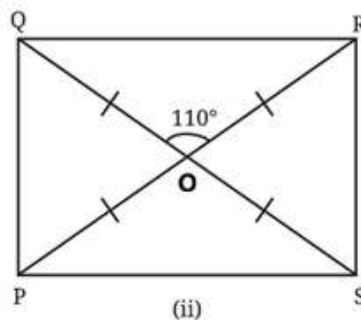
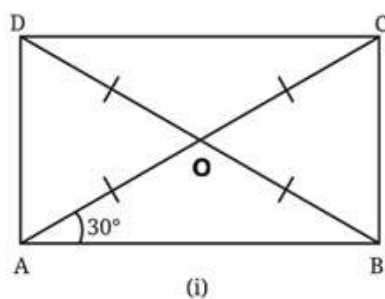


43. Prove that the diagonals of a parallelogram bisect each other. (DIFFICULT)

44. Prove that the sum of the interior angles of a quadrilateral is equal to 360° .
(DIFFICULT)

45. Prove that “the diagonals of a rhombus bisect each other.”
(DIFFICULT)

46. Find all the angles inside the following rectangles, given $\angle CAB = 30^\circ$ in figure (i) and $\angle QOR = 110^\circ$ in figure (ii)
(AVERAGE)



CHAPTER – 5 NUMBER PLAY

LO No	Learning Outcomes	Question Numbers
16	Express a given number as the sum of consecutive numbers.	8, 9, 11, 16, 17, 18, 24, 25, 31, 38, 39, 52, 54, 58, 64
17	Quickly check the divisibility of numbers.	1, 2, 3, 5, 6, 7, 10, 12, 20, 21, 22, 23, 27, 32, 33, 34, 44, 45, 46, 51, 53, 55, 57, 60, 61
18	Solve cryptarithms and integrate arithmetic with algebra.	4, 13, 14, 15, 19, 26, 28, 29, 30, 35, 36, 37, 40, 41, 42, 43, 47, 48, 49, 50, 56, 59, 60, 62, 63

EASY	AVERAGE	DIFFICULT	TOTAL
16	29	19	64

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- Among the following the number divisible by 9 is (EASY)
 A) 333 B) 444 C) 555 D) 777
- When 8316 is divided by 11, the remainder obtained is (EASY)
 A) 1 B) 2 C) 0 D) 3
- The algebraic expressions that always leaves a remainder of 3 when divided by 5 is (AVERAGE)
 A) $3k - 5$ B) $3k + 5$ C) $5k + 2$ D) $5k - 2$
- In a mathematical cryptarithm, if $UTT \times 5 = MUTT$, then the values of U, T, and M respectively are (AVERAGE)
 A) 4, 5, 0 B) 5, 0, 4 C) 5, 0, 2 D) 2, 0, 5
- The multiple of 9 closest to the number 5000 is (EASY)
 A) 4995 B) 4999 C) 4997 D) 4991
- The remainder obtained when the algebraic expression $5K + 3$ is divided by 5 is (AVERAGE)
 A) 1 B) 2 C) 3 D) 4

7. The remainder obtained when 10^5 is divided by 3 is (EASY)
 A) 2 B) 3 C) 0 D) 1
8. If the sum of three consecutive numbers is 51, then the numbers are (AVERAGE)
 A) 15, 16, 17 B) 16, 17, 18 C) 17, 18, 19 D) 14, 15, 16
9. The sum of the first 10 natural numbers is (EASY)
 A) 45 B) 50 C) 55 D) 60
10. The sum of any two consecutive odd numbers is always divisible by the number (AVERAGE)
 A) 3 B) 4 C) 5 D) 6
11. If the sum of three consecutive integers is 30, then the largest number among them is (EASY)
 A) 9 B) 10 C) 11 D) 12
12. Among these the correct statement is (EASY)
 A) All numbers divisible by 3 are also divisible by 9.
 B) All numbers divisible by 9 are also divisible by 3.
 C) All numbers divisible by 2 are also divisible by 4.
 D) If the last digit is 3, then the number is divisible by 3.
13. If a four-digit number 45R2 is divisible by 9, then the value of "R" is (DIFFICULT)
 A) 5 B) 6 C) 7 D) 8
14. If $2A \times A = 12A$, the correct value of "A" is (AVERAGE)
 A) 3 B) 4 C) 5 D) 6
15. In the following addition, the values of "P" and "Q" are (DIFFICULT)
- $$\begin{array}{r} P P \\ + Q Q \\ \hline 1 Q 1 \end{array}$$
- A) P = 9, Q = 2 B) P = 7, Q = 2 C) P = 8, Q = 1 D) P = 4, Q = 5

II. Answer The Following questions (One mark questions)

16. Write the factors of 24. (EASY)
17. Using integers, Express zero as the sum of seven consecutive numbers. (EASY)
18. Hitesh has an even number of marbles, and his classmate Shivank has an odd number of marbles. State whether the total number of marbles they have together is even or odd. (AVERAGE)
19. Solve the given cryptarithm: $HB \times P = HHH$. (AVERAGE)

20. Write the remainder when 548 is divided by 5. (AVERAGE)
21. Which is the least number which is divisible by both 6 and 4? (EASY)
22. Using the divisibility rule, find out whether 2563254 is divisible by 3. (AVERAGE)
23. What is the remainder when an even number that is not a multiple of 4 is divided by 4? (EASY)
24. Write the formula to find the sum of first n consecutive even natural numbers. (EASY)
25. If the sum of three consecutive integers is 24, then write the middle number. (AVERAGE)
26. If a three-digit number 24B is completely divisible by 9 then find the face value of B. (AVERAGE)
27. Write the shortcut rule (divisibility rule) to quickly check if a large number is divisible by 8. (EASY)
28. Find the sum $(X + Y)$ in the following subtraction problem: (DIFFICULT)

$$\begin{array}{r} 5X \\ - 23 \\ \hline Y4 \end{array}$$

29. Find the value of "A" in this special multiplication: $AA \times AA = 121$. (AVERAGE)
30. Write the number dcba in the general expanded form of the Indian number system. (EASY)
31. Express 54 as the sum of four consecutive natural numbers. (EASY)

III. Answer the following questions (Two marks questions)

32. Give an example to show that if an even number is divisible by 3, it is also divisible by 6. (EASY)
33. Using shortcut rule check whether the number 2586 divisible by 11. If it is not divisible by 11, then find the remainder. (AVERAGE)
34. Show with an example that the expression $4m + 2q$ always results in an even number for any integer values of m and q . (DIFFICULT)
35. The middle number of a sequence of 5 consecutive numbers is $5p$. Express the other four numbers of the sequence in terms of p , and find those numbers when $p = 2$. (DIFFICULT)
36. Find the digital root of the number 235678143. (AVERAGE)
37. Solve the given cryptarithm: $WOW \times 5 = MEOW$. (DIFFICULT)
38. The sum of two consecutive natural numbers is 73. Find those two numbers. (AVERAGE)
39. Express the square of 11 as the sum of two consecutive positive integers. (AVERAGE)
40. If a four-digit number 21Y5 is a multiple of 9 then, find the value of "Y". (AVERAGE)

41. The secret PIN of a bank account is 53T4, and it is completely divisible by 11. Find the missing digit "T" in that secret number. **(DIFFICULT)**
42. A fruit vendor has 21431S oranges. If he packs all the oranges into pockets of 4 each with none left over then, find the minimum possible value of S. **(DIFFICULT)**
43. Assume P is the largest of five consecutive numbers. Express the other four numbers in terms of P. **(AVERAGE)**
44. Find a multiple of 9 that does not contain any odd digits/numbers. **(AVERAGE)**
45. Find the multiple of 9 that is closest to 6000. **(EASY)**
46. How many multiples of 9 are there between 4300 and 4400? **(EASY)**
47. If the number 48a23b is a multiple of 18, list all possible pairs of values for a and b. **(EASY)**
48. The middle number of a sequence of 5 consecutive numbers is 5p. Express the other four terms of the sequence in terms of 'p'. **(EASY)**
49. An 8-digit number has a digital root of 5. What will be the digital root of a number that is 10 more than that number? **(AVERAGE)**

IV. Answer the following questions (Three marks questions)

50. What will be the digital root of the number $9a + 36b + 13$? **(AVERAGE)**
51. Find some numbers which when divided by 3 leave a remainder of 2, and when divided by 4 also leave a remainder of 2. Write an algebraic expression that describes all such numbers. **(AVERAGE)**
52. Find three consecutive numbers such that the first number is a multiple of 2, the second is a multiple of 3, and the third is a multiple of 4. Are there more such numbers? How frequently do they occur? **(AVERAGE)**
53. A 6-digit number is divisible by 15. When its digits are reversed, the new number is divisible by 6. Find such numbers. **(DIFFICULT)**
54. Using "+" and "-" signs between the four consecutive numbers 2, 3, 4, and 5, write down all the different possibilities and show that their sum is always an even number. **(AVERAGE)**
55. Show that the expression $9a + 36b + 9c$ is divisible by 9 when $a = 10$, $b = 11$, and $c = 12$ without performing actual long division. **(AVERAGE)**
56. Prove that for any odd natural number 'x' the expression $x^2 + 4$ is always an odd number. **(DIFFICULT)**
57. Find the remainder when 10^{10} is divided by 3. **(DIFFICULT)**
58. The sum of three consecutive natural numbers is 114. Find those three numbers and calculate the square of the largest number among them. **(DIFFICULT)**
59. If the six-digit number 214K35 is completely divisible by 9, find the value of "K". Also, check whether the new number formed using this "K" value is divisible by 3. **(DIFFICULT)**

V. Answer the following questions (Four marks questions)

60. The number 661 when divided by 7 leaves a remainder of 3, and the number 4799 leaves a remainder of 5. Without performing long division or calculation, can you determine the remainders when the corresponding algebraic expressions are divided by 7? Show the solution algebraically. **(DIFFICULT)**

61. When is the sum of two multiples of 3 a multiple of 9, and when is it not? Explain various possibilities and generalize the pattern. **(DIFFICULT)**

62. In a math puzzle, a 5-digit number $3X45Y$ is divisible by 6. If its last digit 'Y' is the largest single-digit even number, then find the value of 'Y' and all possible values of 'X'. **(DIFFICULT)**

63. Solve the following cryptarithm and find the unique digits represented by the letters S, E, N, D, O, R, Y, M **(DIFFICULT)**

$$\begin{array}{r} \text{S E N D} \\ + \text{M O R E} \\ \hline \text{M O N E Y} \end{array}$$

VI. Answer the following questions (Five marks question)

64. The sum of the squares of three consecutive natural numbers is 110. Find those three numbers. **(AVERAGE)**

CHAPTER-6 WE DISTRIBUTE, YET THINGS MULTIPLY

LO No	Learning Outcomes	Question Numbers
19	Perform quick multiplication and write products in a single step; expand products using the distributive law. Find the amount of increase or decrease in the product using distributive property.	1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 36, 37, 40, 41, 44, 45, 46, 57, 58, 66, 67, 70, 71, 72, 77, 79,
20	Explain visually the identities $(a+b)^2$, $(a-b)^2$, $(a+b)(a-b)$	3, 4, 6, 15, 16, 17, 18, 19, 20, 22, 27, 32, 35, 38, 39, 47, 48, 49, 50, 51, 52, 54, 55, 60, 61, 65, 69, 72,
21	Find the area of shaded regions using algebraic identities and apply algebraic identities to determine required areas in daily life.	21, 33, 42, 43, 53, 56, 59, 62, 63, 64, 68, 73, 74, 75, 76, 78, 80, 81

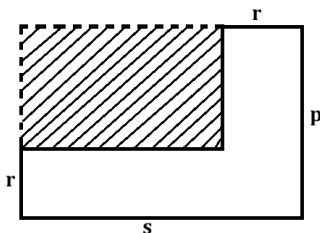
EASY	AVERAGE	DIFFICULT	TOTAL
15	45	20	81

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- When a and b are increased by m and n respectively, the resulting product is **(AVERAGE)**
 A) $(a + m)(b + n)$ B) $(am + bn)$ C) $(ab + mn)$ D) $(a + b)(m + n)$
- The rule indicated here is $(a + b)c = c(a + b)$ **(EASY)**
 A) Associative property of multiplication B) Associative property of addition
 C) Commutative property of multiplication D) Commutative property of addition
- The factors of $a^2 - b^2$ are **(EASY)**
 A) $(a - b)(a - b)$ B) $(a + b)(a + b)$ C) $(a + b)(a - b)$ D) $(a + b)(b - a)$
- When $(2m + 3)^2$ is expanded, the coefficient of m is **(AVERAGE)**
 A) 2 B) 3 C) 6 D) 12
- The sum of ab^2 and $2a^2b$ is **(EASY)**
 A) $2ab^2 + a^2b$ B) $2a^2b^2$ C) $3a^2b^2$ D) $2a^3b^3$

6. The correct statement if 'a' and 'b' are positive integers is **(DIFFICULT)**
 A) $(a + b)^2$ is always greater than $a^2 + b^2$ B) $(a + b)^2$ is always less than $a^2 + b^2$
 C) $(a + b)^2$ is always equal to $a^2 + b^2$ D) $(a + b)^2$ is always equal to $a^2 - b^2$.
7. If 'm' is a positive number, then the product of the square of this number and square of its consecutive number can be expressed as **(DIFFICULT)**
 A) $m^2(m + 1)^2$ B) $m^2(m + 1)$ C) $(m - 1)^2(m + 1)^2$ D) $(m^2+1)(m^2+1)$
8. "4 less than the square of a number" – The algebraic expression representing this statement is **(EASY)**
 A) $4 - y^2$ B) $4y^2$ C) $y^2 + 4$ D) $y^2 - 4$
9. The product of two numbers a and b is ab. When both a and b are increased by 1, the product ab increases by **(DIFFICULT)**
 A) $a + b + 1$ B) $a + b - 1$ C) $ab + 1$ D) $a - b - 1$
10. The general form of the Distributive Law is **(EASY)**
 A) $a \times (b+c) = (a \times b) + (a \times c)$ B) $a+b = b+a$
 C) $a \times b = b \times a$ D) $a \times (b \times c) = (a \times b) \times c$
11. The method to quickly multiply 12×105 using the distributive rule is **(AVERAGE)**
 A) $12 \times (100 \times 5)$ B) $12 \times (100+5)$ C) $(10 - 2) \times 105$ D) $(10+2)(100+5)$
12. The distributive law primarily used in mathematics **(EASY)**
 A) To make calculations difficult
 B) To make the process of multiplication easier and quicker
 C) Only for doing addition
 D) For dividing numbers
13. The distribution of multiplication over subtraction represented by the equation **(EASY)**
 A) $a \times (b - c) = (a \times b) - (a \times c)$ B) $a \times (b - c) = a \times b - c$
 C) $a \times (b - c) = (a - b) \times (a - c)$ D) $a \times (b - c) = (a - b \times c)$
14. Using a special case of subtraction, the value of $(15 \times 60) - (15 \times 10)$ can be simplified as **(EASY)**
 A) $15(15 - 10)$ B) $(15 - 15) \times (60 - 10)$ C) $15(60 - 10)$ D) $15(60+10)$
15. When the algebraic expression $4m^2 + 12mn + 9n^2$ is simplified, its perfect square form is **(AVERAGE)**
 A) $(2m+3n)^2$ B) $(2m - 3n)^2$ C) $(16m+81n)^2$ D) $(4m+9n)^2$
16. The area of $(a+b)^2$ is divided in a geometric diagram, gives the number of rectangles and squares is **(EASY)**

- A) 4 squares only B) One square and three rectangles
 C) Four rectangles only D) Two squares (a^2 , b^2) and two equal rectangles (ab , ba)
17. In the identity $(a + b)^2 = a^2 + 2ab + b^2$ if $a + b = 10$ and $ab = 21$, then the value of $a^2 + b^2$ is
(AVERAGE)
 A) 79 B) 100 C) 142 D) 58
18. In the identity $(a - b)^2 = a^2 - 2ab + b^2$, if $a^2 + b^2 = 29$ and $ab = 10$, then the value of $a - b$ is
(AVERAGE)
 A) 39 B) 19 C) 3 D) 49
19. The correct way to find the value of 99^2 using $(a - b)^2 = a^2 - 2ab + b^2$ is **(AVERAGE)**
 A) $(100 - 1)^2 = 100^2 + 1^2 - 2(100)(1)$ B) $(90 + 9)^2 = 90^2 + 9^2 + 2(90)(9)$
 C) $(100 + 1)^2 = (100)^2 + 1^2 + 2(100)(1)$ D) $(100 - 1)^2 = (100)^2 - 1^2 - 2(100)(1)$
20. The factorised form of $m^2 - 49$ is **(AVERAGE)**
 A) $(m + 49)(m - 49)$ B) $(m + 7)(m - 7)$ C) $(m - 7)(m - 7)$ D) $(m + 7)(m + 7)$
21. The algebraic expression for the area of the shaded region in the figure is **(DIFFICULT)**

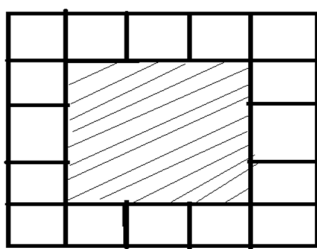


- A) $(p - r)(s - r)$ B) $(p + r)(s - r)$ C) $(p - r)(s + r)$ D) $(p + r)(s + r)$
22. Without direct multiplication, the following forms is appropriate to find the value of $(99.9)^2$ using an algebraic identity is **(AVERAGE)**
 A) $(99 + 0.9)^2$ B) $(100 - 1)^2$ C) $(90 + 9.9)^2$ D) $(100 - 0.1)^2$
23. The example for Distributive property of multiplication over addition of Rational numbers is.
(AVERAGE)
 A) $\frac{-1}{4} \times \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} = \frac{2}{3} + \left(\frac{-1}{4} \right) \times \left(\frac{-4}{7} \right)$
 B) $\frac{-1}{4} \times \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} = \left[\frac{1}{4} \times \frac{2}{3} \right] - \left(\frac{-4}{7} \right) \frac{1}{4} \times \frac{2}{3} \times \left(\frac{-4}{7} \right)$
 C) $-\frac{1}{4} \times \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} = \left\{ \left(\frac{-1}{4} \times \frac{2}{3} \right) + \left[-\frac{1}{4} \times \left(\frac{-4}{7} \right) \right] \right\}$
 D) $-\frac{1}{4} \times \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} = \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} \frac{-1}{4}$

II. Answer the following questions (One-mark questions)

24. What is the common factor in the terms of algebraic expression $ab + ac$? **(EASY)**
25. Apply Distributive law to the expression $a(b - c)$ **(EASY)**
26. Find the value of $-2[3 \times (-4)]$. **(EASY)**

27. Write the product obtained when one of the two numbers is increased by 2 and the other is decreased by 4. (EASY)
28. Find the product $\frac{2}{3}(15 + 6a)$. (EASY)
29. Find the product of 94×11 in one line using the product rule. (AVERAGE)
30. Without computing the product find which is greater among 16×24 and 18×22 (AVERAGE)
31. Express the square of 100 as the sum of two squares. (DIFFICULT)
32. Write an appropriate identity that can be used to calculate 199^2 (AVERAGE)
33. How many tiles can be fitted in the shaded region of this figure? (AVERAGE)

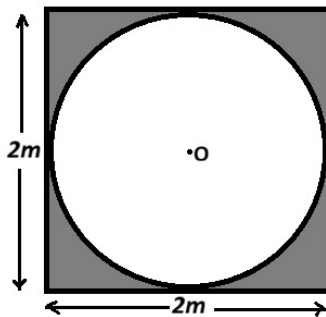


34. Add 2 to both x and y , and then find their product. (AVERAGE)
- III. Answer the following questions (Two marks questions)**
35. Find the value of 94×106 by using the factors of $a^2 - b^2$ (AVERAGE)
36. Simplify $\frac{3a}{2}(a - b + \frac{1}{4})$ using the distributive law. (DIFFICULT)
37. Simplify: $(4 + b)(a + ab - 3b^2)$ (AVERAGE)
38. When $a = -2$, $b = -3$ verify the identity $(a - b)^2$ (AVERAGE)
39. If $x + \frac{1}{x} = 5$, then find the value of $x^2 + \frac{1}{x^2}$ (DIFFICULT)
40. Find the product of $(-3q + 5)$ and $(2q - 2)$. (AVERAGE)
41. Multiply 4985×101 using the *dcha* rule. (AVERAGE)
42. In a square $ABCD$ of side $2x$, if P and Q are the midpoints of AB and CD respectively, find the area of $PBCQ$. (DIFFICULT)
43. If the length of the side of a square is $(5a+2b)$, what is its area? (AVERAGE)
44. Use the distributive property to find the product. $(7p) \times (3r) \times (p + 2)$ (AVERAGE)
45. If $3q$ is an odd number, find the product of the next two consecutive odd numbers. (DIFFICULT)
46. Find the product of $(x - y)$ and $(3x + 2y)$ using the distributive law. (AVERAGE)
47. In $(y - x)^2$ or $(x - y)^2$ which is bigger? Justify your answer (DIFFICULT)
48. Find the value of K if the expression $16x^2 - Kxy + 9y^2$ is a perfect square. (DIFFICULT)

49. Expand $(a - \frac{1}{2a})^2$ and write the value of constant . (AVERAGE)
50. Simplify: $(\sqrt{x} + \frac{1}{\sqrt{x}})^2$ (AVERAGE)
51. Expand and find the value of the constant term of the expression $(\frac{2x}{3y} - \frac{3y}{2x})^2$ using a suitable identity. (AVERAGE)
52. Find the product of 190×210 using a suitable identity. (EASY)
53. The length of a rectangular playground is $(x + 5)$ meters and its breadth is $(x - 5)$ meters. What is the area of the playground? (AVERAGE)
54. Simplify: $(x - 1)(x + 1)(x^2 + 1)$ (DIFFICULT)
55. Find the value of $\frac{98^2 - 4^2}{102}$ using a suitable identity. (AVERAGE)
56. When the side of a square is decreased by 2 units, find how much is its new area less than the original area? (DIFFICULT)
57. The cost of fencing around a square garden needs to be calculated. The length of one side of the garden is $(2x + 5)$ meters. If the cost of fencing is ₹4 per meter, what is the expression obtained when the distributive law is applied to find the total cost of fencing? (AVERAGE)
58. A farmer plants $(x + 4)$ coconut plants in each of the x rows, and $(2x - 1)$ betel nut (arecanut) plants in each of the same number of x rows. Find the total number of plants using distributive law. (AVERAGE)

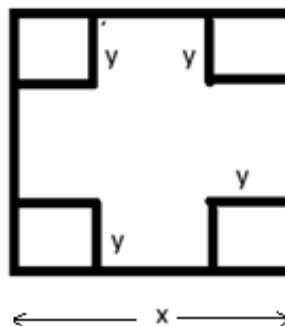
III. Answer the following questions. (Three marks questions)

59. A circle with centre 'O' is inscribed in a square as shown in the figure. Find the area of the shaded region. (AVERAGE)



60. The sum of two numbers is 20 and their product is 96. Find the sum of the squares of those two numbers. (AVERAGE)
61. Simplify: $(a - b)^2 - (a + b)^2$ (AVERAGE)
62. The length of a rectangle is a and its breadth is b . If both the length and breadth are reduced by 2 units, find the change in the area of the rectangle. (AVERAGE)
63. The area of a square playground is $9x^2 - 24x + 16$ square meters. Find its perimeter. (DIFFICULT)

64. The length of the side of a square is x units. If four small squares of side y are cut out from its four corners, find the area of remaining portion. **(AVERAGE)**



65. Find the product of the algebraic expression $(2x + 3y - 5z)(2x + 3y + 5z)$ using an algebraic identity. **(AVERAGE)**
66. When a certain number is divided by 7, it leaves a remainder of 3. When another number is divided by 7, it leaves a remainder of 5. What will be the remainders when their sum, difference, and product are divided by 7? **(DIFFICULT)**
67. Consider any two numbers (x and y). Add these two numbers and multiply the sum by half the sum of the two numbers. Write an algebraic expression for this description. **(DIFFICULT)**
68. A table cloth is spread over a table such that its sides hang down on all sides. The length of the table is 165 cm and the width is 120 cm. If the table cloth hangs down by x cm along the length and y cm along the width, what will be the algebraic expression for the perimeter of the table cloth? **(DIFFICULT)**
69. Verify that $(6n + 2)^2 - (4n + 3)^2$ is 5 less than a perfect square. **(AVERAGE)**
70. Consider any 2 by 2 square of numbers in a calendar, as shown in the figure. **(AVERAGE)**

Find products of numbers lying along each diagonal — $4 \times 12 = 48$, $5 \times 11 = 55$. Do this for the other 2 by 2 squares. What do you observe about the diagonal products? Explain why this happens.

February						
Su	M	Tu	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

71. Observe the following multiplication grid. Each number inside the grid is formed by multiplying two numbers. In the figure, if the middle number of the 3×3 grid is given by the algebraic expression pq , write the algebraic expressions for the other numbers indicated in the grid. **(AVERAGE)**

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

3×5	3×6	3×7
4×5	4×6	4×7
5×5	5×6	5×7

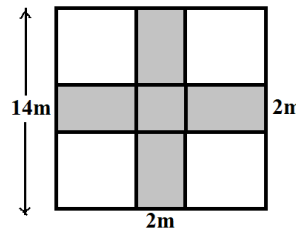
1		
	pq	6
	7	

V. Answer the following questions (Four marks questions)

72. Using the Distributive Property and the suitable Identity expand $(6x + 5)^2$

73. The length and the breadth of the rectangle are $(x + 7) m$, and $(x - 7) m$, respectively. If the area of a rectangle is $480 m^2$, then find its length and breadth. Also calculate its perimeter. **(AVERAGE)**

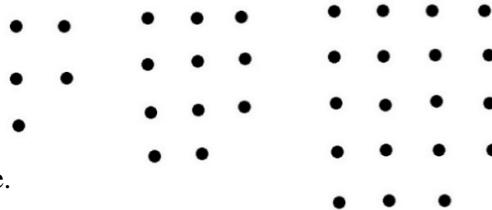
74. In the given figure, the length of the side of the square is 14m. Find the area of the shaded region. **(AVERAGE)**



75. When the length of a cubical well is reduced from $(x-3)$ units to $(x-5)$ units, find the difference in its surface area using an appropriate algebraic identity. **(DIFFICULT)**

76. The length of a large rectangular room is 40 meters and its breadth is 30 meters. Inside it, three square office rooms each having a side length of y meters are constructed. The remaining space is used as a walking corridor. Find the algebraic expression which represents the total area left for the corridor. **(DIFFICULT)**

77. For the pattern shown below: **(AVERAGE)**



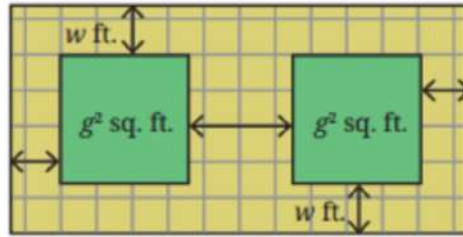
i) Draw the next sequential figure.

ii) How many base dots will be there in the 10th step?

iii) Write an algebraic expression for the number of dots in the n step.

78. A small park is going to be constructed in Bengaluru. Its plan is shown in the figure. There are two square plots with an area of g^2 square feet each, which have a green cover. The entire

remaining area is a pedestrian pathway of width W feet, which needs to be tiled. Write the algebraic expression for the area to be tiled. **(DIFFICULT)**



79. A group of school students from Bengaluru is organizing a cultural trip to Mysuru. The train ticket fare for each student is ₹($x + 50$), where x is the base fare. The number of students participating in the trip is $(y + 10)$. The school has also arranged snacks at a cost of ₹($20y + 100$). Using the distributive law and algebraic identities, answer the following questions

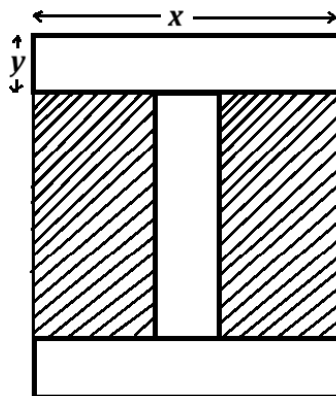
(AVERAGE)

- What is the total ticket fare for all the students?
- If the basic rate $x = 200$ and number of students $y = 40$ then, What is the cost of ticket?
- What is the total cost (tickets + snacks)?
- Write the expression for average expenditure of each student (tickets + snacks)

80. A farmer from Koppal grows wheat in a rectangular field. The length of the field is increased by '5' meters and the breadth is decreased by '3' meters. The farmer uses the distributive law to calculate the new area. He wants to compare it with the original area mn . Answer the following questions. **(AVERAGE)**

- Compared to the original area, will the new area increase or decrease?
- If $m = 50$ and $n = 40$, what is the new area?

81. Find the area of the region indicated by the slanted (hatched) lines in the given image. (*Hint: All three shaded rectangles have the same dimensions.*) **(AVERAGE)**



CHAPTER-7 PROPORTIONAL REASONING-1

LO No	Learning Outcomes	Question Numbers
12	Explain the meaning of Ratio and proportion. Check whether the given ratios are in proportion or not.	2, 3, 4, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 22, 23, 24, 33, 40, 41, 46
13	Solve problems using Trirashika rule. Apply this rule to solve problems in daily life situations.	18, 24, 26, 27, 36, 37,
14	Share the given quantity according to the given ratio. Solve various daily life problems.	1, 5, 6, 11, 21, 28, 29, 30, 31, 32, 34, 35, 38, 39, 42, 43, 44, 45,

EASY	AVERAGE	DIFFICULT	TOTAL
07	31	08	46

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

1. In an adjoining figure ratio of white circles to grey circles is (EASY)



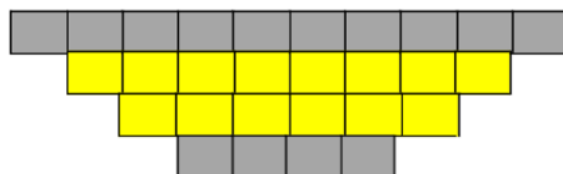
- A) 4:3 B) 3:4 C) 3:7 D) 4:7
2. If $a:b$ and $c:d$ are in proportion then the correct statement in the following is (EASY)
A) $\frac{a}{b} = \frac{c}{d}$ B) $a:b :: c:d$ C) $ad = bc$ D) $ac = bd$
3. The ratio which is in proportion with 10:15 is (AVERAGE)
A) 2:3 B) 3:2 C) 5:10 D) 15:20
4. The correct relationship between a and b to say $a:b :: b:a$ is (DIFFICULT)
A) $a = b$ B) $a > b$ C) $a < b$ D) $ab = 1$
5. A quantity x is divided in the ratio $m:n$ then size of each group is (AVERAGE)
A) $\frac{x}{(m+n)}$ B) $\frac{mx}{(m+n)}$ C) $\frac{nx}{(m-n)}$ D) $\frac{x}{(m-n)}$
6. A sum is divided between A and B in the ratio 3:2. Then, the share of A is (AVERAGE)
A) 3 times B) 5 times C) $\frac{3}{5}$ of the sum D) $\frac{2}{5}$ of the sum
7. Simplest ratio form of 20 meter and 50 cm is (AVERAGE)
A) $2m : 50cm$ B) 200: 50 C) 40: 1 D) 1: 4
8. Simplest ratio form of 25% is (AVERAGE)
A) 25: 100 B) 0.25 C) 1: 4 D) 4: 1
9. Simplest ratio form of 0.40 is (AVERAGE)
A) 40: 100 B) 2: 5 C) 60: 100 D) 5: 2

II. Answer the following questions (One mark questions)

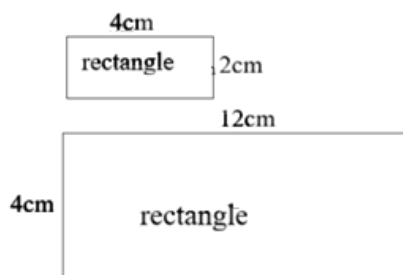
10. When the two ratios are said to be proportion? (EASY)
11. Write the relationship between the units of temperature units fahrenheit and celsius (EASY)
12. Write the ratio of circumference of two congruent circles. (AVERAGE)
13. What is the changing factor to express 72:96 in simplest ratio? (EASY)

III. Answer the following questions (Two marks questions)

14. What factor should we multiply 14 by to get 6? Can it be an integer? (EASY)
15. In given figure express the ratios of Shaded squares and non shaded square in simplest form? (EASY)



16. In adjoining figure write the ratios of length and breadth of rectangles in simplest form? (AVERAGE)



17. Write any two equivalent ratios of 3:4. (AVERAGE)
18. Find the value of x , if 2:5 and x :100 are in proportion. (AVERAGE)
19. Age of Manjula and her son is 30 years and 5 years respectively. Write ratio of their ages in simplest form. (AVERAGE)
20. Check whether 3:5 and 51:102 is in proportion (AVERAGE)
21. To prepare 1 glass of lime juice, 100ml of water, 2 spoons of sugar and 1 spoon of lime extract is used. How much sugar and lime extract is to be used to prepare 10 glass of lime juice? (AVERAGE)
22. Write 4 ratios which are in proportion with 2:3 (AVERAGE)
23. In the given figure, find the ratio of area of smaller square to the area of bigger square (AVERAGE)



24. A car travels a distance of 90km in 2 hour 30 minutes. With the same speed, how much distance it travels in 4 hours ? **(DIFFICULT)**
25. There are 45 girls , 46 boys and 7 teachers are there in a school. Write the ratio of teachers and students in its simplest form. **(DIFFICULT)**
26. The Earth travels approximately 940 million kilometres around the sun in a year. How many kilometres will it take in a week? **(AVERAGE)**
27. Puneeth's father went from Lucknow to Kanpur in 2 hours by riding his motorcycle at the speed of 50 km/hr. If he drives at 75 km/hr. How long will it take him to reach Kanpur? **(AVERAGE)**
28. Divide ₹ 4500 into two parts in the ratio 2: 3? **(AVERAGE)**
29. I have one bucket of orange paint that I made by mixing red and yellow paints in the ratio 3: 5. I added another bucket of yellow paint to the mixture. What is the ratio of red paint to yellow paint in the new mixture? **(AVERAGE)**
30. The area of Delhi is 1484 square metre and the area of Mumbai is 550 square metres. The population of Delhi is approximately 30 million and that of Bombay is 20 million people. Which city is more crowded? Why do you say so? **(AVERAGE)**
31. Harman is a 1-year-old girl. Her elder brother is 5 years old. What will be Harman's age when the ratio of her age to her brother age is 1: 2 ? **(AVERAGE)**
32. In a science lab, acid and water are mixed in the ratio of 1: 5 to make a solution. In a bottle that has 204 ml of the solution. How much acid and water does the solution contain? **(AVERAGE)**

IV. Answer the following questions (Three marks questions)

33. A small farmer in Himachal Pradesh sells each 200g packet of tea for ₹200. A large estate in Meghalaya sells each 1 kg packet of tea for ₹800. Are the weight-to-price ratios in both places proportional? Which tea is more expensive? **(AVERAGE)**
34. In a free medical camp, there are 40 members including doctors, nurses, 10 helpers and 3 drivers. If doctors and nurses are in the ratio 1: 2, find their number? **(AVERAGE)**
35. 100gram wheat flour and 50ml water is required to prepare a chapati. What is the ratio of the ingredients of the chapati? Find the quantity of ingredients required to prepare such 25 chapatis? **(AVERAGE)**
36. In a school, boys and girls are in the ratio 2:5. Girls consume banana and boys consume egg for mid-day meals. If 40 bananas are served every day, find number of students in school? **(AVERAGE)**
37. There are 140 students in a school. Everyday cooks use 21 kg of raw rice to prepare rice. One day due to absent of some students 15kg of raw rice is used. Find the number of students absent on the day? **(AVERAGE)**
38. Gold and silver are mixed in the ratio 3:1 to prepare 16 grams of white gold ring. Cost price of the ring is ₹ 65000. If cost price of 1gram of gold is ₹ 14000 and 1gram of silver is ₹250. Calculate the real price of the ring. **(DIFFICULT)**
39. The ₹10 coin is an alloy of copper and nickel called 'cupro-nickel'. Copper and nickel are mixed in a 3:1 ratio to get this alloy. The mass of the coin is 7.74 g. If the cost of copper is ₹906 per kg and the cost of nickel is ₹1,341 per kg, what is the cost of these metals in ₹10 coin? **(DIFFICULT)**

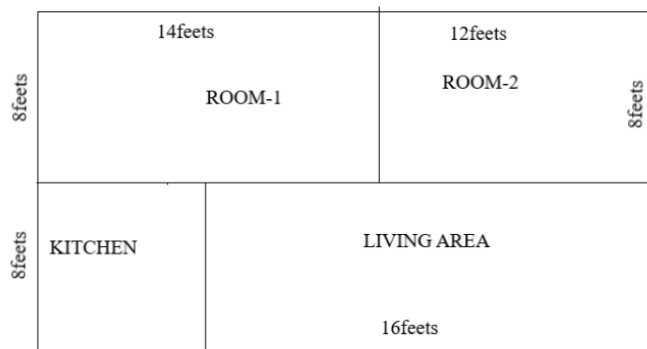
40. In adjoining table measures of rectangular images are given. Name the pair of images whose length and breadth are in proportion? **(AVERAGE)**

Image	Length in cms	Breadth in cms
Image -A	60	40
Image-B	40	20
Image -C	30	20
Image -D	90	60
Image -E	60	60

41. Radii of three circles are 7cm,14cm and 21cm. Check whether their radii and circumferences are in proportion? **(AVERAGE)**
42. Father is 24 years older than his son. Ratio of ages of father and his son is 5 : 1.Find their ages. **(DIFFICULT)**
43. Present ages of Sudha and her mother is 12 years and 39 years respectively. 9 years ago find the ratios of sudhas age and to her mothers age in gthe simplest form. **(AVERAGE)**
44. When Neelima was 3 years old, her mother's age was 10 times of her age. What is the ratio of Neelima's age to her mother's age? What would be the ratio of Neelima's age to her mother's age, when Neelima is 12 years old. Would it remain same?

V. Answer the following questions (Four marks questions)

45. Length and breadth of a room is in the ratio of 5: 2 if 20 tiles are used completely cover the floor of the room . Ratio of length and breadth of one tile is 2: 1.Calculate the length and breadth of the room? **(DIFFICULT)**
46. In adjoining the sketch of 2 rooms, 1 kitchen and 1living room is given. Write the ratio of length and breadth of each one and express in its simplest form. Answer the following questions. **(AVERAGE)**
- How many of them are similar
 - How many of them are not similar
 - Calculate the length and breadth of the house
 - Write the ratio of length and breadth of house and express in its simplest form

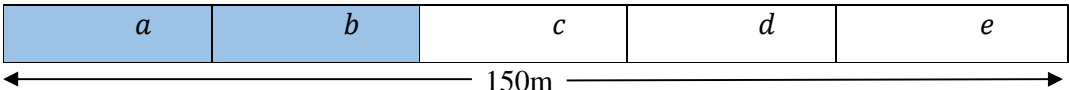


CHAPTER-8 FRACTIONS IN DISGUISE

LO No	Learning Outcomes	Question Numbers
9	Explain the meaning of percentages. Express fractions in decimal and percentage forms; convert decimals to percentages and percentages to decimals.	1, 2, 3, 4, 6, 7, 11, 13, 16, 17, 18, 19, 20, 21, 32, 35, 37, 65, 68,
10	Estimate the percentage of a given quantity	5, 8, 9, 12, 14, 15, 22, 23, 24, 25, 26, 30, 31, 33, 38, 40, 41, 57, 78, 83, 84, 87, 88
11	Solve problems related to percentage increase/decrease, profit and loss, taxes, compounding, and depreciation encountered in daily life.	10, 27, 28, 29, 34, 36, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64, 66, 67, 69, 70, 71, 72, 73, 74, 75, 76, 77, 79, 80, 81, 82, 85, 86, 89, 90, 91

EASY	AVEARGE	DIFFICULT	TOTAL
28	52	11	91

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

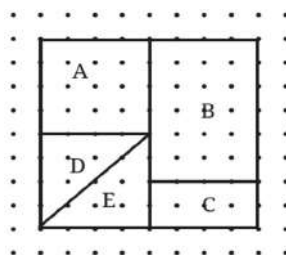
- The word 'Percentage' is derived from the Latin word (EASY)
A) Centi meter B) Centum C) Central D) Center
- In the given figure, a box 150m long is divided into 5 equal parts. The ratio of length of (a + b) to the total length proportion is (EASY)


A) 5 : 1 B) 2 : 5 C) 5 : 2 D) 1 : 1
- Nandini has 25 marbles. Among them, 15 are white. Then the percentage of marbles that are not white is (EASY)
A) 10 B) 15 C) 40 D) 60
- The correct mathematical statement in the following is (EASY)
A) $\frac{5}{10} = 50\%$ B) $30\% > \frac{1}{3}$ C) $\frac{11}{3} = 61\%$ D) $40\% < \frac{2}{5}$
- The value of 50% of 24 is (EASY)
A) 10 B) 12 C) 15 D) 48

6. The simplest form of 40% in fraction form is **(EASY)**
 A) $\frac{2}{5}$ B) $\frac{10}{25}$ C) $\frac{1}{4}$ D) $\frac{4}{10}$
7. The percentage form of the fraction $\frac{3}{4}$ is **(EASY)**
 A) 25% B) 50% C) 75% D) 100%
8. A bag contains 8 white and 12 black balls. The percentage of the number of white balls less than the number of black balls is **(AVERAGE)**
 A) 20.33% B) 150.33% C) 33.33 % D) 40.33%
9. There are 50 students in a class. If 20 of them are boys, then the percentage of girls in the class is **(AVERAGE)**
 A) 40% B) 60% C) 20% D) 50%
10. The price of an item is ₹200. If its price increases by 10% then, the new price of the item is **(EASY)**
 A) ₹190 B) ₹210 C) ₹220 D) ₹240
11. The percentage form of 0.05 is **(EASY)**
 A) 0.5% B) 5% C) 500% D) 50%
12. A person spends 80% of his income. If his total income is ₹25,000, then the money saved is **(EASY)**
 A) ₹4,000 B) ₹5,000 C) ₹3,000 D) ₹20,000
13. In an examination, the maximum marks was 600. If a student scored 450 marks, then the percentage of marks obtained by the student is **(AVERAGE)**
 A) 80% B) 75% C) 70% D) 90%
14. Raghu and Raju both ate biscuits containing 25% sugar. If Raghu ate 100g of biscuits and Raju ate 200g of biscuits, then more sugar consumed is by **(AVERAGE)**
 A) Both ate an equal amount B) Raghu
 C) Raju D) Cannot be determined
15. To pass an examination, a student needs to score 40% marks. Manu scores 150 marks and fails by a margin of 10 marks. The total maximum marks of that examination is **(AVERAGE)**
 A) 375 B) 400 C) 300 D) 500
16. The decimal form of $\frac{3}{4}$ is **(EASY)**
 A) 0.75 B) 0.3 C) 75 D) 0.34
17. The percentage form of 0.4 is **(EASY)**
 A) 40% B) 4% C) 0.4% D) 400%
18. 30% of the students in a class are winners in a competition. The fraction form is **(EASY)**

- A) $\frac{1}{2}$ B) $\frac{2}{5}$ C) $\frac{3}{10}$ D) $\frac{1}{4}$
19. The fraction form of 0.005 is **(EASY)**
- A) $\frac{1}{2}$ B) $\frac{1}{200}$ C) $\frac{1}{5}$ D) $\frac{5}{10}$
20. 85% in decimal form can be written as **(EASY)**
- A) 0.85 B) 0.085 C) 85.0 D) 8.5
21. If Krishna eats 0.25 part of a cake, then the percentage of cake he ate is **(AVERAGE)**
- A) 25% B) 50% C) 2.5% D) 0.25%
22. If Rohit pays 10% tax on an item costing ₹600, then the total amount paid is **(AVERAGE)**
- A) ₹540 B) ₹660 C) ₹590 D) ₹610
23. A merchant bought an item for ₹500 and sold it at a profit of 25%. The selling price is **(DIFFICULT)**
- A) ₹625 B) ₹500 C) ₹600 D) ₹100
24. The value of 1% of an hour is **(DIFFICULT)**
- A) 1.5 minutes B) 0.6 minutes C) 30 minutes D) 60 minutes
25. The marked price (MRP) of a cooker is ₹1800. If the shopkeeper gives a 35% discount, then the selling price of the cooker is **(AVERAGE)**
- A) ₹1765 B) ₹630 C) ₹1170 D) ₹1835
26. A merchant first offers a 30% discount on an item, and then offers another 20% discount on the remaining price. The total discount given by him is **(AVERAGE)**
- A) 50% B) 44% C) 40% D) 30%
27. In compound interest, the total amount obtained at the end of each year becomes for the next year. **(EASY)**
- A) Interest for the next year B) Principal for the next year
C) Discount for the next year D) Rate for the next year
28. The price of one litre of milk was ₹30 in the past and now it is ₹48. The percentage increase in the price of milk is **(EASY)**
- A) 18% B) 36% C) 48% D) 60%
29. The number of elephants in a national park has increased by 5% over the last decade. If the number of elephants in the last decade was 'p', then the current number is **(EASY)**
- A) $p \times 1.05$ B) $p \times 0.5$ C) $p \times 0.05$ D) $p + 1.05$
30. 100% of m is 270. Then 5% of m, 10% of m, and 60% of m are respectively **(AVERAGE)**
- A) 27, 162, 13.5 B) 162, 13.5, 27 C) 27, 13.5, 162 D) 13.5, 27, 162

49. The price of petrol was increased from ₹60 to ₹100. Find the percentage of increase in the price. **(AVERAGE)**
50. A clothing store is offering a 25% discount on all shirts. If the original price of a shirt is ₹300, then find the money he needs to pay to buy that shirt. **(AVERAGE)**
51. The total sales (revenue) of a company last year was ₹2.5 crores. They had a profit margin of 25%. Find the company's total expenditure (expenses) last year. **(AVERAGE)**
52. If a shopkeeper buys a geometry box for ₹75 and sells it for ₹110, then find his profit percentage. **(AVERAGE)**
53. The selling price of a table is $\frac{27}{25}$ times its cost price. Find the loss percentage or profit percentage. **(AVERAGE)**
54. A person buys a laptop worth ₹50,000. If 18% GST is levied on it, then find the total tax amount he has to pay. **(AVERAGE)**
55. The price of a Cement bag is ₹350, and the GST on it is 28%. Ravi buys 100 bags. Find the total GST tax amount he has to pay. **(AVERAGE)**
56. A bank in Bengaluru provides certain financial services. If the GST rate is 18%, what is the total amount Manoj, a resident of Delhi, has to pay for services costing ₹8,000, ₹6,500, and ₹9,500? **(AVERAGE)**
57. "Find the percentage of the total area does the section labelled 'E' in the picture occupy. **(AVERAGE)**



58. A merchant buys an item for ₹2,500 and sells it for ₹1,800. Find his profit percentage **(AVERAGE)**
59. A water tank contains 5,000 litres of water. If 6% of the water leaks out, then find how many litres of water are still left in the tank. **(EASY)**
60. A farmer harvested 260 kg of ragi last year. This year he harvested 850 kg of ragi. What is the percentage increase in this year's harvest compared to last year's harvest? **(AVERAGE)**
61. If the price of a scooter is increased from ₹34,000 to ₹34,500, what is the percentage increase? **(EASY)**

IV. Answer the following questions (Three marks questions)

62. The price of a bicycle is ₹10,000. First, its price was increased by 10%, and later, on the occasion of a festival, a 15% discount was given on the new price. Find the final price of the bicycle. **(AVERAGE)**

63. Ravi spends 75% of his income. When his income increases by 20%, he increases his expenditure by 10%. What is the percentage increase in his savings? **(DIFFICULT)**

64. A cyclist has completed 40% of his journey while traveling from Delhi to Agra. If the distance he covered is 92 km, how much more distance must he travel to reach Agra? **(AVERAGE)**

65. Complete the following table: **(EASY)**

Percentage	50%	1%	43%
Fraction	?	?	?
Decimal	?	?	?

66. Shyamala bought some decorative flower Vases at ₹2,650 per vase. Since one of the vases was slightly damaged, she decided to sell it at an 18% loss. **(AVERAGE)**

i) What is the selling price of that flower vase?

ii) If she had sold it for ₹3,000 instead, what would be her profit percentage?

67. Bharath recently opened a clothing store. He has a daily minimum sales target of ₹5,000. The total sales of the first two days was ₹3,500. What percentage of his target did he achieve? **(AVERAGE)**

68. There is a peculiar bull on Mariamma's farm. One day she gave the bull 2 units of fodder and the bull ate 1 unit. The next day she gave the bull 3 units of fodder and the bull ate 2 units. The day after, she gave the bull 4 units of fodder and the bull ate 3 units. This pattern continued, and on the 99th day, she gave the bull 100 units of fodder and the bull ate 99 units. Represent these quantities in percentage terms. **(DIFFICULT)**

69. Samson bought a car for ₹4,40,000 after receiving a 15% discount from a car dealer. What was the original price of the car? **(AVERAGE)**

70. The cost of materials to make one chair is ₹475. The carpenter wants to make 50% per profit chair. At what price should he sell the chair? **(AVERAGE)**

71. A merchant buys an item in Mysuru for ₹4,800 and sells the same item in Koppala for ₹5,820. If the transportation cost of the item is ₹1,200, find the profit or loss percentage incurred by him. **(AVERAGE)**

72. The population of a city is increasing by about 3% every year. If the current population is 1.5 crores, what will be the expected population after 3 years? **(AVERAGE)**

73. In a specific experiment conducted in a laboratory, the bacteria count is increasing at the rate of 2.5% per hour. If the bacteria count was initially 5,06,000, find the bacteria count at the end of 2 hours. **(DIFFICULT)**

74. Bus fares were increased by 3% last year and by 4% this year. What is the overall percentage increase in the fare over the last 2 years? **(AVERAGE)**

75. In a room of 100 people, 99% are left-handed. How many left-handed people must leave the room to reduce this percentage to 98%? **(DIFFICULT)**

76. By selling certain goods for ₹6,500, a merchant incurs a loss equal to one-tenth ($\frac{1}{10}$)th of the selling price. Find the following: **(DIFFICULT)**

- (i) The cost price of those goods
- (ii) The loss incurred
- (iii) The loss percentage

77. A person sells a radio set for ₹605 and earns a 10% profit. At what price should he sell another identical radio to earn a 16% profit? **(AVERAGE)**

78. In an examination, 30% of the candidates failed in English, 35% of the candidates failed in Mathematics, and 27% of the candidates failed in both subjects. Find the following: **(AVERAGE)**

- (i) The total percentage of candidates who failed.
- (ii) The total percentage of candidates who passed.
- (iii) If 248 candidates passed in both subjects, then find the total number of candidates who appeared for the exam.

79. A certain principal amounts to ₹3,825 in 4 years and to ₹4,050 in 6 years under simple interest. Find the rate of interest and the principal amount. **(AVERAGE)**

80. Giridhar takes a loan of ₹12,500 at an interest rate of 12% per annum under simple interest (without compounding) for a period of 3 years. Raghava takes the same amount for the same period at 10% per annum compounded annually. Who pays more interest and how much pay more? **(AVERAGE)**

81. A post office offers an interest rate of 7% per annum. If a person invests ₹50,000 for 3 years under simple interest, how much interest will he receive? If the same amount had been invested under compound interest, how much more money would he have received? **(DIFFICULT)**

V. Answer the following questions (Four marks questions)

82. The length of a rectangle is increased by 10% while keeping its area unchanged. By what percentage does its breadth decrease? **(DIFFICULT)**

83. A school is organizing an excursion for its students. 40% of the students are from Class 8, and the remaining are from Class 9. Among the Class 8 students, 60% are girls. **(AVERAGE)**

- (i) What percentage of the total students going on the excursion are Class 8 girls?
- (ii) If the total number of students going on the excursion is 150, what is the exact number of Class 8 girls?

84. A halwa recipe for 4 people contains ingredients in the following proportions: Semolina (Rava) 40%, Sugar 40%, and Ghee 20%. **(AVERAGE)**

- i) If you want to make halwa for 8 people, what will be the required proportion of the above ingredients?

- ii) If the total weight of the ingredients combined is 2 kg, how many grams/kilograms of semolina, sugar, and ghee will be there?
85. A milkman sold two buffaloes for ₹80,000 each. On one he made a profit of 5% and on the other he incurred a loss of 10%. Find his overall profit or loss. **(AVERAGE)**
86. Consider a principal amount of ₹1000. If it grows at an interest rate of 10% per annum, how long does it take for this amount to double under compound interest versus simple interest? Are compound interest and simple interest examples of exponential growth and linear growth respectively? **(DIFFICULT)**
87. Three shops sell the same item at the same price. The offers (deals) provided by the shops are as follows: **(AVERAGE)**
- Shop A: "Buy 1 and get 1 free"
- Shop B: "Buy 2 and get 1 free"
- Shop C: "Buy 3 and get 1 free"
- (i) If the price of an item is ₹100, what is the effective price of a single item in each shop? Arrange the shops in order from cheapest to costliest.
- (ii) Calculate the percentage discount applicable to each shop. (Hint: Compare the free items to the total items you get).
- (iii) If you need exactly 4 items, which shop would you choose and why?
88. The percentage breakdown of ingredients in a 65g chips packet is shown in the chart . Find the exact weight of each ingredient present in this packet. **(EASY)**



The information from the picture
(ingredients list):

- **Potato:** 70%
- **Vegetable oil:** 24%
- **Salt:** 3%

89. A merchant bought rice worth ₹4,500. He sold one-third ($\frac{1}{3}$) of it at a 10% profit. If he desires an overall profit of 12%, find the following: **(DIFFICULT)**
- (i) The selling price of the remaining rice.
- (ii) The profit percentage on the remaining rice.
90. Soumya invests ₹9,600 at a compound interest rate of 10% per annum for a period of 3 years. Calculate the following: **(AVERAGE)**
- (i) The interest for the first year.
- (ii) The total amount at the end of the first year.

- (iii) The interest for the second year.
 - (iv) The interest for the third year.
91. Joseph takes a loan of ₹12,000 for a period of 2 years at a compound interest rate of 10% per annum. At the end of the first year, he repays ₹8,000. Find the following: **(AVERAGE)**
- (i) The total amount due at the end of the first year before making the repayment.
 - (ii) The balance amount left at the end of the first year after making the repayment.
 - (iii) The principal amount for the second year.
 - (iv) The total amount to be paid at the end of the second year to completely clear the account.

CHAPTER-9 THE BAUDHAYANA-PYTHAGORAS THEOREM

LO No	Learning Outcomes	Question Numbers
34	Construct a square whose area is equal to the sum or difference of two given squares.	18, 19, 20, 33, 55, 67
35	Deduce the Baudhayana-Pythagoras theorem for right triangles.	3, 4, 5, 11, 12, 24, 26, 27, 28, 31, 32, 34, 35, 37, 44, 46, 50, 65, 66
36	Solve problems by applying the Baudhayana-Pythagoeran theorem.	6, 7, 8, 9, 10, 13, 14, 15, 21, 22, 25, 29, 30, 38, 39, 40, 41, 42, 43, 45, 47, 48, 49, 51, 52, 53, 54, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68
37	Prove that $\sqrt{2}$ has non terminating decimal expansion	1, 2, 56
52	Appreciate the contributions of Baudhayana related to Sulba-sutras and constructions.	16, 17, 23, 36

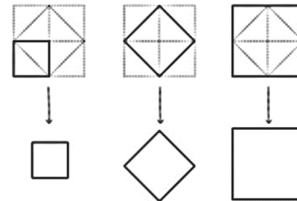
EASY	AVERAGE	DIFFICULT	TOTAL
18	34	16	68

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

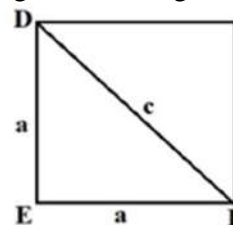
- $\sqrt{2}$ is a (EASY)
 A) Natural Number B) Integer C) Irrational Number D) Rational Number
- The approximate value of $\sqrt{2}$ is (EASY)
 A) 1.54262 B) 3.14156 C) 1.1324686 D) 1.41421
- The Fermat's Last Theorem is represented by the equation (EASY)
 A) $x^n + y^n = z^n$ B) $x^2 + y^2 = z^2$ C) $x^3 + y^3 = z^3$ D) $x^n + y^n + z^n = 0$
- When (a, b, c) is a Baudhāyana triple, then (AVERAGE)
 A) (ka, kb, c) becomes a triple. B) (ka, b, kc) becomes a triple.
 C) (ka, kb, k²c) becomes a triple. D) (ka, kb, kc) becomes a triple.

5. The statements correct regarding Baudhāyana-Pythagoras triples is **(DIFFICULT)**
 A) All three a, b, c can be odd numbers.
 B) All three a, b, c can be even numbers.
 C) a, b can be even numbers and c can be an odd number.
 D) a, c can be even numbers and b can be an odd number.
6. In a Baudhāyana triple (a, b, c), if a = 60 and b = 80, then the value of c is **(AVERAGE)**
 A) 140 B) 70 C) 20 D) 100
7. The Baudhāyana triple with numbers less than twenty is **(AVERAGE)**
 A) (9, 12, 15) B) (8, 12, 18) C) (12, 15, 19) D) (60, 80, 100)
8. The scaled version of (5, 12, 13) is **(AVERAGE)**
 A) (10, 24, 26) B) (15, 26, 29) C) (50, 110, 130) D) All of the above
9. Just as (3, 4, 5) and (6, 8, 10) are Baudhāyana triples, another triple that follows the same pattern is **(DIFFICULT)**
 A) (30, 40, 50) B) (13, 14, 15) C) (23, 24, 25) D) (32, 42, 52)
10. The Baudhāyana primitive (basic) triple is **(AVERAGE)**
 A) (6, 8, 10) B) (3, 4, 5) C) (30, 40, 50) D) All of the above
11. When (a, b, c) is a Baudhāyana triple, the way to represent c is **(AVERAGE)**
 A) $\sqrt{c^2 - b^2}$ B) $\sqrt{a^2 - b^2}$ C) $\sqrt{a^2 + b^2}$ D) $\sqrt{a + b}$
12. When (a, b, c) is a Baudhāyana triple, the way to represent b is **(DIFFICULT)**
 A) $\sqrt{a^2 - c^2}$ B) $\sqrt{c^2 - a^2}$ C) $\sqrt{c^2 - b^2}$ D) $\sqrt{c - b}$
13. If the diagonals of a rhombus are 30 cm and 16 cm, then its perimeter is **(DIFFICULT)**
 A) 17 cm B) 46 cm C) 34 cm D) 68 cm .
14. If the diagonals of a rhombus are 2x and 2y, the length of its one side is **(DIFFICULT)**
 A) $\sqrt{x^2 + y^2}$ B) $2x^2 + 2y^2$ C) $x^2 - y^2$ D) x+y
15. The primitive Baudhāyana triple for (15m, 8m, 17m) is **(AVERAGE)**
 A) (15, 8, 17) B) (15m, 8m, 17m)
 C) (15m², 8m², 17m²) D) (225, 64, 289)

16. The historical period in which Baudhāyana lived is **(EASY)**
 A) Around 800 BCE B) Around 600 BCE C) Around 400 BCE D) Around 300 BCE
17. The book that provides information on doubling a square is **(EASY)**
 A) Aryabhata's Aryabhatiya B) Bhaskaracharya's Lilavati
 C) Baudhāyana's Sulba-Sutra D) Brahmagupta's Brahmasphuta Siddhanta
18. The area of the square produced on the diagonal of a square is ____ the area of the original square. **(EASY)**
 A) three times B) twice (double) C) four times D) half
19. According to Baudhāyana, a key concept is that the figure which can be constructed on the diagonal of the original square is a **(EASY)**
 A) triangle B) rectangle C) rhombus D) square
20. If each side of the square produced on the diagonal of a square is 'a' units, then the length of each side of the original square is **(AVERAGE)**
 A) $\frac{a}{2}$ units B) $\frac{a}{\sqrt{2}}$ units C) a^2 units D) a units.
21. Observe the successive squares formed from these figures. The relationship that the area of each square has with the area of its preceding square is **(AVERAGE)**
 A) Double the area B) Triple the area
 C) Half the area D) Four times the area



22. The length of the diagonal in a square of side 1 unit is **(EASY)**
 A) 1 unit B) 2 units C) $\sqrt{2}$ units D) 4 units
23. The book containing the proof that $\sqrt{2}$ cannot be expressed in the form of a fraction $\frac{m}{n}$ (where m and n are counting numbers) is **(EASY)**
 A) Baudhāyana's Sulba-Sutra B) Euclid's Elements
 C) Bhaskaracharya's Siddhanta Shiromani D) Isaac Newton's Principia Mathematica
24. If the length of each side of a square is 'a' and the length of the diagonal is 'c', then the correct statement is **(AVERAGE)**



- A) $c^2 = 2a^2$ B) $a^2 = 2c^2$
 C) $c^2 = \frac{1}{2}a^2$ D) $a^2 = c^2$

25. Each equal side of an isosceles right-angled triangle is of measure 'a'. The length of its hypotenuse is **(AVERAGE)**

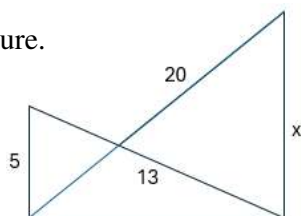
A) $2a$ B) $\sqrt{2}a$ C) $a\sqrt{2}$ D) $2\sqrt{a}$

II. Answer the following questions **(One mark questions)**

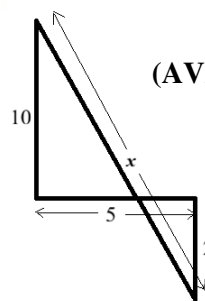
26. What is a Baudhāyana triple? **(EASY)**
 27. Write the general form of a Baudhāyana-Pythagoras triple. **(EASY)**
 28. Give an example of a Baudhāyana triple whose numbers are less than twenty. **(EASY)**
 29. If (15, a, 20) represents a Baudhāyana triple, what is the value of 'a'? **(EASY)**
 30. Write a scaled version of the triple (5, 12, 13). **(AVERAGE)**
 31. What is a primitive Baudhāyana triple? **(EASY)**
 32. Write the primitive Baudhāyana triple corresponding to the triple (ka, kb, kc) **(AVERAGE)**
 33. What is the area of the square formed on the diagonal of a square having a side of 'a' units? **(EASY)**
 34. State Baudhāyana's theorem on right-angled triangles. **(EASY)**
 35. Write an example of a Baudhāyana-Pythagoras triple. **(EASY)**
 36. Who was the great 17th-century French mathematician inspired by the study of Baudhāyana triples? **(EASY)**

III. Answer the following questions **(Two marks questions)**

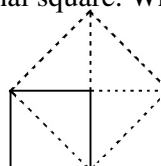
37. Prove that if (5, 12, 13) is a Baudhāyana triple, then (5k, 12k, 13k) is also a Baudhāyana triple **(DIFFICULT)**
 38. Find the value of x from the given figure. **(AVERAGE)**



39. Find the value of x from the given figure. **(AVERAGE)**

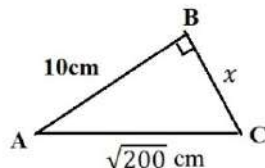


40. The new dotted square has double the area of the original square. Why? **(AVERAGE)**

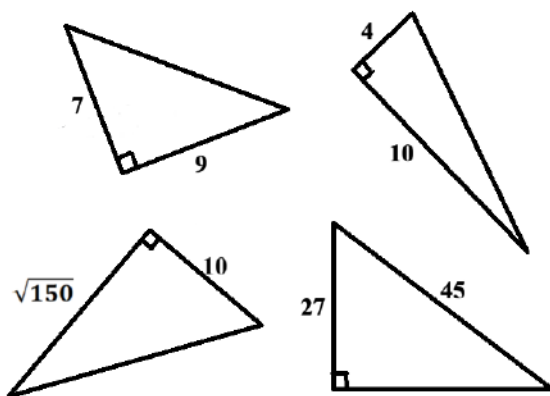


41. Find the area of an isosceles right-angled triangle whose equal sides have a length of 10 cm. Also, find the length of its hypotenuse. **(AVERAGE)**

42. If the hypotenuse of an isosceles right-angled triangle is $\sqrt{128}$ units, find its other two sides. (AVERAGE)
43. Let a , b , and c be the sides of a right-angled triangle, where c is the length of the hypotenuse. Find the missing side length in each of the following (AVERAGE)
- i) $a = 7$ cm, $b = 11$ cm, $c = ?$
- ii) $a = 5$ cm, $c = 13$ cm, $b = ?$
44. Given that $(3k, 4k, 5k)$ represents Baudhāyana triples where k is a positive integer, list the first four Baudhāyana triples. (AVERAGE)
45. Find the length of side BC in the right-angled triangle ABC shown below. (AVERAGE)



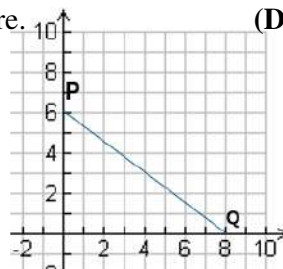
46. Write one example of a Baudhāyana-Pythagoras triple and use it to show that infinitely many triples can be constructed. (AVERAGE)
47. Find the hypotenuse of an isosceles right-angled triangle whose equal sides have a length of 12 cm (AVERAGE)
48. If the hypotenuse of an isosceles right-angled triangle is $\sqrt{72}$, find its other two sides. (AVERAGE)
49. Find the lengths of the missing sides in the right-angled triangles given below. (AVERAGE)



50. Is the hypotenuse the longest side of a right triangle? Justify your answer. (AVERAGE)

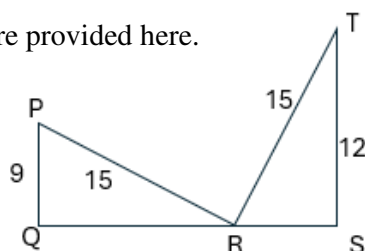
III. Answer the following questions (Three marks questions)

51. Write three scaled versions of the primitive Baudhāyana triple $(3, 4, 5)$. (AVERAGE)
52. Find the length of PQ from the grid map provided here. (DIFFICULT)



53. Find the length of QS from the figure provided here.

(DIFFICULT)



54. A traveler starts from a point and moves 150 meters due East. From there, he moves 200 meters due North. Find how far the traveler is now from his starting point. **(DIFFICULT)**

55. Prove by the construction of diagram that each equal side of an isosceles right-angled triangle is 1 unit, the length of the hypotenuse will be $\sqrt{2}$ units. **(AVERAGE)**

56. Prove that $\sqrt{2}$ cannot be expressed in the form $\frac{m}{n}$, where m and n are natural numbers.

(AVERAGE)

57. If the length of the two equal sides of an isosceles right-angled triangle is 5 units, find the length of the hypotenuse. Find the upper and lower bounds on the length of the hypotenuse such that they have at least one digit after the decimal point. **(AVERAGE)**

58. Let a, b, and c denote the side lengths of a right-angled triangle, with c being the length of the hypotenuse. Fill in the blanks in the following list of Baudhāyana-Pythagoras triples

(AVERAGE)

SL. NO	a	b	c
1	7	24	
2	8		17
3		35	37
4	15		39
5		4	5
6	5		13

59. "In a lake surrounded by chakra and krauncha birds, there is a lotus flower peeping out of the water, with the tip of its stem 1 unit above the water. On being swayed by a gentle breeze, the tip touches the water 3 units away from its original position. Quickly tell the depth of the lake." (Translated problem from Bhaskaracharya's Lilavati). **(AVERAGE)**

60. If the diagonals of a rhombus are 30 units and 72 units, find the length of its sides.

(AVERAGE)

61. If the diagonals of a rhombus are 24 units and 70 units, find the length of its sides.

(AVERAGE)

62. Construct a square whose area is equal to the difference of the areas of squares of side lengths 5 units and 7 units. **(DIFFICULT)**

63. If (a, b, c) is non-primitive, and the integers have f greater than 1 as a common factor, then $\left(\frac{a}{f}, \frac{b}{f}, \frac{c}{f}\right)$ a Baudhāyana triple? Check this statement for $(9, 12, 15)$. Justify this statement.

(DIFFICULT)

64. Find the area of an equilateral triangle with side length 6 units. [Hint: Show that an altitude bisects the opposite side. Use this to find the height.]

(DIFFICULT)

III. Answer the following questions

(Four marks questions)

65. If the shorter sides of a right-angled triangle are 6 cm and 8 cm, what is the length of its hypotenuse? First, construct a right-angled triangle with these measurements and measure the hypotenuse. Then, verify your answer using Baudhāyana's theorem.

(DIFFICULT)

66. If a right-angled triangle has a side of length 8 cm and a hypotenuse of length 17 cm, what is the length of the third side? Try drawing this triangle and measuring the side. Verify your answer using Baudhāyana's theorem.

(DIFFICULT)

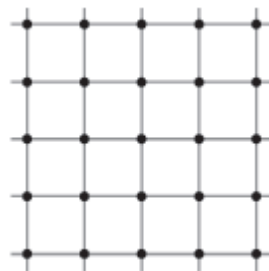
67. Using the lattice dots of a grid as the vertices, construct a square that has an area of

(DIFFICULT)

a) 2 square units

b) 3 square units

c) 4 square units



68. A bamboo 32 feet long was broken by the wind; its tip touched the ground 16 feet away from its base. At what height from the base did it break? (Verse 150 from the book 'Lilavati')

(DIFFICULT)

CHAPTER-10 PROPORTIONAL REASONING-2

LO No	Learning Outcomes	Question Numbers
15	Identify the situations of inverse proportion and solve various direct and inverse proportion problems.	1 To 62

EASY	AVERAGE	DIFFICULT	TOTAL
12	46	04	62

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- $a:b$ and $c:d$ are in direct proportion, then d is (EASY)
 A) $\frac{bc}{a}$ B) $\frac{ab}{c}$ C) $\frac{ac}{b}$ D) $\frac{a}{bc}$
- If 2, 5, 4 and 10 are in direct proportion, then the correct relationship between them is (EASY)
 A) $2 \times 5 = 4 \times 10$ B) $2 \times 4 = 5 \times 10$ C) $2 \times 10 = 4 \times 5$ D) $2 + 10 = 4 + 5$
- The ratios which are in direct proportion are (AVERAGE)
 A) 7:3 and 3:7 B) 2:3 and 3:2 C) 1:2 and 2:4 D) 3:5 and 7:9
- The example for direct proportion is (EASY)
 A) $2:3 :: 4:6$ B) $1:3 :: 4:6$ C) $2:3 :: 6:4$ D) $3:1 :: 5:2$
- If $3:4 = x:12$, then the value of x is (AVERAGE)
 A) 2 B) 52 C) 9 D) 36
- ₹2000 is divided between A and B in the ratio 2:3, then share of A is (AVERAGE)
 A) ₹1200 B) ₹500 C) ₹400 D) ₹800
- If the cost price of 5 books is ₹75, then the cost price of 12 books is ₹180, the correct form of representing the statement is (EASY)
 A) $5:75 = 12:180$ B) $75:5 = 12:180$ C) $5:12 = 75:180$ D) $5:75 = 180:12$
- If cost price of 5 kg rice is ₹250, then cost price of 8 kg rice is (AVERAGE)
 A) ₹500 B) ₹400 C) ₹450 D) ₹125
- Which of the following pair is an example for direct proportion (EASY)
 A) Number of workers and time required to complete a particular work
 B) Distance travelled and time taken in uniform speed
 C) Velocity and time taken to travel a particular distance
 D) Number of taps and time required to fill the water tank completely

10. If $x:y = 1:3$ and $x=10$ then, the value of y is **(DIFFICULT)**
 A) $3.\bar{3}$ B) 30 C) $\frac{3}{10}$ D) $\frac{1}{3}$
11. The example for inverse proportion is **(DIFFICULT)**
 A) If cost price of 3 pencils is ₹3 then cost price of 5 pencils is ₹5
 B) Real distance and distance between two places in map
 C) As the speed of the cycle increases time taken to travel a particular distance decrease
 D) In cricket, total runs increase as a number of runs increase
12. x is inversely proportion with y , the symbolic form of the statement is **(EASY)**
 A) $x > y$ B) $x < y$ C) $x \propto y$ D) $x \propto \frac{1}{y}$
13. a is inversely proportionl to b , If k is constant then, the correct relationship between a and b is **(EASY)**
 A) $ab = k$ B) $a = bk$ C) $\frac{a}{b} = k$ D) $\frac{a}{b} = 1$
14. If one of the two quantities in inverse proportion changes by n , then, the other quantity will change by **(DIFFICULT)**
 A) n B) $2n$ C) $\frac{n}{2}$ D) $\frac{1}{n}$

II. Answer the following questions (One mark questions)

15. Name the type of proportion-‘The side of a square and its area’, **(EASY)**
 16. Name the type of proportion- ‘Radius of a circle and its circumference’. **(EASY)**
 17. $a:b:c:d$ and $p:q:r:s$ are proportional, write the relationship among them. **(EASY)**
 18. If one of the two quantities in direct proportion increases, then how the other quantity varies? **(EASY)**
 19. If one of the two quantities in inverse proportion become double, then how the other quantity vary? **(AVERAGE)**
 20. Length and breadth of a tin sheet are in ratio 35: 15. Find how many pieces with length and breadth in the same ratio 7:3 can be cutfrom it, assuming no wastage. **(AVERAGE)**
 21. Flour, Suger and Ghee (in kg) are mixed in the ratio 1 :1.5: 2 to prepare a particular sized 100 sweets. How much quantity (in kg) of flour, suger and ghee are required to make 200 such sweets. **(AVERAGE)**

III. Answer the following questions (Two marks questions)

22. Length and breadth of national flag is in the ratio 3: 2. If length of our school national flag is 4.5m then, find its breadth. **(AVERAGE)**
 23. Yellow and blue colour are mixed in ratio 2: 3 to prepare green colour. How many litres of yellow colour is to be mixed with 15 liters of blue colour to prepare such green colour. **(AVERAGE)**
 24. Length and breadth of a rectangle is in the ratio 7: 5. If its perimeter is 24 cm, then find the length and breadth of the rectangle. **(AVERAGE)**
 25. Adjacent angles of a parallelogram are in the ratio 3: 7. Find the angles. **(AVERAGE)**
 26. If $4:1 = 36 : x$ then, find the value of x . **(AVERAGE)**
 27. Interior angles of a triangle are in the ratio 1: 3: 5. The largest angle is 100° then, find the remaining two angles. **(AVERAGE)**
 28. Is it possible to construct a triangle, whose sides are in the ratio 2: 3: 7? Justify. **(AVERAGE)**

29. 3 taps of same diameter can fill the water tank in 18 hours. How much time it will take to fill the tank, if one more tap of same kind is added? **(AVERAGE)**
30. Hostel has food provisions to feed 60 students for 15 days. If 15 students remained absent from beginning, then find how many days will the provisions last. **(AVERAGE)**
31. Three different ingredients A, B and C are mixed in the ratio 2: 5: 7 to prepare 196 kg of a product. Calculate the quantity of most and least ingredient used in the product. **(AVERAGE)**
32. A car travels with a speed of 60km/hr to reach destination in 5hrs. Find how long the car takes to reach the destination if its speed is 75km/hr? **(AVERAGE)**
33. Cost price of 18 pens is equal to cost price of 12 notebooks. Write the ratio of cost price of one pen and cost price of one notebook in simplest form. **(EASY)**
34. Are the triangles constructed with sides in the ratio 3: 4: 5 is congruent? Justify. **(AVERAGE)**
35. 30 workers take 4 days to complete laying a road. Find how many days will 10 workers take to complete laying the same length of road? **(AVERAGE)**
36. 4 workers can complete a work in 15 days. Verify whether, 12 workers can complete same work in 5 days? **(AVERAGE)**
37. To make a special shade of purple, paint must be mixed in the ratio, *red : blue : white :: 2: 3: 5* .if Yasmin has 10 litres of white paint, how many litres of red and blue paint should she add to get the same shade of purple? **(AVERAGE)**
38. Puneeth's father went from Lucknow to Kanpur in 3 hours by riding his motorcycle at a speed of 30 km/hr. if he takes a car instant and drives at 60 km/hr. how long it will take him to reach Kanpur? **(AVERAGE)**
39. 2 pumps can fill a tank in 18 hours. How much time will it take to fill the tank if we add 2 more pumps of the same kind? **(AVERAGE)**
40. School has food provision to feed 80 students for 15 days. If 20 more students join the school, for how many days will the provision last? **(AVERAGE)**

IV. Answer the following questions (Three marks questions)

41. i) 6: 3 and 4: 2 ii) 7: 5 and 9: 5, check whether these pairs of ratios are in proportion. **(AVERAGE)**
42. Interior angles of a triangle are in the ratio 5 : 6 : 7. Calculate the angles of the triangle. **(AVERAGE)**
43. Interior angles of a triangle are in the ratio 3: 4: 5. Calculate the angles of the triangle. Name the type of triangle. **(AVERAGE)**
44. To prepare 15 litres of purple paint, red, blue, and white colours are mixed in the ratio 2: 3: 5 respectively. How many litres of each colour were used? To make 20 litres of the same shade of purple paint, find how many litres of each colour should be used. **(AVERAGE)**
45. Population of a village is 1000 members. **(AVERAGE)**

The language used in the village is given in the pie chart.

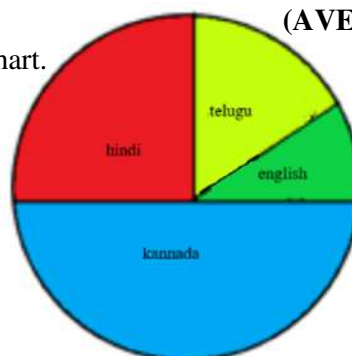
Answer the given questions using pie chart.

How many of them are talking in

i) kannada

ii) hindi

and iii) which language is least used?



46. For some construction, 110 units of concrete are needed., how many units of cement, sand and gravel are needed if these are to be mixed in the ratio 1: 1.5 : 3 **(AVERAGE)**
47. 3 workers can paint a fence in 4 days. If one more worker joins the team, how many days will it take them to finish the work? what are the assumptions you need to make? **(AVERAGE)**
48. 5 workers can prepare 4000 bricks in a day. How many workers are required to prepare 12000 such bricks in one day. Which type of proportion is this situation? **(AVERAGE)**
49. 10 litres of milk is meant to distribute equally among 100 students, but it was distributed equally among 120 students. Calculate the quantity of milk each student gets in the two cases. Find the ratio of milk to be distributed to the quantity of milk distributed. **(AVERAGE)**
50. 12 workers can complete a work in 20 days. How many days will 15 workers take to complete the same work? How much work each worker will do in one day? **(AVERAGE)**
51. In a college, students are enrolled in arts, science and commerce departments in the ratio 1: 2: 3, if 150 students enrolled for arts, calculate the students enrolled in the college? **(AVERAGE)**
52. x and y are in inverse proportion. Complete the given table. **(AVERAGE)**

x	16	12		36
y	9		48	

53. 30 workers can complete the work in 6 days. How many workers will be needed to complete the same work in 9 days? Which type of proportion is this? **(AVERAGE)**
54. There are 40 students in each section A and B of class 8th. The ratio of boys and girls in section B is 2: 3 and the ratio of boys and girls in section A is inverse of B. Calculate number of boys and girls in each section. **(AVERAGE)**

V. Answer the following questions (Four marks questions)

55. I have 100 coins in the ratio, number of ₹10 coins : number of ₹5 coins : number of ₹2 coins : number of ₹1 coins :: 4: 3: 2: 1. How much money do i have in the coins? **(AVERAGE)**
56. During school prayer, students are arranged in 15 rows and 40 students in each row. One day it is changed as 20 students in each row. How many rows does this arrangement have? What is the total number of students in the school **(AVERAGE)**
57. A small pump can fill a tank in 5 hours while a large pump can fill the same tank in 3 hours. If both pumps are used together, how long will the tank take to fill? **(AVERAGE)**
58. Which of the following pairs of quantities are in inverse proportion?
- The number of taps filling a water tank and time taken to fill it.
 - The number of painters hired and the days needed to paint a wall of fixed size.
 - The distance a car can travel and the amount of petrol in the tank.
 - The speed of a cyclist and the time taken to cover a fixed route.
 - The length of cloth bought and the price paid at a fixed rate per metre.
 - The number of pages in a book and the time required to read it at a fixed reading speed.

59. A student's daily work schedule is given in the table. Draw its pie chart. **(AVERAGE)**

sleep	school	read	homework	games
8 hours	6 hours	5 hours	3 hours	2 hours

60. Draw a pie chart for given information about type of tv channel's viewers.: Entertainment 50%, Sports 25%, Information 10%, and News 15%. **(AVERAGE)**

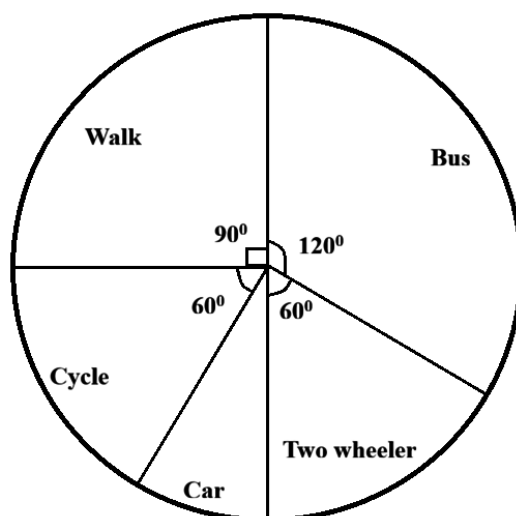
61. A table is given with information about students who joined 1st PUC in a college. Draw a pie chart. **(AVERAGE)**

HEPS	PCMB	PMCS	HEBA	HECA
75	125	50	25	100

62. The pie chart shows the result of a survey carried out to find the modes of transport used by children to go to school. Study the pie chart and answer the following questions.

(DIFFICULT)

- What is the most common mode of transport?
- What fraction of children travel by car?
- If 18 children travel by car, how many children took part in the survey? How many children use cycle to travel to school?
- By which two modes of transport are equal numbers of children travelling?



CHAPTER 11: EXPLORING SOME GEOMETRICAL THEMES

LO No	Learning Outcomes	Question Numbers
28	Construct solid figures using suitable nets.	1, 18, 19, 20, 25, 34, 37, 38, 43, 46, 49,
29	Draw isometric projections of various solid shapes using isometric grid paper.	8, 9, 11, 12, 13, 26, 48, 52, 53, 55, 56
30	Solve problems based on visualizing solids	2, 3, 4, 5, 6, 7, 10, 17, 23, 27, 28, 29, 33, 39, 40, 41, 42, 50, 51,
38	Extend the patterns and discuss fractal patterns; Solve problems based on fractals	14, 21, 30, 31, 32, 44,
39	Draw fractal designs such as Sierpensi Triangle, Koch snowflake and appreciate fractals in daily life.	15, 16, 22, 24, 35, 36, 45, 47, 54,

EASY	AVERAGE	DIFFICULT	TOTAL
15	34	07	56

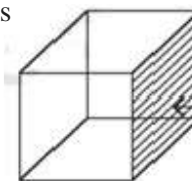
I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

1. The number of possible nets that can form a cube is (EASY)

- A) 2 B) 4 C) 11 D) 12

2. The total number of faces in the solid shape given here is (EASY)

- A) 2 B) 8
C) 6 D) 12



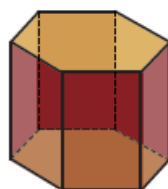
3. The total number of vertices in the solid shape given here is (EASY)

- A) 2 B) 8
C) 4 D) 12



4. The solid in the given figure is

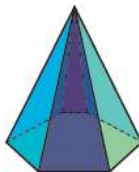
- A) Triangular prism B) Hexagonal prism
C) Square prism D) Pentagonal prism



(EASY)

5. The solid in the given figure is

- A) Triangular prism B) Hexagonal pyramid
C) Square pyramid D) Pentagonal prism



(EASY)

6. If the base of a pyramid is a pentagon, then the number of total faces does it have is

(AVERAGE)

- A) 2 B) 8 C) 4 D) 6

7. If a solid has 6 faces, 8 vertices, and 12 edges, then its is

(AVERAGE)

- A) Triangular prism B) Hexagonal pyramid C) Square prism D) Pentagonal prism

8. The solid shape formed by this net is

(AVERAGE)

- A) Triangular pyramid B) Hexagonal pyramid
C) Triangular prism D) Pentagonal prism



9. The projection of a square on a plane is a

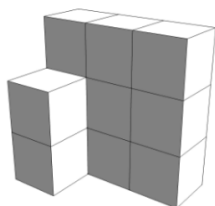
(AVERAGE)

- A) Triangle B) Square C) Hexagon D) Pentagon

10. The number of identical cubes in this heap/stack is

(AVERAGE)

- A) 9 B) 11
C) 14 D) 10



11. The projection that a cylinder creates on a plane is a

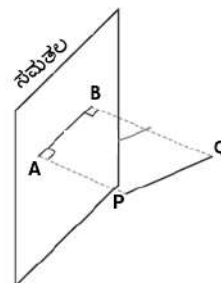
(AVERAGE)

- A) Triangle B) Circle C) Rectangle D) Circle or Rectangle

12. In this figure, the projection of the straight line PQ on the plane is

(AVERAGE)

- A) AB B) AP
C) BQ D) APQB



13. If all edges of a solid object appear equal in length, then its projection is

(AVERAGE)

- A) Front view B) Isometric projection C) Side view D) Top view

14. When a real fractal is viewed by 'zooming in' (AVERAGE)
 A) The image blurs and disappears B) The pattern changes completely
 C) The same or similar pattern repeats D) Details decrease with repetition
15. In a Sierpinski Carpet, the number of shaded squares remain from Step 0 to Step 2 is (AVERAGE)
 A) 32 B) 64 C) 16 D) 128
16. The formula representing the number of triangles remaining at step 'n' in a Sierpinski Gasket is (AVERAGE)
 A) 2^n B) 3^n C) 4^n D) 3^n
17. The total number of faces a hexagonal prism has (EASY)
 A) 6 B) 7 C) 8 D) 10
18. The name of the 2D shape formed when a 3D solid object is unfolded flat onto a plane is (EASY)
 A) Face B) Vertex C) Net D) Slice
19. The number of possible nets that a regular tetrahedron has is (AVERAGE)
 A) 6 B) 2 C) 3 D) 1

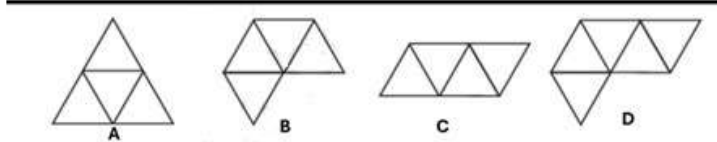
II. Answer the following questions (One mark questions)

20. How many possible nets does a cuboid have? (AVERAGE)
21. Name two fractal patterns found in nature. (EASY)
22. What is the number of non-overlapping congruent equilateral triangles required to make the first step of a Koch Snowflake? (EASY)
23. How many faces does a cuboid have? (EASY)
24. In a Sierpinski Carpet, if the number of squares remaining at the n-th step is R_n then, write the formula for R_n . (AVERAGE)
25. Write the shape of the net of a regular tetrahedron. (AVERAGE)
26. What is the name of the projection in which the lengths of all edges of a cube appear equal? (EASY)
27. If a prism has 10-sided congruent polygons as its faces, how many vertices will it have? (AVERAGE)
28. How many edges does a hexagonal pyramid have? (AVERAGE)
29. How many vertices does a square pyramid have? (AVERAGE)
30. What is a projection? (EASY)

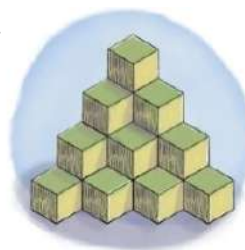
31. What is an isometric projection? (EASY)
32. State what types of projections a conical shape can create on a plane. (AVERAGE)
33. What shape are the faces of an icosahedron? (EASY)

III. Answer the following questions (Two marks questions)

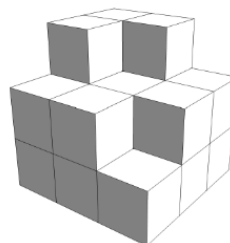
34. What is the net of a solid shape? Give an example. (EASY)
35. Find the number of holes and triangles remaining at each step of the pattern sequence that leads to a Sierpinski Triangle. (AVERAGE)
36. Find the number of sides at the n-th step of the shape sequence that leads to a Koch Snowflake. (AVERAGE)
37. What is the net of a regular tetrahedron? Which of the following are nets of a regular tetrahedron? (AVERAGE)



38. Draw any two nets of a cube. (AVERAGE)
39. Define Faces and Edges in the context of solid geometry. (AVERAGE)
40. Write the differences between a prism and a pyramid. (AVERAGE)
41. Find the number of identical cubes in this heap/stack. (AVERAGE)



42. Find the number of identical cubes in this heap/stack. (AVERAGE)

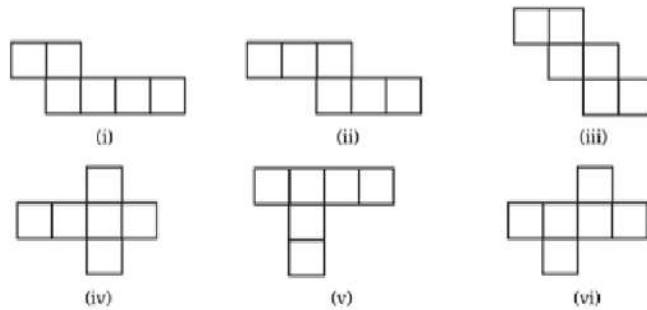


43. Draw the net of a cuboid with the following side lengths: (DIFFICULT)
- A) 5 cm, 3 cm, and 1 cm B) 6 cm, 3 cm, and 2 cm
- C) 5 cm, 4 cm, and 3 cm D) 4 cm, 4 cm, and 4 cm

IV. Answer the following questions (Three marks questions)

44. Define a fractal and give three examples of self-similarity found in nature. (AVERAGE)
45. Explain the steps to construct a Sierpinski Gasket (triangle). (AVERAGE)

46. How is a 'net' useful in finding the shortest distance between two points on the surface of a solid shape? **(AVERAGE)**
47. Explain the construction process of a Koch Snowflake. **(DIFFICULT)**
48. Why are three mutually perpendicular projections (front, top, and side views) necessary to describe a solid object? **(AVERAGE)**
49. Which of the following are nets of a cube? **(AVERAGE)**

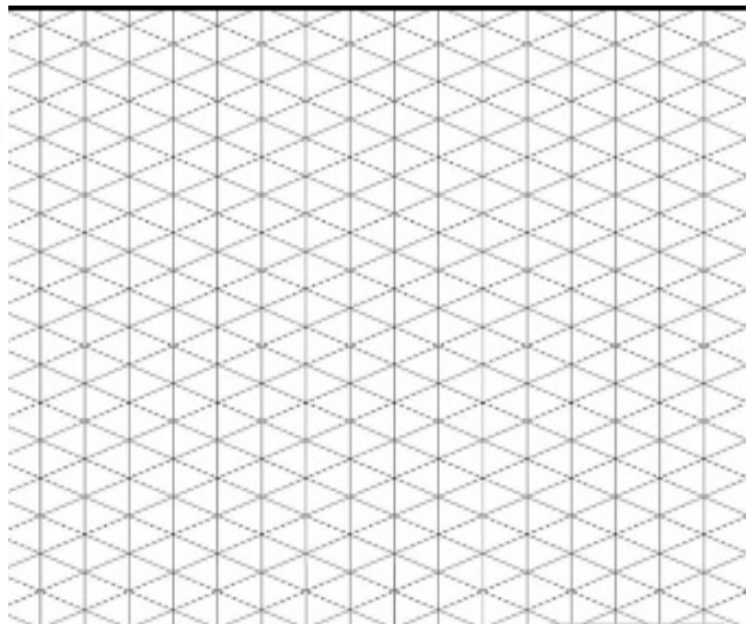
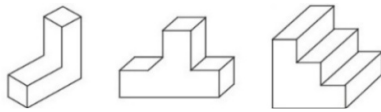


50. If a pyramid has a 10-sided polygon as its base, calculate its number of faces and edges. **(DIFFICULT)**
51. Draw the top view, front view, and side view for each of the following combinations. **(AVERAGE)**

	Top veiw	Front veiw	Side veiw

52. Draw the following figures on an isometric grid.

(DIFFICULT)



53. Match each of the following objects with its respective projections (Side View and Top View).

(AVERAGE)

	Object		Side View		Top View
(a)	 A bottle	(i)		(i)	
(b)	 A weight	(ii)		(ii)	
(c)	 A flask	(iii)		(iii)	
(d)	 Cup and Saucer	(iv)		(iv)	
(e)	 Container	(v)		(v)	

V. Answer the following questions (Four marks questions)

54. Explain the construction process of a Sierpinski Carpet and show the number of remaining squares (R_n) and holes (H_n) up to Step 2. **(DIFFICULT)**
55. What is an 'Isometric Projection' and what is its significance in engineering drawing? **(DIFFICULT)**
56. Explain the concepts of Front View, Top View, and Side View. Why is a single projection not sufficient to describe a solid object? **(DIFFICULT)**

CHAPTER-12 TALES BY LINES AND DOTS

LO No	Learning Outcomes	Question Numbers
42	Draw, Interpret and visualize various data representations including pie charts, line graphs, clustered bar graphs, and infographics	20, 22, 25, 31, 34, 46, 47, 51, 65, 69, 70, 71, 73, 75, 76, 77, 78, 79
43	Work individually/ collaboratively on projects involving data collection, organisation, visualization and share their observations and inferences.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24, 26, 27, 28, 29 30, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 72, 74,

EASY	AVERAGE	DIFFICULT	TOTAL
45	29	05	79

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- If each value in a data is increased by 7, the new mean is **(EASY)**
 A) Remains the same B) Increases by 7 C) Increases by 14 D) Multiplied by 7
- If every value in a data set is divided by 5, the new mean is **(EASY)**
 A) Remains the same B) Increases by 5 C) divided by 5 D) multiplied by 5
- If 3 is subtracted from every value in a data set, the new mean is **(EASY)**
 A) Increases by 3 B) Decreases by 3 C) No change occurs D) Is divided by 3
- In a dot plot, the mean is considered the "center" because it is **(AVERAGE)**
 A) The most frequent value B) The middle number
 C) The highest value D) The sum of the distances on both sides is equal
- If every value in a data set is doubled, the new mean is **(EASY)**
 A) Half of the old mean B) No change C) Doubled D) Increased by 2
- The mean of the scores 5, 8, 12, 15, 20 is **(EASY)**
 A) 12 B) 8 C) 15 D) 10
- If a value equal to the current mean is added to the data set, the new mean **(EASY)**
 A) Increases B) Decreases C) Remains unchanged D) Becomes zero
- If a value greater than the current mean is added to a data set, the new mean is **(EASY)**
 A) Increases B) Decreases C) Remains unchanged D) Becomes zero

9. If the mean of four numbers is 10, then the sum of the numbers is **(EASY)**
 A) 40 B) 20 C) 10 D) 5
10. If the mean of a data set is 25 and every number is decreased by 5 then the new mean is **(EASY)**
 A) 5 B) 20 C) 25 D) 30
11. If there are 10 scores in a data, then the mean is **(EASY)**
 A) The 5th value B) The 6th value
 C) The average of the 5th and 6th values D) The total sum divided by 10
12. If the height of 5 students in a class (in cm) are: 150, 152, 154, 156, 158 then the mean height of this data is **(EASY)**
 A) 152 B) 154 C) 156 D) 153
13. In a spreadsheet, the intersection of a row and a column is **(EASY)**
 A) Box B) Cell C) Grid D) Point
14. In a spread sheet 'Columns' are identified as **(EASY)**
 A) Numbers (1, 2, 3...) B) Letters (A, B, C...) C) Symbols (@, #, \$...) D) Roman numerals
15. The correct formula for finding the largest value in a range of cells (C1 to C20) in a spreadsheet is **(EASY)**
 A) =MAX(C1:C20) B) =HIGH(C1:C20) C) =LARGE(C1:C20) D) =SUM(C1:C20)
16. The formula that calculates the AVERAGE of cells B2 to B10 in a spreadsheet is **(EASY)**
 A) =SUM(B2:B10) B) =COUNT(B2:B10)
 C) =MEAN(B2:B10) D) =AVERAGE(B2:B10)
17. In a spreadsheet, the cell reference C5 indicates **(EASY)**
 A) Column 5, Row C B) Row 5, Column C C) The cell on page 5 D) Row C
18. The correct formula to add the values of cell B4 and cell D4 in a spread sheet is **(EASY)**
 A) =SUM(B4:D4) B) =B4+D4 C) =ADD(B4,D4) D) =SUM(B4,D4)
19. A function used to find the 'smallest' value of data in a spread sheet is **(EASY)**
 A) =MAX() B) =MIN() C) =SMALL() D) =LOW()
20. The value represented by each dot in a dot plot is **(EASY)**
 A) Mean of the data B) Median of the data C) Frequency of the data D) Range of the data
21. The formula used to count the number of cells containing numbers from A1 to A5 in a spread sheet is **(EASY)**
 A) =SUM(A1:A5) B) =AVERAGE(A1:A5) C) =COUNT(A1:A5) D) =NUMBER(A1:A5)
22. The most appropriate graph for displaying the change in temperature throughout the day is **(AVERAGE)**
 A) Pie chart B) Bar graph C) Line graph D) Dot plot

23. The mean of 5 numbers is 10. When a new number is added, the mean becomes 11. The new number added is **(AVERAGE)**
 A) 11 B) 15 C) 16 D) 20
24. The "balance point" refers to **(EASY)**
 A) Maximum value of the data B) Minimum value of the data
 C) Mean of the data D) Median of the data
25. The most suitable one for representing line graphs is **(AVERAGE)**
 A) Categorical data B) Proportions C) Trends over time D) Single data points

II. Answer the following questions (One mark questions)

26. Find the mean of the data: 12, 8, 15, 10, 5. **(EASY)**
27. What is the mean of the first 5 natural even numbers? **(AVERAGE)**
28. For the data 3, 5, 7, 9, 11 (mean = 7), verify the "balance property" by calculating the sum of distances on both sides of the mean. **(DIFFICULT)**
29. A data set has a mean of 20. If each value is multiplied by 3 and then 5 is added to each, what is the new mean? **(AVERAGE)**
30. Explain why the mean is called the "balance point" in a dot plot. **(AVERAGE)**
31. If a dot plot is balanced, where is the mean located? **(EASY)**
32. The mean of 7 numbers is 10. When one number is removed, the mean becomes 9. What is the removed number? **(AVERAGE)**
33. If the mean of five numbers is 20, what is their total sum? **(EASY)**
34. Which measure of central tendency is called the "balance point" of a dot plot? **(EASY)**
35. In a spread sheet, what does cell A1 represent? **(EASY)**
36. Which formula is used to calculate the mean of data in a spread sheet? **(EASY)**
37. What is the intersection of a 'Row' and a 'Column' in a spread sheet called? **(EASY)**
38. In a spreadsheet, with which symbol must every formula begin? **(EASY)**
39. If 10 is added to every value in a data set, what happens to the mean? **(EASY)**
40. In what order must data be arranged to find the median of a data set? **(EASY)**
41. What is the Excel formula to find the Average of cells A1 to A10? **(EASY)**
42. Write a spreadsheet formula to calculate the sum of values in cells B2, B3, B4, and B5. **(EASY)**
43. Find the median of the following data: 5, 12, 3, 8, 10. **(AVERAGE)**
44. What is the 'Range' of a data set? **(EASY)**
45. If the mean of a data set is 15 and a new value of 15 is added, what is the new mean? **(EASY)**
46. What does the 'X-axis' represent in a graph? **(EASY)**

47. Which graph is best to show how a student's height changes over 10 years? (EASY)

III. Answer the following questions (Two marks questions)

48. The weights of 5 students are 42 kg, 45 kg, 48 kg, 50 kg, and 45 kg. Find their Average weight. (EASY)

49. The amount of Rainfall in a week (in mm): 10, 12, 8, 15, 5, 20, 10. What is the mean rainfall? (EASY)

50. The mean of 10 numbers is 50. If 10 is added to every number, what is the new mean? (AVERAGE)

51. Draw a simple dot plot for the given data: 2, 4, 4, 5, 7, 7, 7, 8. (EASY)

52. For the data set 4, 7, 9, 12, 15, 18, calculate the new mean if you add two new values 8 and 11. (AVERAGE)

53. A data set has 8 values with a mean of 15. If a new value 24 is added, does the mean increase or decrease? Prove it. (AVERAGE)

54. The mean of a collection of 20 numbers is 45. If each number is multiplied by 3, what is the new mean? (AVERAGE)

55. The average age of 5 friends is 16. If the ages of four friends are 12, 14, 18, and 20, find the age of the fifth friend. (AVERAGE)

56. The mean of 6 numbers is 12. If one number is excluded, the mean becomes 11. Find the excluded number. (AVERAGE)

57. Given the data: 2, 5, 8, 10, 15. Calculate the mean for this data. Show that the sum of the deviations (distances) of all points from the mean is zero. (DIFFICULT)

58. The mean of the numbers 8, 13, 10, 4, 5, 20, y, 10 is 10.375. Find the value of y. (AVERAGE)

IV. Answer the following questions (Three marks questions)

59. The average weight of 8 players is 39.2 kg. If the weights of 7 players are 42, 40, 39, 33, 48, 38, and 42 kg, find the weight of the 8th player. (AVERAGE)

60. In an examination, the mean marks of 6 students is 75. After re-evaluating the marks, one student's marks were considered as 90 instead of 60. Find the correct mean marks. (AVERAGE)

61. In a spread sheet, write the formulas to find: (i) the minimum value of cells C2:C12, (ii) the maximum value of cells D1:D20, (iii) the sum of cells E5:E15. (EASY)

62. Consider the given data: 10, 10, 11, 17. (DIFFICULT)

(i) Calculate the mean.

(ii) Show that the sum of the distances of points below the mean is equal to the sum of the distances of points above the mean.

(iii) If you add the value 22 to this group, what is the new mean?

63. Data: 2, 4, 6, 8, 10. (i) Find the mean. **(EASY)**

(ii) If each value is multiplied by 2, what is the mean of the new data?

(iii) What is the relationship between the original mean and the new mean?

64. The mean of the data 5, 7, 9, 11, 13 is 9. **(DIFFICULT)**

(i) Add two values such that the mean remains 9.

(ii) Add one value less than 9 and one value greater than 9 such that the mean remains 9.

(iii) If you remove '9' from the original group, does the mean change?

65. Using a dot plot, find the mean and median of the values 5, 5, 5, 6, 7, 8, 9, 9, 9

(AVERAGE)

66. Explain the function of the following spreadsheet formulae **(EASY)**

i) =MAX(A1:A10)

ii) =SUM(B2:B10)

iii) =AVERAGE(C1:C5)

67. The mean salary of 20 workers in a factory is Rs.5000. When the manager's salary is added, the mean salary becomes Rs.5500. What is the manager's salary? **(AVERAGE)**

68. Venkayya keeps track of coconut yield in his garden. He calculates the Average yield per tree as 25.6. His son checks the count for one tree and finds it was recorded incorrectly, being 3 more than the actual number. If the number of trees is 15, find the correct Average.

(DIFFICULT)

69. A line graph shows the city temperature recorded every 2 hours:

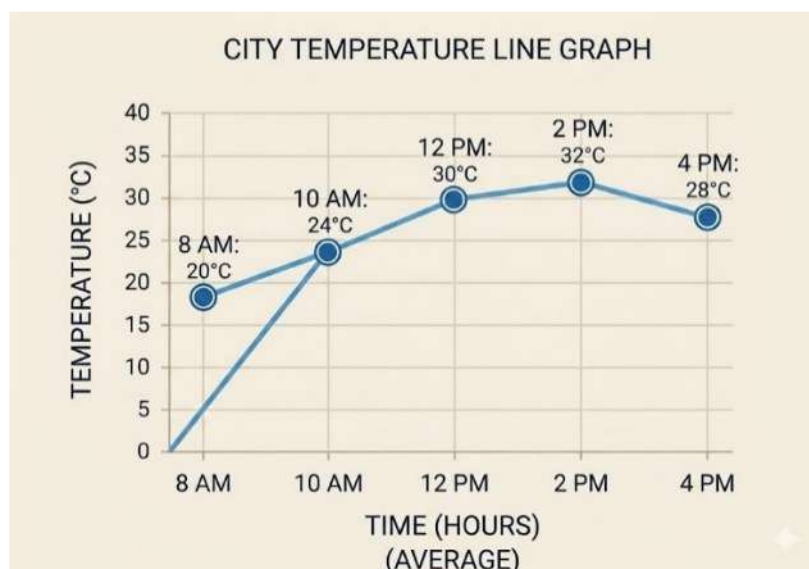
(AVERAGE)

(8 AM: 20°C, 10 AM: 24°C, 12 PM: 30°C, 2 PM: 32°C, 4 PM: 28°C).

(i) At what time was it the hottest?

(ii) Based on these readings,
what is the Average daily temperature?

(iii) What is the "range" of the temperature?

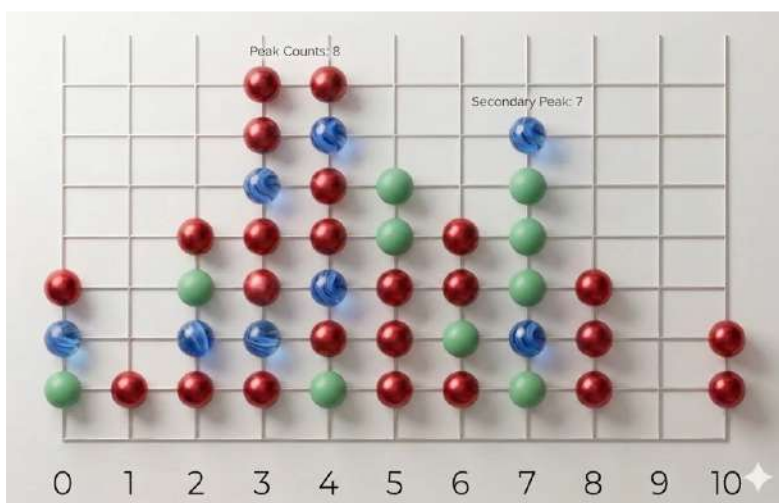


70. The average number of customers visiting a shop and the average number of customers actually purchasing items over different days of the week is shown in the table below. Visualise this data on a line graph. **(AVERAGE)**

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Visiting	16	19	10	14	20	22	35
Purchasing	10	8	7	11	12	16	26

V. Answer the following questions (Four marks questions)

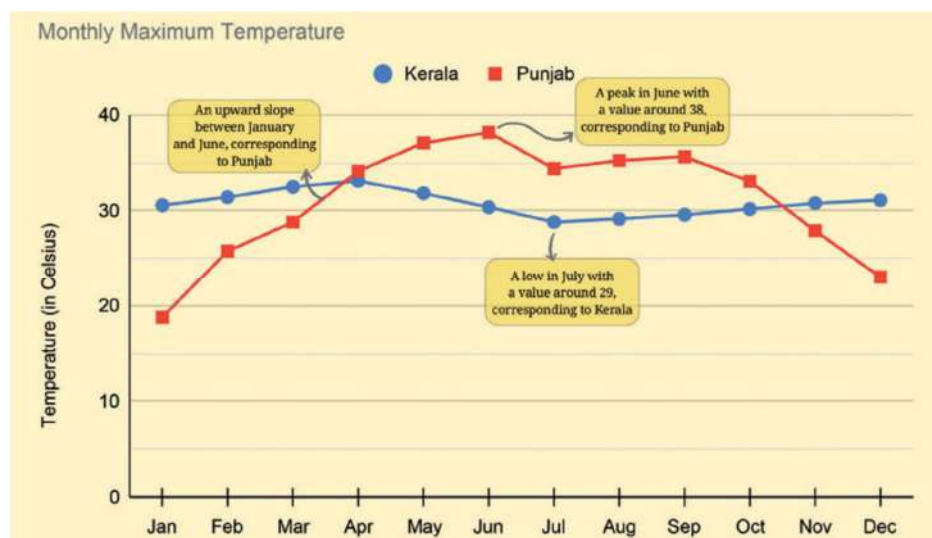
71. The following dot plot shows how many times students rode their bicycles in a week. Four students rode their bicycles twice. (i) Find the mean number of times students rode their bicycles. (ii) Find the median number of times students rode their bicycles **(AVERAGE)**



72. Find the median of 8, 10, 19, 23, 26, 34, 40, 41, 41, 48, 51, 55, 70, 84, 91, 92. **(AVERAGE)**
- (i) If we include one value to the data (in the given list) without affecting the median, what could that value be?
- (ii) If we include two values to the data without affecting the median what could the two values be?
- (iii) If we remove one value from the data without affecting the median what could the value be?
73. Weights of 10 students (in kg): 40, 42, 45, 48, 50, 42, 45, 48, 50, 50. **(AVERAGE)**
- (i) Construct a dot plot for this data. (ii) Find the mean weight.
- (ii) Find the median and the mode.
74. Find the mean of the following data **(EASY)**
- (i) The first 50 natural numbers. (ii) The first 50 odd numbers.
- (ii) The first 50 multiples of 4.

75. Observe the graph and answer the following questions: **(AVERAGE)**

- In which month is the temperature in Punjab at its maximum level?
- What is the approximate temperature in Kerala during the month of July?
- In which months are the temperatures in both Punjab and Kerala approximately the same?
- Which state is colder during the months of November and December?

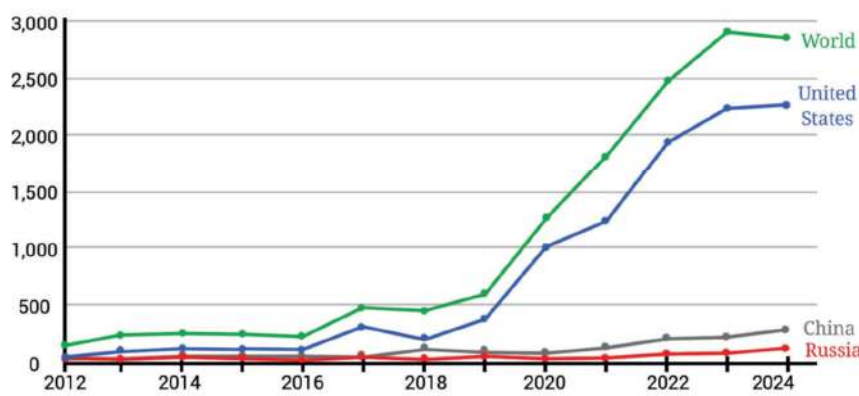


76. Based on this graph showing the annual number of objects launched into space, Answer the following questions: **(AVERAGE)**

- Which country launched the most objects into space between 2012 and 2024?
- What change has been observed in the number of objects launched worldwide after 2020?
- In which year did the United States launch approximately 1,000 objects into space?
- What is the estimated total number of global launches in 2024?

Annual number of objects launched into space

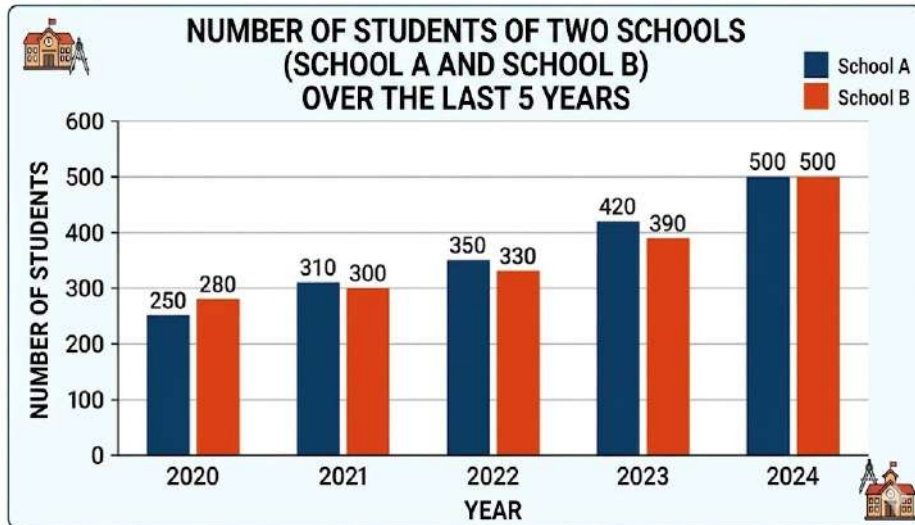
Including satellites, probes, landers, crewed spacecrafts, and space station flight elements launched into Earth orbit or beyond.



Source: United Nations Office for Outer Space Affairs (2025)

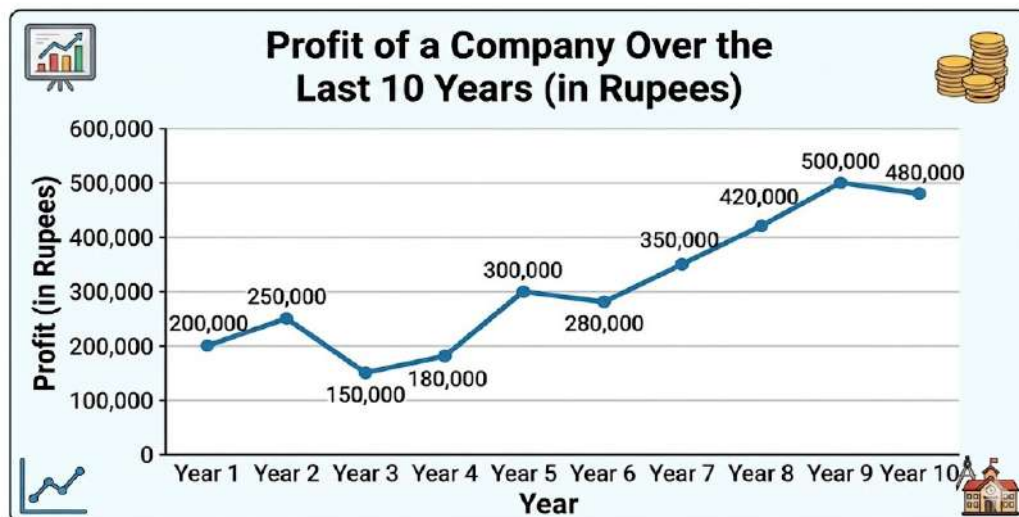
77. Based on a bar graph showing student numbers for two schools (School A and School B) over the last 5 years
(AVERAGE)

- In which year did School A have the highest number of students?
- What is the mean number of students in School B over the last 5 years?
- In which year is the difference between the numbers of students in both schools the smallest?
- In which year are the student numbers in both schools equal?



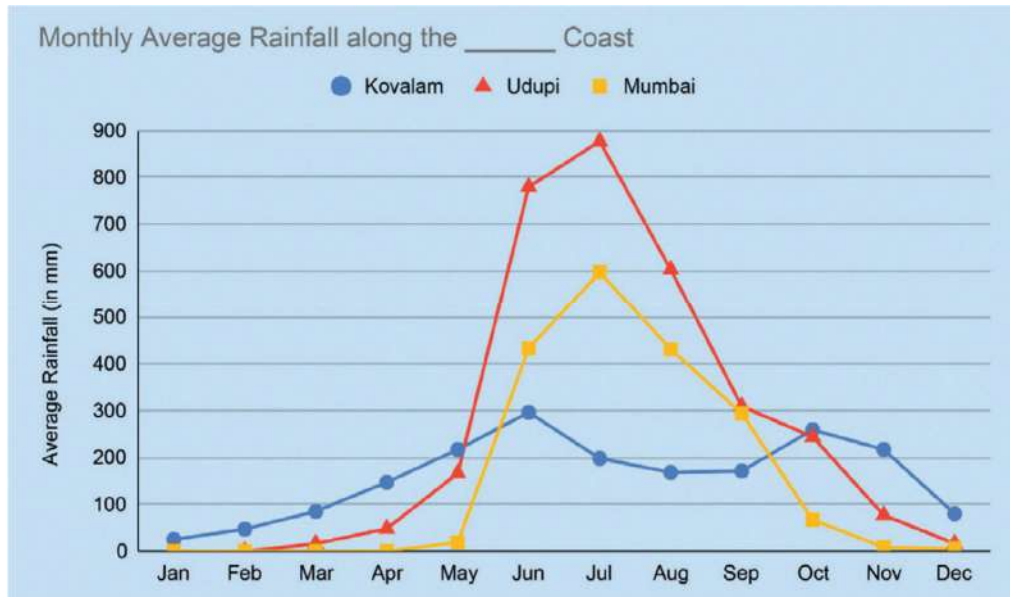
78. Based on the line graph showing a company's profit (in Rupees) over the last 10 years.
(EASY)

- Which year had the highest profit?
- Which year had the lowest profit?
- During which period did the profit increase continuously?
- What is the trend in profit after the 5th year?



79. The following graph compares the rainfall amounts in Kovalam, Udipi, and Mumbai.
(AVERAGE)

- i) In which month does Udipi city receive the most rainfall (about 900 mm)?
- ii) Which city receives more rainfall than Mumbai in the month of June?
- iii) In which month of the year is the rainfall in Kovalam at its lowest?
- iv) In Mumbai, the rainfall starts in June; by which month does it completely decline?



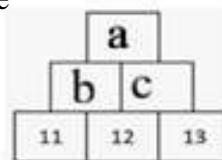
CHAPTER-13 ALGEBRA PLAY

LO No	Learning Outcomes	Question Numbers
22	Investigate number patterns and visual patterns and generalise them using suitable identities.	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 38, 39, 40, 41, 43, 44, 45, 46, 47, 49, 50, 52.
23	Solve number-based puzzles, tricks, and games using algebraic thinking	1, 2, 19, 20, 21, 22, 23, 31, 36, 37, 42, 48, 51

EASY	AVERAGE	DIFFICULT	TOTAL
21	18	13	52

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- “A number is doubled and four is added” the algebraic expression for this statement is (EASY)
 A) $x + 2$ B) $x + 3$ C) $2x + 4$ D) $x + 5$
- Multiply a number by 2 and add 10 to it, then divide by 2 and subtract the number you thought of first from the answer. The final answer is (EASY)
 A) 2 B) 5 C) 10 D) 4
- Any three-digit numbers of the same type is divided by the sum of these three digits, then the result obtained is (EASY)
 A) 11 B) 21 C) 37 D) 39
- In a math trick, if you multiply your age by 7 and then multiply it by 1443, then in the product, the number of times your age appears to be repeated is (DIFFICULT)
 A) One time B) two times C) three times D) four times
- In the given pyramid, the values of a, b, and c respectively are (EASY)
 A) 48, 23, 25 B) 48, 25, 23
 C) 23, 25, 48 D) 25, 48, 23



- In a number pyramid, if the number in the top row is 10 and between the two numbers in the immediate below row, one number is 4 then, the other number is (EASY)
 A) 14 B) 40 C) 6 D) 5
- In a number pyramid every number is the sum of the two numbers directly below it. If the bottom row contains a, b, c then, the number in the top most row is (AVERAGE)
 A) $a + b + c$ B) $2a + 2b + 2c$ C) $a + 2b + c$ D) $3a + 3b + 3c$

8. The sequence 1 , 2 , 3, 5 , 8 ,is **(EASY)**
 A) Number grid B) Row sequence
 C) Virahanka Fibonacci Sequence D) Calender Gap
9. When choosing any 2×2 squares in a calendar, the formula to find the sum of those numbers is **(EASY)**
 A) Multiply the largest number by 4
 B) Add 8 to the smallest number and multiply by 4
 C) Add 7 to the smallest number and multiply by 4
 D) Multiply the middle number by 2
10. If the total sum of a 2×2 square in a calendar is 100, then the smallest number in that square is **(DIFFICULT)**
 A) 15 B) 17 C) 21 D) 25
11. The difference between the numbers in the vertical columns of a calendar is **(EASY)**
 A) 1 B) 7 C) 5 D) 10
12. If the sum of all the numbers in a 2×2 calendar grid is 40, the value of the first number 'a' is **(AVERAGE)**
 A) 5 B) 6 C) 10 D) 4
13. In a 2×2 calendar grid, the grid numbers are 6, 7, 13, and x, the value of x is **(AVERAGE)**
 A) 12 B) 15 C) 14 D) 20
14. In a calendar grid, if "a "is a date, then the date in the same column in the below row is **(AVERAGE)**
 A) a + 1 B) a + 2 C) a + 7 D) a + 14
15. In a 2×2 calender grid, if the top left number is represented as "a ", the sum of all four numbers is **(DIFFICULT)**
 A) $4a + 8$ B) $4a + 12$ C) $4a + 14$ D) $4a + 16$
16. The largest product using the digit 3 , 5 , and 9 is **(AVERAGE)**
 A) 35×9 B) 59×3 C) 53×9 D) 95×3
17. When a two – digit number "ab "($b > a$), is written as "ba". The difference of these two numbers is always divisible by **(AVERAGE)**
 A) 7 B) 8 C) 9 D) 11

18. If the digits of a three digit number 'abc' are cyclically rearranged as $(abc + bca + cab)$, then the sum is always divisible by the number **(AVERAGE)**
- A) 3 B) 37 C) 111 D) 5

II. Answer the following questions (One - mark questions)

19. If 7 is added to 3 times a number, the result is 19. What is that number? **(EASY)**
20. When a certain number is multiplied by 5 and 3 is subtracted from the product, the result is 12. Find that number. **(EASY)**
21. A number is doubled and 4 is added, the result is 10. Find the number. **(EASY)**
22. Rama's present age is x years, after 5 years his age will be 20 years. Find his present age. **(AVERAGE)**
23. If the perimeter of a square is 24cm, find the length of one side. **(AVERAGE)**
24. The lower row of a number pyramid has 5 and 8, find the number that comes above that row. **(EASY)**
25. In a number pyramid, the top number is 20. If one of the numbers in the row directly below it is 12, what is the other number in that row? **(EASY)**
26. According to the pyramid rule, the bottom row contains the numbers x , 4, 6. The second row contains 9 and 10 then, what is the value of x ? **(AVERAGE)**
27. If all the numbers in the bottom row of a three -tier pyramid are 2, what will be the number at the very top of the pyramid. **(EASY)**
28. In a 2×2 calendar square, the total sum is 44. What is the first date (top left) in that square? **(AVERAGE)**
29. In a 2×2 calendar square, if the first number is represented as ' n ', what is the number directly below it? **(EASY)**
30. In the algebraic magic square, what should be written in the place of '?' mark? **(DIFFICULT)**

$x + 3$	$x - 4$	$x + 1$
$x - 2$	x	$x + 2$
$x - 1$	$x + 4$	?

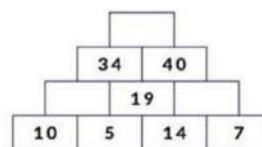
31. The sum of two numbers is 10. Find their largest possible product. **(DIFFICULT)**
32. If a number is divisible by 2, what digit must be in its unit's place? **(EASY)**
33. Write the expanded form of the two – digit number 'ab'. **(EASY)**
34. If the three – digit number 'abc' is divisible by 5, what should be the value of 'c'. **(EASY)**
35. Which number always divides the difference of three – digit numbers of the form $(abc - cba)$? **(AVERAGE)**

III. Answer the following questions (Two marks questions)

36. Think of a number. Double it. Add 5 to the result and then, multiply by 2. If the final answer is 30, what was the initial number? **(AVERAGE)**
37. Double a number and add 10 to it. If half of that total is 15, find that number. **(AVERAGE)**

38. Complete this number pyramid.

(EASY)



39. The first six numbers of a Virahanka – Fibonacci sequence are 1, 2, 3, 5, 8. Find the next three numbers. (EASY)

40. In Virahanka – Fibonacci sequence, if two consecutive numbers are x and $x + 3$, find the next number in terms of x . (EASY)

41. In a 2×2 calendar grid, if the largest number is 13, find the sum of all the numbers in that grid. (AVERAGE)

42. Present age of a mother is 28 years and her daughter is 4 years. After how many years will the mother's age be 3 times her daughter's age? (DIFFICULT)

43. Prove that the difference between the three – digit number 724 and the number obtained by reversing the digits is divisible by 99. (AVERAGE)

44. Test whether the sum of the first 10 numbers of a Fibonacci sequence is 1 less than the 12th number of the sequence. (AVERAGE)

IV. Answer the following questions (Three marks questions)

45. In the “Calendar Magic “trick, the sum of a 2×2 grid in the month of August is 52. Find the 4 numbers in that grid. (DIFFICULT)

46. Fill in the blanks using the digits 1, 4, and 8, ____ x ____ to get the largest possible product. (AVERAGE)

47. Show that the sum of the 3-digit numbers abc , bca , and cab is always divisible by 37 and 111. (DIFFICULT)

48. Without constructing the full pyramid, find the numbers in the top-most row given the following bottom rows. (AVERAGE)

i) 4 13 8 ii) 7 11 3 iii) 10 14 25

V. Answer these questions (Four marks questions)

49. Find the values of the different shapes in the grids below and fill in the empty squares. (DIFFICULT)

			27
			21

			18
			15

50. The first three Virahanka-Fibonacci numbers are written in the bottom row of a 3-row number pyramid. Fillout the rest of the pyramid. Which numbers appear in the grid? What is the number at the top? Are all of them Virahanka-Fibonacci numbers? (DIFFICULT)

51. In a farm, there are some horses and chickens. The total number of heads of these animals is 55, and the total number of legs is 150. How many horses and chickens are there in the farm? Can you solve this problem without using variables/letters? (DIFFICULT)

VI. Answer the following questions

(Five marks question)

52. Consider a calendar. Instead of a 2×2 grid, select “L” shaped area containing 3 consecutive dates in a single row.

(DIFFICULT)

- a) If the smallest number in the “L” shape is “a” express all three numbers in terms of “a”
- b) If the sum of these numbers is 36, find the three dates.
- c) Create a similar trick for 3×1 vertical column.

CHAPTER-14 AREAS

LO No	Learning Outcomes	Question Numbers
32	Derive the formula to find the area of triangle, parallelogram, rectangle, rhombus, trapezium and apply them to solve problems.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 45, 47, 50, 51, 52.
33	Calculate the area by dividing complex polygons into simpler figures such as triangles and rectangles. Transform one figure into another figure of equal area using the dissection method.	27, 40, 44, 46, 48, 49.

EASY	AVERAGE	DIFFICULT	TOTAL
09	38	05	52

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative & write the complete answer along with its letters of alphabet.

- If the length and breadth of a rectangle are 4cm and 6cm respectively then its area is (EASY)
 A) 24cm² B) 12 cm² C) 10 cm² D) 20 cm²
- If the area of a rectangle is 72 cm² and its length is 6 cm then its breadth is (EASY)
 A) 18 cm B) 36 cm C) 12 cm D) cm
- If the perimeter of a square is 20cm then its area is (AVERAGE)
 A) 50 cm² B) 16 cm² C) 40 cm² D) 25 cm²
- The area of a triangle having base 5cm and height 8cm is (EASY)
 A) 15 cm² B) 20 cm² C) 40 cm² D) 10 cm²
- If the base of a triangle is 'a' and the height is twice the base then the area of triangle is (AVERAGE)
 A) a² B) 2a² C) $\frac{1}{2} a^2$ D) $\frac{1}{4} a^2$
- The formula to find the area of a parallelogram is (EASY)
 A) $\frac{1}{2} \times \text{base} \times \text{height}$ B) $2 \times \text{base} \times \text{height}$ C) $4 \times \text{base} \times \text{height}$ D) $\text{base} \times \text{height}$

7. If a triangle and a parallelogram have the same base and height, then the area of the triangle is **(EASY)**
- A) Half of the area of parallelogram B) Double of the area of parallelogram
C) Triple the area of parallelogram D) Equal to the area of parallelogram
8. The area of a rhombus whose diagonals are 10 cm and 12 cm is **(AVERAGE)**
- A) 120 cm² B) 60 cm² C) 240 cm² D) 30 cm²
9. The area of a trapezium is 60 cm² and the sum of its parallel sides is 30 cm. Its height is **(AVERAGE)**
- A) 4 cm B) 8 cm C) 12 cm D) 24cm
10. If the area of a rectangle is 48 cm² and its length is three times its width, then its length and width respectively are **(DIFFICULT)**
- A) 6 cm and 8 cm B) 4 cm and 12 cm C) 12 cm and 4 cm D) 8 cm and 6 cm
11. In the formula for the area of a trapezium, $A = \frac{1}{2}(a+b)h$, 'a' and 'b' represents **(EASY)**
- A) Diagonals B) Parallel sides C) Lateral sides D) Height
12. If one of the equal sides of a right-angled isosceles triangle is 8 cm. then the area of the triangle is **(AVERAGE)**
- A) 16 cm² B) 48 cm² C) 64 cm² D) 32 cm²

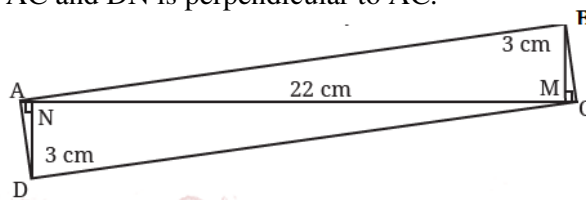
II. Answer the following questions (One-mark questions)

13. If the side of a square is doubled then, what will be the change in its area? **(AVERAGE)**
14. Name the quadrilateral formed when the parallel sides of a trapezium are equal. **(EASY)**
15. If the perimeter of a rectangle is 46 cm, then find the sum of its length and width. **(AVERAGE)**
16. If the area of a parallelogram is 50 cm² and the base is 10 cm, then find its height. **(AVERAGE)**
17. Name the parallelograms in which all four sides are equal. **(EASY)**
18. Find the perimeter of a rhombus whose side length is 7.5 cm. **(AVERAGE)**
19. The area of a rhombus is 98 cm². Find the product of its diagonals. **(AVERAGE)**
20. Write the formula to calculate the area of a trapezium. **(EASY)**

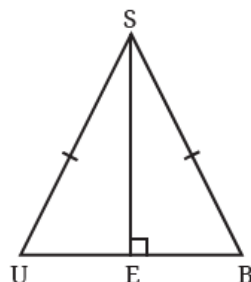
III. Answer the following questions (Two marks questions)

21. The ratio of the length and breadth of a rectangular ground is 3:2. If the area is 600 m² then, find the length and breadth of the ground. **(AVERAGE)**
22. A diagonal of a rectangle divides it into two congruent triangles. If the length and breadth of a rectangle are 18cm and 10cm respectively then, find the area of the one such triangle. **(AVERAGE)**
23. The area of a rectangle is 96 cm² and its base is 8 cm. Calculate the perimeter of the rectangle. **(AVERAGE)**

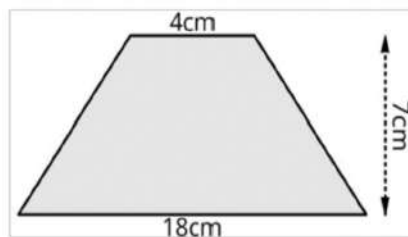
24. A rectangle with a length of 12 cm and a width of 8 cm needs to be converted into a triangle with the same area having base 12cm. Find the height of a triangle. **(AVERAGE)**
25. The area of a square is 441 cm^2 . Find the perimeter of the square. **(AVERAGE)**
26. The side lengths of an A4 sheet are 21 cm and 29.7 cm. Find the area of the sheet. **(AVERAGE)**
27. Find the area of the quadrilateral ABCD given that $AC = 22 \text{ cm}$, $BM = 3 \text{ cm}$, $DN = 3 \text{ cm}$. If BM is perpendicular to AC and DN is perpendicular to AC . **(AVERAGE)**



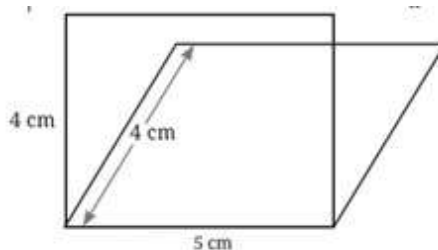
28. $\triangle SUB$ is an isosceles triangle. Here, SE is perpendicular to UB . If the area of $\triangle SEB$ is 24 square units, then find the area of $\triangle SUB$. **(AVERAGE)**



29. The base of a triangular plate is 24cm and its height is 10 cm. Calculate the area of this plate. Also find the total area of 5 such plates. **(AVERAGE)**
30. The diagonals of a rhombus are 16 cm and 12 cm respectively. Find the area of the rhombus. **(AVERAGE)**
31. The diagonals of a rhombus are in the ratio 3:4, and its area is 54 cm^2 . Find the measures of its diagonals. **(AVERAGE)**
32. Find the area of the given trapezium. **(AVERAGE)**

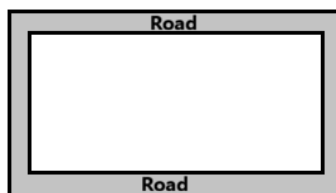


33. The area of a trapezium is 162 cm^2 . If its height is 9 cm and one of its parallel sides is 15 cm. Find the length of the other parallel side. **(AVERAGE)**
34. In the figure a rectangle and a parallelogram are on the same base. Find which of these has a larger area. **(AVERAGE)**

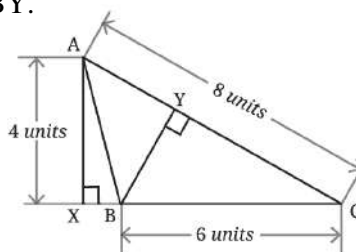


IV. Answer the following questions (Three marks questions)

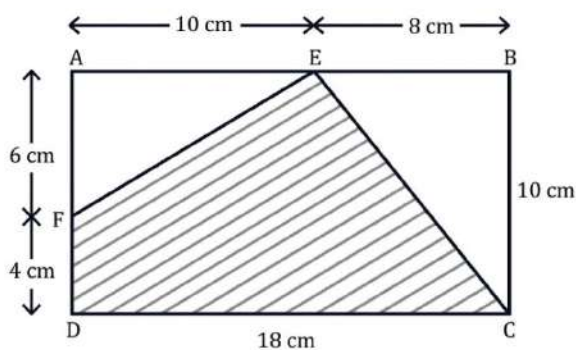
35. The length and breadth of a rectangle are 9 cm and 3 cm respectively. Find the ratio of the area of the rectangle to its perimeter. **(AVERAGE)**
36. A triangle and a rectangle both have an equal area of 50 cm^2 with the same base of 10 cm. Find the difference between their heights. **(AVERAGE)**
37. A road 2 meters wide is constructed inside a rectangular park that is 50 meters long and 40 meters wide. Find the area of the road. **(AVERAGE)**



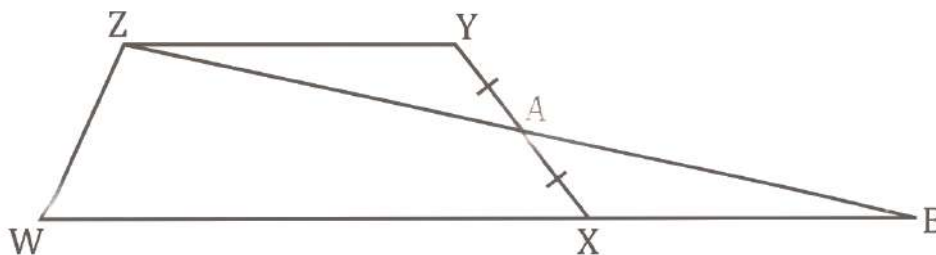
38. Explain with a diagram an example of how to find the area of a polygon by dividing it into different triangles. **(DIFFICULT)**
39. In the figure, find the length of the altitude BY. **(AVERAGE)**



40. In the figure, find the area of the shaded region given that ABCD is a rectangle. **(AVERAGE)**

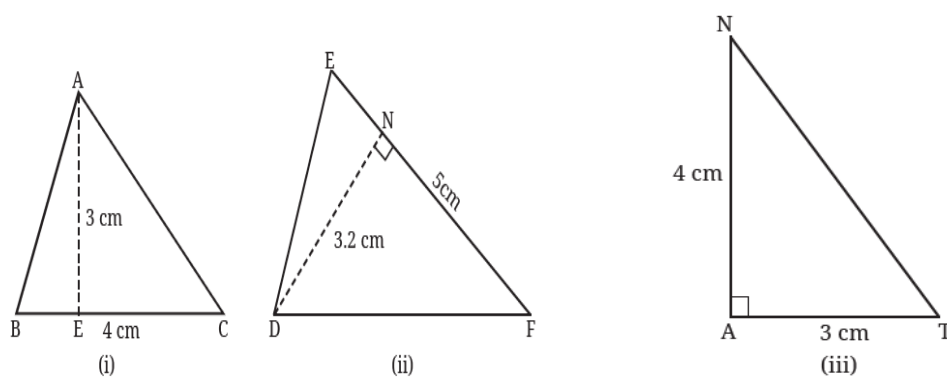


41. ZYXW is a trapezium with $ZY \parallel WX$. A is the midpoint of XY. Show that the area of the trapezium ZYXW is equal to the area of $\triangle ZWB$ **(DIFFICULT)**



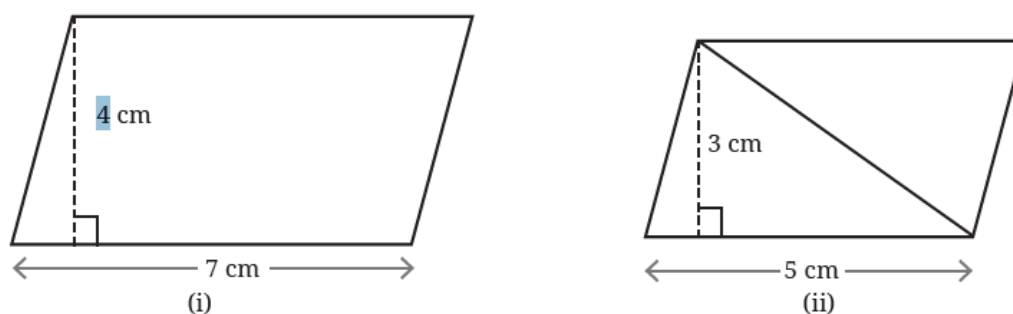
42. Find the areas of the following triangles.

(AVERAGE)



43. Find the areas of the following parallelograms.

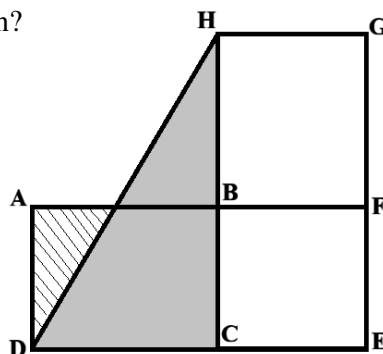
(AVERAGE)



44. "ABCD, BCEF, and BFGH are identical squares."

(DIFFICULT)

If the area of the shaded region is 49 square units, then, find the area of the hatched lines region?

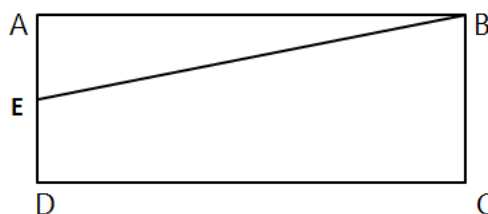


45. If the perimeter of a rhombus is 52 cm and one of its diagonals is 24 cm, then find the area of the rhombus.

(AVERAGE)

46. In the given figure, E is the midpoint of AD. If the lengths of BC and DC are 8 cm and 12 cm respectively then, find the area of the resulting trapezium and triangle.

(AVERAGE)



47. A field is in the shape of a trapezium whose parallel sides measure 25 m and 35 m. If the non-parallel sides are equal and each measures 13 m then, find the area of the field.

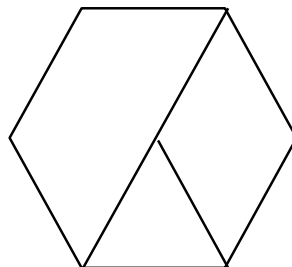
(AVERAGE)

48. Explain with an example the method of converting a trapezium into a rectangle of equal area.

(AVERAGE)

49. A regular hexagon is divided into a trapezium, an equilateral triangle, and a rhombus as shown. Find the ratio of their areas.

(DIFFICULT)



V. Answer the following questions

(Four marks questions)

50. The diagonals of a rhombus-shaped ground are 50m and 120m. Calculate the total cost to fence around it, at the rate of ₹25 per meter. **(AVERAGE)**
51. A farmer's land is in the shape of a trapezium, with parallel sides measuring 45 m and 65 m. The distance between them is 30 m. If 10 kg of vegetables are grown per square meter, find the total yield that can be produced in the land. **(AVERAGE)**
52. A wall is in the shape of a trapezium. The parallel sides are 12m and 18m, and the perpendicular distance between them is 10 m. Calculate the total cost to paint it at the rate of ₹50 per square meter. **(AVERAGE)**

CHAPTER-1 SQUARES AND CUBES

KEY ANSWERS:

I. Multiple choice Questions:

1. B) 100
2. C) 1, 4, 9
3. B) n^2
4. C) 17
5. B) 3
6. D) 2, 3, 7, 8
7. B) 21
8. A) 36 cm
9. D) 5
10. A) 0
11. B) 180
12. D) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
13. A) 5
14. D) 8
15. A) 6
16. C) 125
17. A) 4
18. C) 1729
19. B) all its prime factors occur in even powers
20. C) $15 \times 8 \times 25$

II. One mark questions:

21. $5^2 + 6^2 + 30^2 = 31^2$
22. n th odd number is $2n - 1$
23. $1 + 3 + 5 + 7 + 9 = 25$
24. $2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$
25. The perfect square number between 30 and 40 is 36
26. $(4.2)^2 = 4.2 \times 4.2 = 17.64$
27. $1729 = 1^3 + 12^3$
 $1729 = 9^3 + 10^3$
28. $6 \times 5 = 30$
29. 6 digits.
30. $4^3 = 64$
 $14^3 = 2744$
31. 44448889 .
32. $b^3 = 125$, $b = \sqrt[3]{125} = 5$
33. $n = \sqrt{m}$
34. 256, 289
35. $216 = 6 \times 6 \times 6 = 6^3$
36. 28

III. Two mark questions:

37. $368 = 2 \times 2 \times 2 \times 2 \times 23$

23 is a single factor therefore 368 is not a perfect square.

38. $1764 = 2 \times 2 \times 21 \times 21$

$\sqrt{1764} = 2 \times 21 = 42$, unit place number is 2.

39. $\sqrt{248 + \sqrt{52 + \sqrt{144}}} = \sqrt{248 + \sqrt{52 + 12}} = \sqrt{248 + \sqrt{64}} = \sqrt{248 + 8} = \sqrt{256} = 16$

40. $49 - 1 = 48$, $48 - 3 = 45$, $45 - 5 = 40$, $40 - 7 = 33$, $33 - 9 = 24$

$24 - 11 = 13$, $13 - 13 = 0$

So $\sqrt{49} = 7$.

41. perimeter = 48 cm $\Rightarrow 4a = 48$. $a = 12$ cm

42. $500 = 2 \times 2 \times 5 \times 5 \times 5$

Arrange in the group of three factors = $(2 \times 2) \times (5 \times 5 \times 5)$

2 is short of one factor

hence 500 should be multiplied by 2

43. $270 = 2 \times 3 \times 3 \times 3 \times 5$

Arrange in the group of three factors = $2 \times 5 \times (3 \times 3 \times 3)$

$2 \times 5 = 10$

270 should be divided by 10.

44. $5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$\sqrt[3]{5832} = 2 \times 3 \times 3 = 18$

45. $2^3 + 4^3 + 6^3 = 8 + 64 + 216 = 288$

46. length of the edge = 13 cm

volume = $a^3 = (13)^3 = 13 \times 13 \times 13 = 2197 \text{ cm}^3$

47. $\sqrt{4096} + \sqrt{40.96} = 64 + 6.4 = 70.4$

48. factors $5 \times 2 \times 5$

To make a cube we need triple pairs

$(5 \times 5 \times 5) \times (2 \times 2 \times 2)$

Extra needed = $5 \times 2 \times 2 = 20$

49. 3rd triangular number = $\frac{3 \times (3+1)}{2} = 6$

4th triangular number = $\frac{4 \times (4+1)}{2} = 10$

Sum = $6 + 10 = 16$

Since $16 = 4^2$, it is a perfect square.

50. The square of 4 is 16 , The square of 8 is 64 , The square of 2 is 4 , The square of 6 is 36

Therefore 108^2 and 292^2 has '4' in its unit place.

51. $(n + 1)^2 = n^2 + 2n + 1$

$$126^2 = 125^2 + 250 + 1$$

$$126^2 = 15625 + 250 + 1 = 15876$$

52. 27000 Prime factors are $= 2^3 \times 3^3 \times 5^3$

$$\sqrt[3]{27000} = 2 \times 3 \times 5 = 30$$

53. Between n^2 and $(n + 1)^2$ there are $2n$ numbers

here $n = 16$, $(n + 1)^2 = 17$

$$\therefore 2n = 2 \times 16 = 32 \text{ There are 32 numbers}$$

IV. Three Mark Questions:

54. Triangular numbers formula $= \frac{n \times (n+1)}{2}$

Solve for $n \times (n + 1) = 72$

$$8 \times 9 = 72 , \text{ so 8 rows}$$

Yes , $36 = 6^2$, so it is both a triangular number & a perfect square.

55. $2^3 + 16^3 = 8 + 4096 = 4104$

$$9^3 + 15^3 = 729 + 3375 = 4104$$

56. Total money = ₹5929

Number of students = n , collected money = n

$$\text{total} = n \times n = n^2$$

$$n = \sqrt{5929} = 77$$

$$\text{total number of students} = 77$$

57. square root of one number $= \sqrt{a} = 3$, $(\sqrt{a})^2 = 3^2$, $a = 9$

$$\text{Sum of the squares} = a^2 + b^2 = 145 , 81 + b^2 = 145 , b^2 = 145 - 81 = 64$$

$$b^2 = 64 , b = \sqrt{64} = 8 , \text{ other number is } = 8$$

58. $46656 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

46656 arrange the factors in the group of three

$\therefore$ 46656 is a perfect cube number

$$\sqrt[3]{46656} = 2 \times 2 \times 3 \times 3 = 36,$$

59. Finding the L . C . M of 8 , 15 , 20

$$\therefore \text{L . C . M} = 2 \times 2 \times 2 \times 5 \times 3 = 120.$$

Find the factors of 120

$$120 = 2 \times 2 \times 2 \times 3 \times 5$$

2, 3, 5 these factors are not in the group of two, on multiplying $= 2 \times 3 \times 5 = 30$

multiply : $120 \times 30 = 3600$

$\therefore 3600$ is a perfect square number

$\therefore 3600$ is the smallest square number divisible by 8, 15 and 20

60. Nearest square $34^2 = 1156$, $1200 - 1156 = 44$

Number of students who were excluded $1200 - 1156 = 44$

Number of students in every row $= \sqrt{1156} = 34$

V. Four marks questions:

61. The prime factors of 9408 are $2^2 \times 2^2 \times 2^2 \times 7^2 \times 3$

Here there is no pair to 3 hence 9408 is multiplied by 3

$$3 \times 9408 = 28224$$

The factors of 24224 are $2^2 \times 2^2 \times 2^2 \times 7^2 \times 3^2$

$$\sqrt{24224} = 2 \times 2 \times 2 \times 3 \times 7 = 168$$

62. $1008 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$

$$= 2^2 \times 2^2 \times 3^2 \times 7$$

Here the factor 7 is not in pair.

$\therefore 7$ is the least number to be multiplied to 1008 to make it a perfect square.

Perfect square is $= 1008 \times 7 = 7056$

$$\therefore \sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$$

63. The ratio of three numbers $= 2 : 3 : 4$

Let us represent them as $2x$, $3x$, $4x$

$$\text{Sum of the cubes} = (2x)^3 + (3x)^3 + (4x)^3 = 33957,$$

$$8x^3 + 27x^3 + 64x^3 = 33957$$

$$99x^3 = 33957$$

$$x^3 = \frac{33957}{99} = 343,$$

$$x = 7$$

$$\text{First number} = 2x = 2 \times 7 = 14,$$

$$\text{second number} = 3x = 3 \times 7 = 21,$$

$$\text{third number} = 4x = 4 \times 7 = 28$$

64. $13^2 = 169$, $31^2 = 961$

$$12^2 = 144, 21^2 = 441$$

$$102^2 = 10404, 201^2 = 40401$$

65. Yes 1331 is a perfect cube

$$10 < \sqrt[3]{1331} < 20$$

If the unit place has 1 then the cube root also have the 1 in its unit place.

$$\therefore \sqrt[3]{1331} = 11$$

4913 : If the last (unit) digit is 3 The cube root consists of 7 in its last place

The remaining places should consist less than 4

$$\therefore \sqrt[3]{4913} = 17$$

12167 : If the last digit is 7 then the cube root consists of 3 in the unit place The remaining part is less than 12 then the nearest cube number is 8 Therefore it is 2

$$\therefore \sqrt[3]{12167} = 23$$

32768 : If the last digit is 8 then the cube root consists of 2 in the unit place

The remaining part is less than 32 then the nearest cube number is 27 Therefore it is 3

$$\therefore \sqrt[3]{32768} = 32$$

$$66. n^3 - (n-1)^3 = 3n^2 - 3n + 1$$

$$i) 67^3 - 66^3 = 3 \times 67^2 - 3 \times 67 + 1 = 13267$$

$$ii) 43^3 - 42^3 = 3 \times 43^2 - 3 \times 43 + 1 = 5418$$

$$iii) 67^2 - 66^2 = 2 \times 67 - 1 = 133$$

$$iv) 43^2 - 42^2 = 2 \times 43 - 1 = 85$$

$$\therefore i) 67^3 - 66^3 \text{ is the largest number}$$

VI. Five marks Questions:

67. a) Let the number of students = x

$$\text{Total amount} = ₹9216$$

$$\sqrt{9216} = 96$$

$$\text{Total students} = 96.$$

$$b) \text{ volume of cubical box} = \sqrt[3]{64} = 4\text{cm}$$

$$\text{each side} = 4 \text{ cms.}$$

68. a) Total number of soldiers = 4500

$$67^2 = 4489, 68^2 = 4624$$

Smallest one is $67^2 = 4489$, subtract this from the total pool of soldiers

$$\text{to find the remainder } 4500 - 4489 = 11 \text{ soldiers are left out.}$$

b) The next larger square grid size requires a layout of 68×68 soldiers

$$68^2 = 4624$$

Subtract the existing 4500 soldiers to discover how many more are needed.

$$4624 - 4500 = 124 \text{ additional soldiers.}$$

CHAPTER – 2 POWER PLAY

KEY ANSWERS

- I)
1. B) 2
 2. C) Index
 3. C) 5
 4. D) 1
 5. B) 1
 6. B) 1000
 7. C) 2^3
 8. A) 2^8 V
 9. A) 2^5
 10. C) $(a \times b)^5$
 11. B) 7^3
 12. A) 3^4
 13. D) +225
 14. A) 2m
 15. D) $\frac{1}{x}$
 16. A) 0.01
 17. B) 5
 18. B) 64
 19. B) 1.0×10^5
 20. B) 3.2×10^{-4}
 21. B) 8
 22. A) 1.673×10^{-24} g

II) One mark Questions

23. 6^4
24. $x^4 \times y^2$
25. $3x^2$
26. 2×10^3
 $2 \times 1000 = 2000$
27. $\frac{1}{2^9}$ or 2^{-9}

$$28. 32$$

$$29. a^2 b c^4 d^2$$

$$30. 500$$

$$31. 48300000$$

$$32. \frac{1}{5^2}$$

$$33. -128$$

$$34. x^4$$

$$35. \frac{2^{100}}{2^{25}} = 2^{100-25} = 2^{75}$$

$$36. p^3$$

$$37. \frac{1}{x^7}$$

$$38. 3^2 \times 3^{-5} \times 3^6 \\ = 3^{2-5+6} = 3^{8-5} = 3^3$$

$$39. x^{12}$$

$$40. \frac{1}{x^{10}}$$

$$41. 3 \times 2 \times 3 \times 2 \times 3 \times 2$$

$$42. 2 \times x \times 2 \times x \times 2 \times x \times 2 \times x$$

$$43. \frac{2^3}{x^3} = \frac{8}{x^3}$$

$$44. p^3 \times p^{-10} = p^{3-10} = p^{-7} = \frac{1}{p^7}$$

$$45. 1 \times 10^2 + 5 \times 10^1 + 2 \times 10^0$$

$$46. 10^4$$

$$47. 8^p \times 8^q = 8^{p+q}$$

$$48. 1$$

$$49. 2^6 = 2^{3a}$$

$$6 = 3a$$

$$\frac{6}{3} = a, \quad a = 2$$

$$50. 1.0 \times 10^6$$

$$51. \quad \begin{array}{ll} \text{Linear growth} & \text{Exponential growth} \end{array}$$

$$\begin{array}{ll} \text{Additive} & \text{Multiplicative} \end{array}$$

$$52. (2^3)^{14}$$

$$53. 5 \times 40 = 200$$

III) Two marks Questions

$$54. 2025 = 5^2 \times 3^4$$

$$55. 3600 = 2^4 \times 3^2 \times 5^2$$

$$56. \frac{3^{2+4}}{3^3} = \frac{3^6}{3^3} = 3^{6-3} = 3^3$$

$$57. (x^3)^2 \cdot (y^5)^2 = x^6 \cdot y^{10}$$

$$58. (2)^3 \cdot (p^2)^3 = 8 p^6$$

$$59. (a^2)^3 \cdot (b^{-3})^3$$

$$= a^6 \cdot b^{-9}$$

$$= \frac{a^6}{b^9}$$

$$60. (5)^3 \cdot (x^{-3})^3 \cdot (y^{-2})^3$$

$$= 125 \cdot x^{-9} \cdot y^{-6}$$

$$= \frac{125}{x^9 \cdot y^6}$$

$$61. \frac{10^4}{5^4} = \frac{(2 \times 5)^4}{5^4} = \frac{2^4 \times 5^4}{5^4} = 2^4$$

$$62. 2^{2 \times 2 \times 2 \times 2} = 2^{16}$$

$$63. \frac{2^{224}}{4^{32}} = \frac{2^{224}}{(2^2)^{32}}$$

$$= \frac{2^{224}}{2^{64}} = 2^{224-64}$$

$$= 2^{160} \text{ When the power ends with multiple of 4 then the digit in the units place is 6}$$

$$64. m^5 n^{12} (mn)^9$$

$$= m^5 n^{12} m^9 n^9$$

$$= m^{5+9} n^{12+9}$$

$$= m^{14} n^{21}$$

$$65. 172 = 100 + 70 + 2$$

$$= 1 \times 100 + 7 \times 10 + 2 \times 1$$

$$= 1 \times 10^2 + 7 \times 10^1 + 2 \times 10^0$$

$$66. \text{ Given, } 6^{15} = (6^5)^3 \quad 6^{15} = 6^{5^3}$$

$$\text{But, } 6^{15} = 6^{5 \times 3} \quad 6^{15} \neq 6^{125}$$

$$6^{15} = 6^{15}$$

$$6^{15} = (6^5)^3 \text{ is correct.}$$

$$67. (5^5)^2 \quad \text{and} \quad 5^{5^2}$$

$$5^{10} \quad \text{and} \quad 5^{25}$$

On comparing these, 5^{5^2} is bigger.

$$68. 100000 = 10 \times 10 \times 10 \times 10 \times 10$$

$$= 10^5$$

$$69. 8^6 = (8^3)^2 \quad 8^6 = (8^2)^3$$

$$70. (i) 65950$$

$$= 6.595 \times 10^4$$

$$(ii) 3435000$$

$$= 3.435 \times 10^6$$

$$71. x \times 10^y \quad 1 \leq x < 10, \text{ Here } y \text{ is an integer}$$

$$72. 2^8, 8^2$$

Here 8^2 is written as $(2^3)^2 = 2^6$

Therefore, 2^8 is bigger than 8^2 .

$$73. 12^2 = 144 \text{ then}$$

$$(1.2)^2 = 1.44$$

$$(0.12)^2 = 0.0144$$

$$74. \text{Number of sheeps} = 10^9$$

$$\text{Number of Goats} = 10^9$$

$$\text{Total} = 10^9 + 10^9$$

$$= 2 \times 10^9$$

IV. Three marks questions:

$$75. \frac{3^5 \times 2^2 \times 7^{-3}}{7^{-2} \times 3^{-3} \times 2^4}$$

$$= \frac{3^{5+3}}{7^{-2+3} \times 2^{4-2}}$$

$$= \frac{3^8}{7 \times 2^2}$$

$$76. \frac{15^4 \times 14^2}{21^3 \times 10^3}$$

$$= \frac{(5 \times 3)^4 \times (7 \times 2)^2}{(7 \times 3)^3 \times (5 \times 2)^3}$$

$$= \frac{5^4 \times 3^4 \times 7^2 \times 2^2}{7^3 \times 3^3 \times 5^3 \times 2^3}$$

$$= \frac{5 \times 3}{7 \times 2} = \frac{15}{14}$$

$$77. 3^m \times 3^2 = 3^5$$

$$3^{m+2} = 3^5$$

$$\therefore m + 2 = 5 \quad m = 5 - 2, \quad m = 3$$

$$78. 32^{-5}$$

$$= (2^5)^{-5} = 2^{-25} = \frac{1}{2^{25}}$$

$$79. \quad \text{Number of pockets} = 8.5 \times 10^9$$

$$0 - 9 \text{ ten digits total combination is } 10^{10}$$

$$= 10^{10} > 8.5 \times 10^9$$

$$\therefore \text{Code must consist 10 digits.}$$

$$80. 14^2 = 196$$

$$\text{i) } (1.4)^2 = 1.96$$

$$\text{ii) } (0.14)^2 = 0.0196$$

$$\text{iii) } (140)^2 = 19600$$

$$81. 0 - 9 \longrightarrow 10 \text{ options}$$

$$A - Z \longrightarrow 26 \text{ options}$$

$$\text{Total choice per position is } 10 + 26 = 36$$

$$\text{Pass code length is 5}$$

$$\therefore \text{Total possible code} = 36 \times 36 \times 36 \times 36 \times 36 \\ = 36^5$$

$$82. \text{ The estimated number of trees} = (3 \times 10^{12})$$

$$\text{The number of leaves in each tree is} = 10^5$$

$$\text{Total number of leaves in the world is} = 3 \times 10^{12} \times 10^5 \\ = 30 \times 10^{16}$$

$$83. \text{ a) } 5672 = 5000 + 600 + 70 + 2$$

$$= 5 \times 1000 + 6 \times 100 + 7 \times 10 + 2 \times 1$$

$$= 5 \times 10^3 + 6 \times 10^2 + 7 \times 10^1 + 2 \times 10^0$$

$$\text{b) } 465.943 = 400 + 60 + 5 + \frac{9}{10} + \frac{4}{100} + \frac{3}{1000}$$

$$= 4 \times 10^2 + 6 \times 10^1 + 5 \times 10^0 + 9 \times 10^{-1} + 4 \times 10^{-2} + 3 \times 10^{-3}$$

84. i) $9^{14} = (9^2)^7$

ii) $9^{14} = (9^7)^2$ iii) $(3^2)^{14}$

85. $64^3 = (2^6)^3$, $64^3 = (2^3)^6$, $64^3 = (8^2)^3$, $64^3 = (4^3)^3$

86. In scientific notation of scientific form, we write numbers as $x \times 10^y$, where $1 \leq x < 10$ is the coefficient and y, the exponent, is an interger.

$$450000 = 4.5 \times 10^5$$

87. Initial number = 8

Growth rate = 2 times

Time = 3 hours

$$8 \times 2^3$$

$$= 64$$

After 3 hours the number of bacteria will be 64.

88. 100 Million = 100×1000000

$$= 100000000$$

$$= 10^8$$

number of bee's in one hive = $50000 = 5 \times 10^4$

total number of bee's = $5 \times 10^4 \times 10^8$

$$= 5 \times 10^{12}$$

89. Size of Red Blood Cell: $0.000007m = 7 \times 10^{-6}m$

size of Plant cell: $0.00001275m = 1.275 \times 10^{-5}m$

$1.275 \times 10^{-5}m$ is bigger than $7 \times 10^{-6}m$.

$$0.00001275 - 0.000007 = 0.00000575m$$

$$= 5.75 \times 10^{-6}m$$

size of Plant cell is $5.75 \times 10^{-6}m$ times greater than size of the blood cell.

90. Sun's diameter = 1.47×10^9m

Earth's Diameter = 1.2757×10^4km

$$= 1.275 \times 10^4 \times 10^3m$$

$$= 1.275 \times 10^7m$$

$$\frac{\text{Sun diameter}}{\text{Earth Diameter}} = \frac{1.4 \times 10^9}{1.275 \times 10^7}$$

$$= \frac{1.4}{1.275} \times 10^2$$

$$= 1.098 \times 100$$

$$= 109.8$$

Sun's diameter is 110 times bigger than Earth's diameter.

$$91. i) \frac{(3^2)^4}{3^5}$$

$$= \frac{3^8}{3^5}$$

$$= 3^{8-5}$$

$$= 3^3$$

$$ii) \frac{(2^3)^4 \times 2^{-2}}{2^6}$$

$$= \frac{2^{12} \times 2^{-2}}{2^6}$$

$$= \frac{2^{12-2}}{2^6}$$

$$= \frac{2^{10}}{2^6}$$

$$= 2^{10-6} = 2^4 = 16$$

92. The distance between Earth and Moon is 3,84,400 km

Thickness of paper = 0.001 cm

$$1 \text{ km} = 100000 \text{ cm} = 10^5 \text{ cm}$$

$$\therefore 3,84,400 \text{ km} = 3,84,400 \times 10^5 \text{ cm}$$

$$\text{Number of papers required} = \frac{384400 \times 10^5}{0.001} = 384400 \times 10^8$$

$$= 3844 \times 10^{10}$$

$$93. \frac{\text{Number of ants estimated}}{\text{Human Population}} = \frac{2 \times 10^{16}}{8 \times 10^9}$$

$$= \frac{1}{4} \times 10^{16-9}$$

$$= \frac{1}{4} \times 10^7$$

$$= \frac{1}{4} \times 10000000$$

$$= 2500000$$

94. Distance between earth and sun = $1.497 \times 10^8 \text{ km}$

Speed of Light = $3 \times 10^5 \text{ km/s}$

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time}}$$

$$\text{Or time} = \frac{\text{distance travelled}}{\text{speed}}$$

$$\begin{aligned}\text{time} &= \frac{1.497 \times 10^8}{3 \times 10^5} \\ &= \frac{1.497}{3} \times 10^3\end{aligned}$$

$$\text{time} = 0.499 \times 1000$$

$$\text{time} = 499\text{s}$$

95. Counting speed is 1 star per second

Expressing seconds in a year in scientific notation:

$$\begin{aligned}1 \text{ year} &= 365 \times 24 \times 60 \times 60 \text{ s} \\ &= 3.15 \times 10^7 \text{ s}\end{aligned}$$

$$\therefore \text{Number of stars counted in 1 year} = 3.15 \times 10^7$$

96.

$$\text{i) } 1296 \times 36$$

$$= 6^4 \times 6^2$$

$$= 6^{4+2}$$

$$= 6^6$$

$$= 46656$$

$$\text{ii) } \frac{7776}{216}$$

$$= \frac{6^5}{6^3}$$

$$= 6^{5-3}$$

$$= 6^2$$

$$= 36$$

$$\text{iii) } 46656 \times \frac{1}{216}$$

$$= \frac{6^6}{6^3}$$

$$= 6^{6-3}$$

$$= 6^3$$

$$= 216$$

$$\text{iv) } \frac{1}{6^2} \times \frac{1}{6^3}$$

$$= \frac{1}{6^{2+3}}$$

$$= \frac{1}{6^5}$$

$$= \frac{1}{7776}$$

CHAPTER-3 A STORY OF NUMBERS

KEY ANSWERS

I.

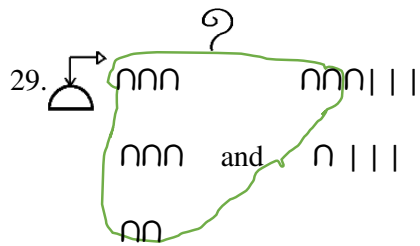
1. A) Al-Khwarizmi
2. C) Seashell
3. A) Brahmasphuti Sidhantha
4. D) 
5. A) Aryabhata
6. C) 50
7. B) Time and Angles
8. C) 10^7
9. B) 2
10. C) India
11. B) 6
12. B) 1000

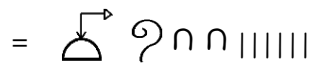
II. One mark Questions

13. The standard sequence of objects, names written symbols, in a fixed order is called Number System
14. Al-Khwarizmi
15. Bakshali manuscript
16. Fibonacci
17. Tally marks
18. Republic of Congo
19. South Africa
20. $\bigcirc \times \cap = \bigtriangleup \rightarrow$
21. The symbols occurring in a written number system are called numerals.
22. In the Roman Number system to represent bigger numbers, they used alphabets called landmark numbers.
23. Sexagesimal system
24. CCCII
25. Zongs and Hengs

III. Two marks Questions

26. i) D = 500 ii) M = 1000 iii) C = 100 iv) L = 50
27. 2367
MMCCCLXVII
28. CCXXXII + CCCXIII
(CCCCC) (XXXX) (IIII)
= DXLV

29. 

= 

30. 3743

= MMMDCCXLIII

31. 1222

= MCCXXII

2999

= MMDCDXCIX

32. i) 200

= 

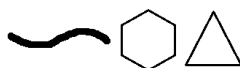
ii) 60 = 

IV. Three marks Questions

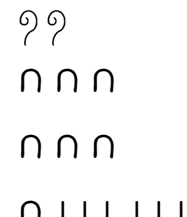
s

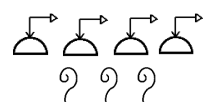
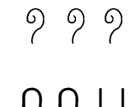
33. i) 15 = 

ii) 147 = 

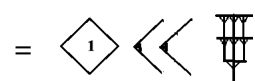
iii) 651 = 

34.

(i) 
= 276

ii) 

= 4322

35. i) 77

= 

ii) 361 = 

iii) 7210 = 

CHAPTER-4 QUADRILATERAL

KEY ANSWERS

I.

1. (B) 180°
2. (C) 360°
3. (B) 2
4. (B) Equal
5. (C) Square
6. (D) 360°
7. (A) 90°
8. (B) Diagonals bisect each other at right angles
9. (D) Rectangle
10. (B) 90°
11. (C) Trapezium
12. (B) Diagonals bisect each other.

II. One mark questions:

13. The adjacent angles of a parallelogram are supplementary. That means their sum is 180° .
14. The diagonals are equal to each other. The diagonals bisect each other.
15. If the lengths of the non-parallel sides of a trapezium are equal to each other, then it is called an isosceles trapezium.
16. Diagonals AC and BD. $\angle DCA = \angle BAC = 50^\circ$ (Alternate angles)
17. The sum of the interior angles of a quadrilateral is equal to 360°
The measure of the fourth angle $= 360^\circ - (55^\circ + 115^\circ + 70^\circ) = 360^\circ - 240^\circ = 120^\circ$
18. The adjacent angles of a parallelogram are supplementary.

$$\angle P + \angle Q = 180^\circ$$

$$110^\circ + \angle Q = 180^\circ$$

$$\angle Q = 180^\circ - 110^\circ = 70^\circ$$

III. Two Marks Questions:

19. i) Opposite Sides: AB and DC
ii) Opposite Angles: $\angle A$ and $\angle C$
iii) Adjacent Sides: AB and BC
iv) Adjacent Angles: $\angle A$ and $\angle B$

20. i) All four sides of a rhombus are equal to each other.
 ii) The diagonals of a rhombus bisect each other at right angles.
21. i) The lengths of all four sides of a square are equal to each other.
 ii) Each interior angle of a square is a right angle.

22. The opposite angles of a parallelogram are equal. $\angle C = \angle A = 60^\circ$

The sum of the adjacent angles of a parallelogram is 180°

$$\angle A + \angle B = 180^\circ$$

$$60^\circ + \angle B = 180^\circ$$

$$\angle B = 180^\circ - 60^\circ = 120^\circ$$

$$\angle D = \angle B = 120^\circ \text{ (Opposite angles are equal)}$$

The measures of the remaining three angles are 120° , 60° , 120° .

23. Given the ratio of the adjacent angles is 2:3, let us take these angles as $2x$ and $3x$.

The sum of the adjacent angles of a parallelogram is 180°

$$2x + 3x = 180^\circ$$

$$5x = 180^\circ$$

$$x = \frac{180^\circ}{5} = 36^\circ$$

$$\text{First angle} = 2x = 2 \times 36^\circ = 72^\circ$$

$$\text{Second angle} = 3x = 3 \times 36^\circ = 108^\circ$$

Since the opposite angles of a parallelogram are equal, the remaining two angles are also 72° and 108° respectively.

24. Given $\angle A = 75^\circ$ Opposite angles are equal $\angle C = \angle A = 75^\circ$

The sum of the adjacent angles of a parallelogram is 180°

$$\angle A + \angle B = 180^\circ$$

$$75^\circ + \angle B = 180^\circ$$

$$\angle B = 180^\circ - 75^\circ = 105^\circ$$

$$\angle D = \angle B = 105^\circ \text{ (Opposite angles are equal)}$$

The measures of remaining angles are: $\angle B = 105^\circ$, $\angle C = 75^\circ$ and $\angle D = 105^\circ$

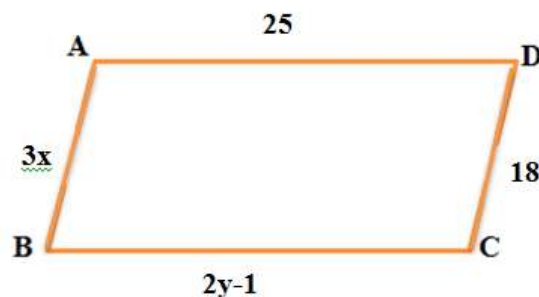
25. In a parallelogram opposite sides are equal.

$$AB = CD$$

$$3x = 18$$

$$x = \frac{18}{3} = 6$$

$$BC = AD$$



$$2y - 1 = 25$$

$$2y = 25 + 1$$

$$2y = 26$$

$$y = \frac{26}{2} = 13$$

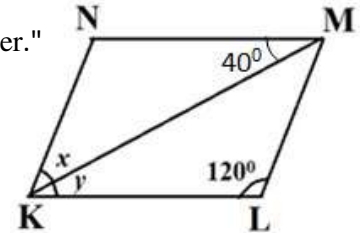
$$x = 6 \text{ and } y = 13$$

26. If the lines are parallel lines, alternate angles are equal to each other."

$$\angle NMK = \angle MKL$$

$$40^\circ = y$$

$$y = 40^\circ$$



"According to the properties of a parallelogram, the sum of adjacent angles is 180° . Here, angle K and angle L are adjacent angles."

$$\angle K + \angle L = 180^\circ$$

$$x + 40^\circ + 120^\circ = 180^\circ$$

$$x = 180^\circ - 160^\circ$$

$$x = 20^\circ$$

27. In the fig, $\angle SPN = \angle PNA$ (alternate interior angles are equal.)

$$\angle SPN = \angle PNA = 50^\circ$$

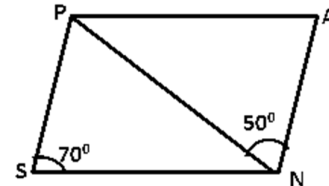
In triangle SNP, the sum of three interior angles is 180°

$$\angle SNP + \angle SPN + \angle PSN = 180^\circ$$

$$\angle SNP + 50^\circ + 70^\circ = 180^\circ$$

$$\angle SNP = 180^\circ - 120^\circ$$

$$\angle SNP = 60^\circ$$



28. 1. Draw the first diagonal:

Draw a straight line and mark a line segment AC of length 6 cm on it. This will be your first diagonal.

2. Mark the midpoint:

Find and mark the midpoint O of the line segment AC by constructing its perpendicular bisector or by measuring with a ruler $AO = OC = 3\text{ cm}$.

3. Construct a 60-degree angle:

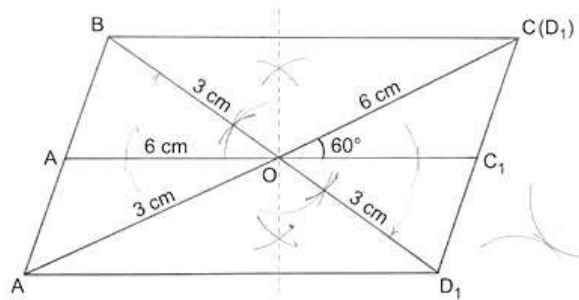
Using a protractor, draw a straight line (XY) passing through the midpoint 'O' such that it makes an angle of 60° with the line AC.

4. Cut the second diagonal:

Since the length of the second diagonal must also be 6 cm, take a radius of 3 cm using a compass. With 'O' as the center, cut arcs on both sides of the line XY. Name these points as B and D (OB = OD = 3cm).

5. Join the points:

Now, join the points AB, BC, CD, and DA sequentially using a ruler.



29. Steps of Construction

1. Construct the base:

Using a ruler, draw a straight line AB of length 5 cm. This will be the base of the parallelogram.

2. Mark the angle:

Place the protractor on point A, mark an angle of 50° , and draw a line extending in that direction.

3. Cut the adjacent side:

Take a radius of 4 cm using a compass. With point A as the center, draw and cut an arc on the 50° line. Name this intersection point D.

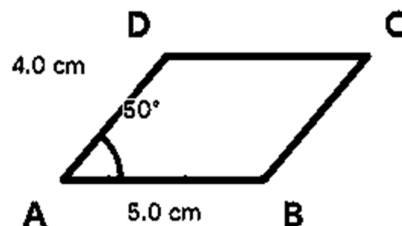
4 Locate the remaining points:

Since the opposite sides of a parallelogram are equal:

From point D, draw an arc with a radius of 5 cm. From point B, draw another arc with a radius of 4 cm such that it intersects the first arc. Name this intersection point C.

5. Complete the parallelogram:

Join the lines from point B to C and from point D to C. Now, ABCD is the required parallelogram.



30. "The sum of interior angles on the same side of the transversal between parallel lines is 180° ."

$$\angle A + \angle D = 180^\circ$$

$$100^{\circ} + \angle D = 180^{\circ}$$

$$\angle D = 180^{\circ} - 100^{\circ}$$

$$\angle D = 80^{\circ}$$

$$\angle B + \angle C = 180^{\circ}$$

$$120^{\circ} + \angle C = 180^{\circ}$$

$$\angle C = 180^{\circ} - 120^{\circ}$$

$$\angle C = 60^{\circ}$$

31. "According to the properties of a parallelogram, the diagonals bisect each other"

Therefore $AO=OC$ and $BO=OD$

i) Finding the value of y

$$OC= AO$$

$$6y-1=5y+1$$

$$6y-5y=1+1$$

$$y=2$$

ii) Finding the value of x

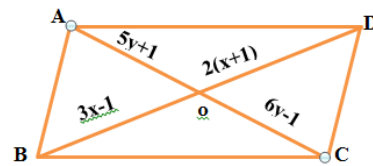
$$BO=OD$$

$$3x-1=2(x+1)$$

$$3x-1=2x+2$$

$$3x-2x=2+1$$

$$x=3$$



IV. Three Marks Questions:

32. Let the angles of a quadrilateral are x, 2x, 3x and 4x

The sum of the interior angles of a quadrilateral is 360°

$$x + 2x + 3x + 4x = 360^{\circ}$$

$$10x = 360^{\circ}$$

$$x = \frac{360^{\circ}}{10}$$

$$x=36^{\circ}$$

$$\text{First angle} = 1x = 1 \times 36^{\circ} = 36^{\circ}$$

$$\text{Second angle} = 2x = 2 \times 36^{\circ} = 72^{\circ}$$

$$\text{Third angle} = 3x = 3 \times 36^{\circ} = 108^{\circ}$$

$$\text{Fourth angle} = 4x = 4 \times 36^\circ = 144^\circ$$

33. The sum of the interior angles of a quadrilateral is 360°

The sum of the four angles is

$$(x + 10) + (2x - 20) + (3x - 30) + (x + 50) = 360^\circ$$

$$(x + 2x + 3x + x) + (10 - 20 - 30 + 50) = 360^\circ$$

$$7x + 10 = 360^\circ$$

$$7x = 360^\circ - 10^\circ$$

$$7x = 350^\circ$$

$$x = \frac{350^\circ}{7}$$

$$x = 50^\circ$$

$$\text{First angle} = (x + 10)^\circ = (50 + 10)^\circ = 60^\circ$$

$$\text{Second angle} = (2x - 20)^\circ = (2 \times 50 - 20)^\circ = (100 - 20)^\circ = 80^\circ$$

$$\text{Third angle} = (3x - 30)^\circ = (3 \times 50 - 30)^\circ = (150 - 30)^\circ = 120^\circ$$

$$\text{Fourth angle} = (x + 50)^\circ = (50 + 50)^\circ = 100^\circ$$

34. The adjacent angles of a parallelogram are $(3x + 4)^\circ$ and $(3x - 10)^\circ$

The sum of the adjacent angles of a parallelogram is 180°

$$(3x + 4)^\circ + (3x - 10)^\circ = 180^\circ$$

$$6x - 6 = 180^\circ$$

$$6x = 180^\circ + 6$$

$$6x = 186^\circ$$

$$x = \frac{186}{6} = 31^\circ$$

$$(3x + 4) = 3(31) + 4 = 93 + 4 = 97^\circ$$

$$(3x - 10) = 3(31) - 10 = 93 - 10 = 83^\circ$$

35. The three angles of a quadrilateral is $4x$, $6x$ and $3x$

The sum of the interior angles of a quadrilateral is 360°

$$4x + 6x + 3x + 100 = 360^\circ$$

$$4x + 6x + 3x = 360^\circ - 100^\circ$$

$$13x = 260^\circ$$

$$x = \frac{260}{13}$$

$$x = 20^\circ$$

$$\text{First angle} = 4x = 4(20) = 80^\circ$$

$$\text{Second angle} = 6x = 6(20) = 120^\circ$$

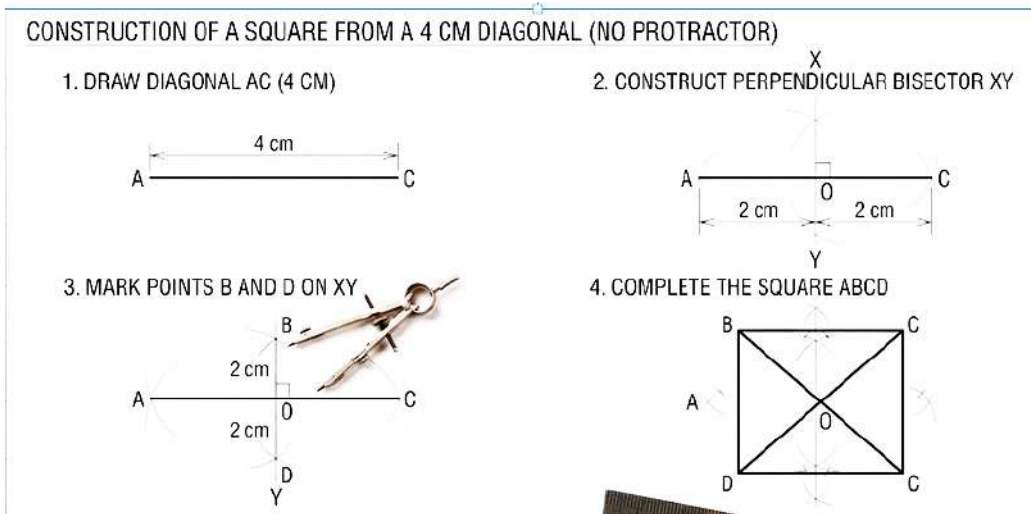
$$\text{Third angle} = 3x = 3(20) = 60^\circ$$

36. Drawing the line segment 4 cm diagonal AC.

Using a compass to create the perpendicular bisector line XY.

Measuring 2 cm from the center O along XY to find points B and D.

Connecting the points to form the completed square ABCD.



37. ABCD is a rectangle, and its diagonals AC and BD intersect each other at point O.

According to the properties of a rectangle, the diagonals are equal to each other and bisect each other. That is, $OA=OB=OC=OD$

Finding the value of x

In $\triangle OAB$, since $OA=OB$, it is an isosceles triangle.

Therefore, its base angles are equal: $\angle OBA = \angle OAB = 35^\circ$

Each angle of a rectangle is equal to 90° .

$$\angle ABC = 90^\circ$$

$$\angle OBC + \angle OBA = 90^\circ$$

$$x^\circ + 35^\circ = 90^\circ$$

$$x^\circ = 90^\circ - 35^\circ$$

$$x = 55^\circ$$

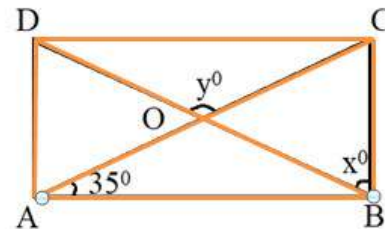
Finding the value of y:

In $\triangle OAB$ sum of the interior angle is 180°

$$\angle AOB + \angle OAB + \angle OBA = 180^\circ$$

$$\angle AOB + 35^\circ + 35^\circ = 180^\circ$$

$$\angle AOB + 70^\circ = 180^\circ$$

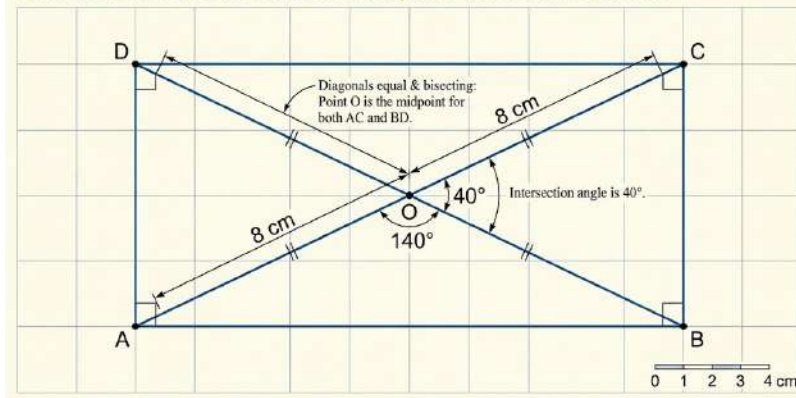


$$\angle AOB = 180^\circ - 70^\circ = 110^\circ$$

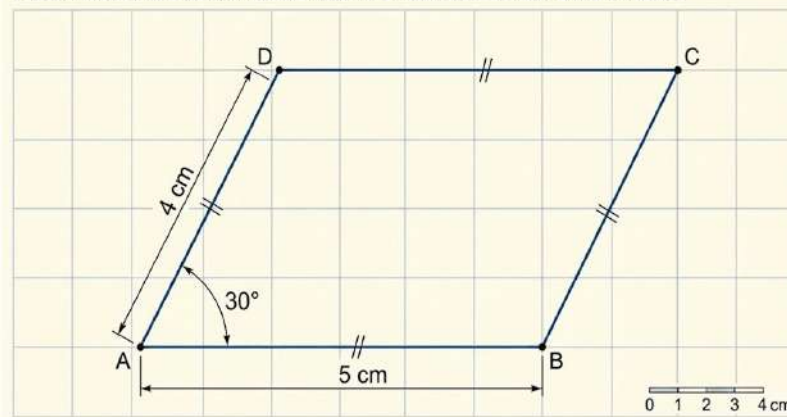
$\angle DOC$ (y°) and $\angle AOB$ are vertically opposite angles, and they are equal

$$y^\circ = \angle AOB \quad y = 110^\circ$$

38. GEOMETRIC CONSTRUCTION: QUADRILATERAL ABCD



39. GEOMETRIC CONSTRUCTION: PARALLELOGRAM ABCD



40. $\angle IOE = \angle AEO = 20^\circ$

$\angle OIE = \angle OAE$ Opposite angles are equal

$$\angle AOE = \angle AEO = 20^\circ$$

$$\angle A = \angle I = 180^\circ - (20^\circ + 20^\circ) = 140^\circ$$

$$\angle IOE = \angle IEO = 20^\circ$$

$$\text{Total Angle } O = \angle IEA = 40^\circ$$

41. Step-by-Step Construction Method

Step 1: Draw the primary diagonal $AC = 5$ cm horizontally using a ruler.

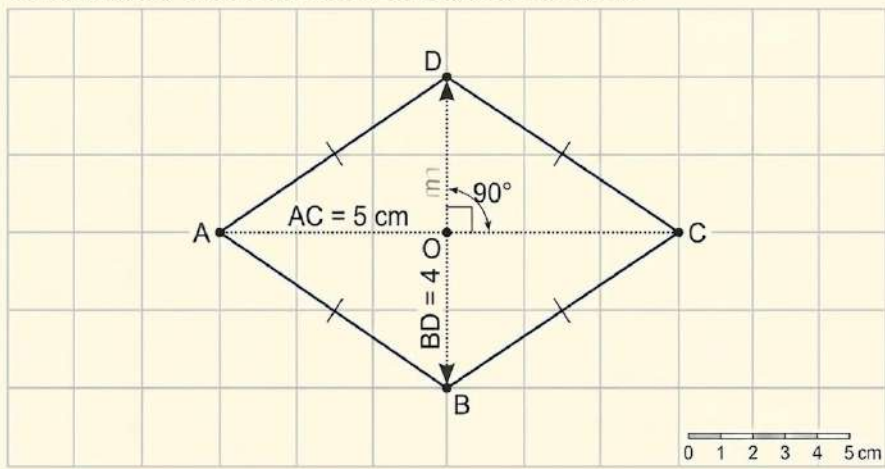
Step 2: Locate the exact midpoint O of segment AC at 2.5 cm.

Step 3: Construct a perpendicular line passing through midpoint O (90° to AC).

Step 4: From point O , measure 2 cm directly upwards along the perpendicular line to locate vertex D , and 2 cm directly downwards to locate vertex B (giving $BD = 4$ cm.)

Step 5: Connect points A to B to C to D to A with straight lines to form the rhombus $ABCD$

GEOMETRIC CONSTRUCTION: RHOMBUS ABCD



V. Four Marks Questions:

42. PAIR and RODS are two rectangles and each interior angle is equal to 90°

1. Finding the value of $\angle IRS$

In Rectangle PAIR, $\angle PRI = 90^\circ$

In Rectangle RODS, $\angle SRO = 90^\circ$

According to the diagram $\angle ORI = 30^\circ$

When we observe $\angle SRO$

$\angle SRO = \angle SRI + \angle ORI$

$90^\circ = \angle SRI + 30^\circ$

$\angle SRI = 90^\circ - 30^\circ = 60^\circ$

2. Finding the value of $\angle IOD$

In Rectangle PAIR, $\angle RIA = 90^\circ$

Therefore on a straight line AI the $\angle RIO = 90^\circ$

In Right angled triangle RIO sum of the interior angle is 180°

$\angle ROI + \angle RIO + \angle ORI = 180^\circ$

$\angle ROI + 90^\circ + 30^\circ = 180^\circ$

$\angle ROI + 120^\circ = 180^\circ$

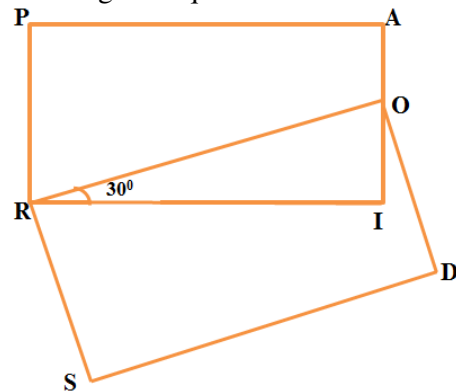
$\angle ROI = 180^\circ - 120^\circ = 60^\circ$

In Rectangle RODS, $\angle ROD = 90^\circ$

According to the diagram, $\angle ROD = \angle ROI + \angle IOD$

$90^\circ = 60^\circ + \angle IOD$

$\angle IOD = 90^\circ - 60^\circ$ $\angle IOD = 30^\circ$



43. Data: ABCD is a parallelogram. The diagonals AC and BD intersect each other at point O. $AD \parallel BC$, $AB \parallel DC$
To Prove: $OA = OC$ and $OB = OD$

Proof: In $\triangle AOB$ and $\triangle COD$:

$$\angle OAB = \angle OCD \quad (\text{alternate interior angles})$$

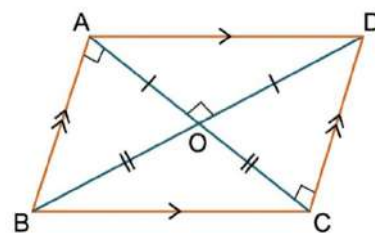
$$AB = CD \quad (\text{Opposite sides})$$

$$\angle OBA = \angle ODC \quad (\text{alternate interior angles})$$

$$\triangle AOB \cong \triangle COD \quad (\text{ASA congruence criterion})$$

$$OA = OC \quad \text{and} \quad OB = OD \quad (\text{CPCT})$$

Hence, it is proved that the diagonals of a parallelogram bisect each other.



44. Data: ABCD is a quadrilateral. AC is one of its diagonals.

$$\text{To Prove:- } \angle A + \angle B + \angle C + \angle D = 360^\circ$$

Proof:- In $\triangle ABC$:

$$\angle CAB + \angle B + \angle BCA = 180^\circ \text{--- (Equation 1)}$$

In $\triangle ADC$:

$$\angle CAD + \angle D + \angle ACD = 180^\circ \text{--- (Equation 2)}$$

Now, adding both sides of Equation (1) and Equation (2) together:

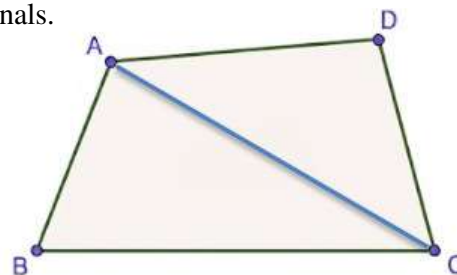
$$(\angle CAB + \angle B + \angle BCA) + (\angle CAD + \angle D + \angle ACD) = 180^\circ + 180^\circ$$

Grouping the adjacent angles appropriately:

$$(\angle CAB + \angle CAD) + \angle B + (\angle BCA + \angle ACD) + \angle D = 360^\circ$$

$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$

Hence, it is proved that the sum of all four interior angles of a quadrilateral is 360°



45. Data: ABCD is a rhombus. Diagonals AC and BD intersect at O.

To Prove: The diagonals bisect each other, which means:

$$OA = OC, \quad OB = OD$$

Proof: In $\triangle AOB$ and $\triangle COD$

$$\angle OAB = \angle OCD \quad (\text{alternate angles})$$

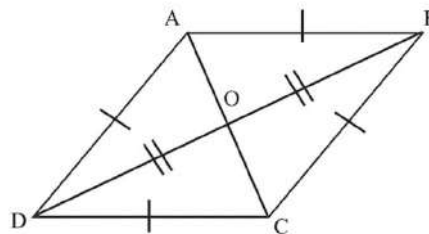
$$AB = CD \quad (\text{sides of a rhombus})$$

$$\angle OBA = \angle ODC \quad (\text{alternate angles})$$

$$\triangle AOB \cong \triangle COD \quad (\text{ASA congruence criterion})$$

$$OA = OC, \quad OB = OD \quad (\text{CPCT})$$

Hence, it is proved that the diagonals of a rhombus bisect each other at point O.



46. Rectangle (i) — ABCD

$$\angle CAB = 30^\circ$$

Since $OA = OB$,

$\triangle OAB$ is isosceles

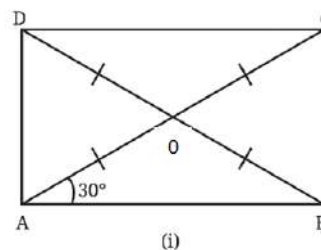
$$\angle OBA = \angle OAB = 30^\circ$$

$$\angle DAO = 90^\circ - 30^\circ = 60^\circ$$

$$\angle CBO = 90^\circ - 30^\circ = 60^\circ$$

$$\angle ACD = \angle CAB = 30^\circ \text{ and } \angle BDC = \angle ABD = 30^\circ$$

$$\angle ADO = 60^\circ \text{ and } \angle BCO = 60^\circ$$



Intersection Angles at O

$$\angle AOB = 180^\circ - (30^\circ + 30^\circ) = 120^\circ$$

$$\angle COD = \angle AOB = 120^\circ \text{ (vertically opposite)}$$

$$\angle AOD = 180^\circ - 120^\circ = 60^\circ \text{ (linear pair)}$$

$$\angle BOC = \angle AOD = 60^\circ \text{ (vertically opposite)}$$

Rectangle (ii) — PQRS

$$\text{Given: } \angle QOR = 110^\circ$$

Intersection Angles at O:

$$\angle POS = \angle QOR = 110^\circ \text{ (vertically opposite)}$$

$$\angle POQ = 180^\circ - 110^\circ = 70^\circ \text{ (linear pair)}$$

$$\angle ROS = \angle POQ = 70^\circ \text{ (vertically opposite)}$$

Base Angles of Triangles:

In isosceles $\triangle QOR$ ($OQ = OR$)

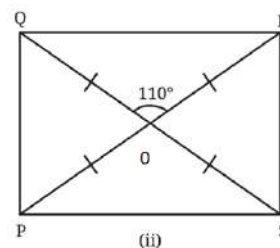
$$\angle OQR = \angle ORQ = \frac{1}{2}(180^\circ - 110^\circ) = 35^\circ$$

In isosceles triangle POQ ($OP = OQ$)

$$\angle OPQ = \angle OQP = \frac{1}{2}(180^\circ - 70^\circ) = 55^\circ$$

$$\angle OPS = \angle OSR = 35^\circ$$

$$\angle OSP = \angle ORS = 55^\circ$$



CHAPTER : 5 NUMBER PLAY

KEY ANSWERS

I. Multiple Choice questions:

1. A) 333
2. C) 0
3. D) $5k - 2$
4. C) 5, 0, 2
5. A) 4995
6. C) 3
7. D) 1
8. B) 16, 17, 18
9. C) 55
10. B) 4
11. C) 11
12. B) All numbers divisible by 9 are also divisible by 3.
13. C) 7
14. C) 5
15. A) $P = 9, Q = 2$

II. One mark Questions:

16. 1, 2, 3, 4, 6, 8, 12, 24
17. $(-3) + (-2) + (-1) + 0 + 1 + 2 + 3 = 0$
18. Odd numbers
19. $H = 3, B = 7, P = 9$
20. 3
21. 12
22. Yes, this is divisible by 3.
Sum of the digits $= 2+5+6+3+2+4 = 27$
Since 27 is divisible by 3 $\therefore 2563254$ is divisible by 3
23. 2
24. $n(n + 1)$
25. $\frac{24}{3} = 8$

26. $B = 3$

27. Shortcut rule: If the last three digits of the given number are completely divisible by 8 or if the last three digits are zeros, then the entire number is divisible by 8.

28. $X + Y = 7 + 3 = 10$

29. $A = 1$

30. $1000d + 100c + 10b + a$

31. $12 + 13 + 14 + 15 = 54$

III. Two mark questions:

32. 12 is an even number and it is divisible by 3 $\left(\frac{12}{3} = 4\right)$.

According to the rule, it is also divisible by 6 $\left(\frac{12}{6} = 2\right)$.

33. Sum of digits at odd places: $2 + 8 = 10$

Sum of digits at even places: $5 + 6 = 11$

Difference: $11 - 10 = 1$

Since the difference is 1, the number 2586 is not divisible by 11.

Remainder: 1

34. Example: Let $m = 3$, $q = 5$

Algebraic Expression = $4m + 2q$

$$= 4(3) + 2(5)$$

$$= 12 + 10 = 22$$

22 (Even Number)

35. First number: $(5p - 2)$

Second number: $(5p - 1)$

Middle number: $5p$

Fourth number: $(5p + 1)$

Fifth number: $(5p + 2)$

When $p = 2$: $5p - 2 = 8$, $5p - 1 = 9$, $5p = 10$, $5p + 1 = 11$, $5p + 2 = 12$

36. $2 + 3 + 5 + 6 + 7 + 8 + 1 + 4 + 3 = 39$

$$3 + 9 = 12$$

$$1 + 2 = 3$$

The digital root of the number 235678143 is 3.

37. Finding the value of W: When multiplying $W \times 5$, the last digit of the product must return the digit W itself.

For the last digit to remain the same when multiplied by 5, it must be either 5 or 0. Therefore,
 $W = 5$.

Finding the value of M: The equation becomes: $505 \times 5 = \text{MEO}5$.

In the hundreds place, $5 \times 5 = 25$.

Even after adding any carryover from multiplication, the total value exceeds 2500, making the thousands place digit $M = 2$.

Following this logic, $O = 7$ and $E = 8$.

Verification: $575 \times 5 = 2875$

38. First number: x , Second number: $x + 1$

$$x + x + 1 = 73$$

$$\Rightarrow 2x = 72 \Rightarrow x = 36$$

$$x + 1 = 37$$

The numbers are 36 and 37.

39. Square of 11: $11^2 = 121$

$$\text{First number} = \frac{121-1}{2} = 60$$

$$\text{Second number} = \frac{121+1}{2} = 61$$

$$\text{Therefore: } 121 = 60 + 61$$

40. According to the divisibility rule of 9, the sum of the digits must be divisible by 9.

$$\text{Sum of digits: } 2 + 1 + Y + 5 = 8 + Y.$$

For $8 + Y$ to be divisible by 9, the minimum total sum must be 9.

$$8 + Y = 9 \Rightarrow Y = 1.$$

41. According to the divisibility rule of 11: Sum of digits at odd places - Sum of digits at even places must equal 0 or a multiple of 11.

$$\text{Sum of digits at odd places: } (5 + T)$$

$$\text{Sum of digits at even places: } (3 + 4) = 7$$

$$\text{Difference: } (5 + T) - 7 = 0 \Rightarrow T - 2 = 0$$

$$\Rightarrow T = 2.$$

42. According to the divisibility rule of 4, the last two digits (1S) must be divisible by 4.

The least 2 digit number number divisible by 4 is 12.

Therefore, $1S = 12$,

$$S = 2.$$

43. If P is the largest among five consecutive numbers, the other four numbers are
 $(p - 1)$, $(p - 2)$, $(p - 3)$, and $(p - 4)$.
44. Even numbers are 0, 2, 4, 6, 8.
 Among these, $8 + 8 + 2 = 18$.
 Therefore, the smallest multiple of 9 made from even digits is 18.
45. $6000 \div 9 = 666.66\ldots$
 $666 \times 9 = 5994$, $667 \times 9 = 6003$. These are multiples of 9; the multiple closest to and greater than 6000 is 6003.
46. $4400 - 4300 = 100$, and $100 = (9 \times 11) + 1$.
 Therefore, $n = 11$; there are 11 multiples of 9 between 4400 and 4300.
47. For $48a23b$ to be a multiple of 18, it must be divisible by 2 and 9. Sum of digits: $4 + 8 + a + 2 + 3 + b = 17 + a + b$.
 For divisibility by 9: $a + b = 1$. For divisibility by 2, b must be an even digit. Therefore, the possible pair is $(a, b) = (1, 0)$.
48. Middle even number = $5p$.
 The four numbers in the sequence are $5p - 4$, $5p - 2$, $5p + 2$, $5p + 4$.
49. If the 8-digit number N has digital root 5:
 $N + 10$ has digital root $5 + 10 = 15 \rightarrow 1 + 5 = 6$.
 Therefore, the digital root of the larger number is 6.

IV. Three Mark Questions:

50. The digital root of a multiple of 9 is 9.
 The digital root of $9a$ is 9; the digital root of $36b$ is 9.
 Digital root of $13 = 1 + 3 = 4$.
 Digital root of $9a + 36ab + 13 = 9 + 9 + 4 = 22$; then $2 + 2 = 4$.
51. Numbers which leave remainder 2 when divided by 3: $3a + 2$. Numbers which leave remainder 2 when divided by 4: $4b + 2$.
 So the numbers are common multiples of 3 and 4 plus 2.
 $\text{LCM} = 3 \times 4 = 12$.
 Therefore, the expression representing all such numbers is $12c + 2$.
52. Let the first number be x , the second number $x + 1$, and the third number $x + 2$.
 If $x = 2$, the numbers are 2, 3, 4.
 If $x = 14$, the numbers are 14, 15, 16.
 If $x = 26$, the numbers are 26, 27, 28.
 If $x = 38$, the numbers are 38, 39, 40.
 Therefore, the three consecutive numbers are 14, 15, 16.

53. The 6-digit number = 643215.

Sum of digits = $6 + 4 + 3 + 2 + 1 + 5 = 21$. This number is divisible by 3 and 5; therefore, it is also divisible by 15.

When the number is reversed, it becomes 512346.

Sum of digits = $5 + 1 + 2 + 3 + 4 + 6 = 21$.

The digit in the units place is 6, so the number is divisible by 2. Since the digit sum is 21, it is divisible by 3.

Therefore, 512346 is divisible by 6.

54. Given numbers: 2, 3, 4, and 5. There are 3 empty spots between these four numbers to place operators. Each spot has 2 possibilities ("+" or "-").

Therefore, total unique possibilities = $2 \times 2 \times 2 = 8$

1. $2 + 3 + 4 + 5 = 14$

2. $2 + 3 + 4 - 5 = 4$

3. $2 + 3 - 4 + 5 = 6$

4. $2 + 3 - 4 - 5 = -4$

5. $2 - 3 + 4 + 5 = 8$

6. $2 - 3 + 4 - 5 = -2$

7. $2 - 3 - 4 + 5 = 0$

8. $2 - 3 - 4 - 5 = -10$

In all the above scenarios, the resulting sums are even numbers.

55. $9(a + 4b + c)$

Substituting $a = 10$, $b = 11$, $c = 12$:

$$= 9(10 + 44 + 12) = 9 \times 66$$

Since the sum is written in the form of 9×66 , it is a multiple of 9.

Any number that is a multiple of 9 is definitely divisible by 9.

56. The square of any natural odd number is always another odd number.

Examples: $1^2 = 1$, $3^2 = 9$, $5^2 = 25$

Substituting values:

When $x = 1$, $x^2 + 4 = 1^2 + 4 = 5$

When $x = 3$, $x^2 + 4 = 3^2 + 4 = 13$

When $x = 5$, $x^2 + 4 = 5^2 + 4 = 29$

When x is an odd number, the value of $x^2 + 4$ never yields an even number.

57. Write the number 10 close to a multiple of 3:

$$10 = 9 + 1 = (3 \times 3) + 1$$

$$10^2 = 99 + 1 = (3 \times 33) + 1$$

$$10^3 = 999 + 1 = (3 \times 333) + 1$$

$$10^4 = 9999 + 1 = (3 \times 3333) + 1$$

$$\text{Similarly, } 10^0 = 999999999 + 1 = (3 \times 333333333) + 1$$

Therefore, the remainder when 10^{10} is divided by 3 is 1.

58. Three consecutive natural numbers: x , $(x + 1)$, $(x + 2)$

$$x + (x + 1) + (x + 2) = 114$$

$$3x + 3 = 114$$

$$3x = 111$$

$$x = 37$$

$$\text{First number} = x = 37$$

$$\text{Second number} = (x + 1) = 38$$

$$\text{Third number} = (x + 2) = 39$$

$$\text{Square of the largest number: } 39^2 = 1521$$

59. Using the divisibility rule of 9: Sum of digits = $2 + 1 + 4 + K + 3 + 5$

$$\text{Total sum} = 15 + K$$

$$15 + K = 18$$

$$K = 3$$

New number when $K = 3$ is 214335.

Checking divisibility of 3: Any number divisible by 9 is definitely divisible by 3.

The sum of digits is 18, which is divisible by 3 ($\frac{18}{3} = 6$).

V. Four Marks Questions:

60. . i) $4779 + 661$

$$\text{Remainders: } 5 + 3 = 8$$

$$8 \div 7 \text{ gives remainder } 1$$

ii) $4779 - 661$

$$\text{Remainders: } 5 - 3 = 2.$$

iii) Algebraic expression

$$661 \rightarrow 7x + 3$$

$$4779 \rightarrow 7y + 5$$

61. Two multiples of 3: $3a$ and $3b$.

$$\text{Their sum: } 3a + 3b = 3(a + b).$$

For it to be a multiple of 9, the sum $(a + b)$ must be a multiple of 3. $a + b = 3k$; $3(3k) = 9k$, which is a multiple of 9.

Possible cases:

1. When the sum is a multiple of 9, the sum of the remainders obtained by dividing the two numbers by 3 should be 3, 6, 9, 12, ...
2. When the sum is not a multiple of 9: if the remainders of both numbers are 3 and 6, one is a multiple of 9 and the other is not a multiple of 9.

Generalization: The sum of two multiples of 3 is a multiple of 9 only when the sum of their corresponding quotients/factors $(m + 1)$ is divisible by 3.

62. The largest single-digit even number is 8, so $Y = 8$.

Now the number becomes $3X458$.

Finding the value of X :

For a number to be divisible by 6, it must be divisible by both 2 and 3.

Since the number ends in 8, it is divisible by 2.

To be divisible by 3, the sum of all digits must be a multiple of 3.

Sum of digits $= 3 + X + 4 + 5 + 8 = 20 + X$.

Numbers greater than 20 that are divisible by 3: 21, 24, 27, etc.

$$20 + X = 21 \Rightarrow X = 1$$

$$20 + X = 24 \Rightarrow X = 4$$

$$20 + X = 27 \Rightarrow X = 7$$

$Y = 8$ and $X = 1$ or 4 or 7 .

63. Value of "M": When adding two 4-digit numbers, the maximum carryover to the fifth column can only be 1. Therefore, the first letter of the fifth line must be $M = 1$.

Value of "O": Since $M = 1$, the value of "O" must be 0 or 1. Because $M = 1$ is already taken, $O = 0$.

Value of "S": For $S + 1 = 10$ to occur in the thousands column, $S = 9$.

Values of "E" and "N": In the hundreds column: $E + 0 = N$.

For this to be possible, a carryover of 1 must come from the tens column.

Hence, $E + 1 = N$.

Arranging remaining digits: The unused digits are: 2, 3, 4, 5, 6, 7, 8.

In the tens column: $N + R = E$.

Since $N = E + 1$, then

$(E + 1) + R = 10 + E \Rightarrow R = 9$. But $S = 9$ is already used. With a carryover of 1 from the units column: $(E + 1) + R + 1 = 10 + E \Rightarrow R = 8$.

Values of D and Y: In the units column: $D + E = Y$.

If we take $E = 5$, then $N = 5 + 1 = 6$.

Then $D + 5 = 10 + Y \Rightarrow D - Y = 5$.

Among the remaining digits (7, 4, 3, 2), the difference between 7 and 2 is 5.

Therefore, $D = 7$ and $Y = 2$.

$$\begin{array}{r} 9\ 5\ 6\ 7 \\ +\ 1\ 0\ 8\ 5 \\ \hline 1\ 0\ 6\ 5\ 2 \end{array}$$

VI. Five marks questions:

64. Three consecutive natural numbers: $x, x+1, x+2$

Sum of their squares: $x^2 + (x+1)^2 + (x+2)^2 = 110$

$$x^2 + (x^2 + 2x + 1) + (x^2 + 4x + 4) = 110$$

$$3x^2 + 6x - 105 = 0$$

$$x^2 + 2x - 35 = 0$$

$$x^2 + 2x - 35 = 0$$

$$x^2 + 2x = 35$$

$$x(x+2) = 35$$

$$x(x+2) = 5 \times 7$$

$$x = 5$$

Taking positive values: $x = 5, x+1 = 6, x+2 = 7$

The three numbers are 5, 6, and 7.

CHAPTER– 06: WE DISTRIBUTE YET THINGS MULTIPLY

KEY ANSWERS

I. Multiple choice Questions:

1. (A) $(a + m)(b + n)$
2. (C) Commutative property of multiplication
3. (C) $(a + b)(a - b)$
4. (D) 12
5. B) $ab^2 + 2a^2b$
6. $(a + b)^2$ is always greater than $a^2 + b^2$
7. (A) $m^2(m + 1)^2$
8. D) $y^2 - 4$
9. A) $a + b + 1$
10. A) $a \times (b+c) = (a \times b) + (a \times c)$
11. B) $12 \times (100+5)$
12. B) To make the process of multiplication easier and quicker
13. A) $a \times (b-c) = (a \times b) - (a \times c)$
14. C) $15(60-10)$
15. A) $(2m+3n)^2$
16. D) Two squares (a^2, b^2) and two equal rectangles (ab, ba)
17. D) 58
18. C) 3
19. A) $(100-1)^2 = 100^2 + 1^2 - 2(100)(1)$
20. B) $(m+7)(m-7)$
21. A) $(p-r)(s-r)$
22. D) $(100-0.1)^2$
23. C) $-\frac{1}{4} \times \left\{ \frac{2}{3} + \left(\frac{-4}{7} \right) \right\} = \left\{ \left(\frac{-1}{4} \times \frac{2}{3} \right) + \left[-\frac{1}{4} \times \left(\frac{-4}{7} \right) \right] \right\}$

II. One mark questions:

24. a
25. $ab - ac$
26. $(-2 \times 3) + (-2) \times (-4) = -6 + 8 = 2$
27. $(x + 2)(y - 4)$ or $xy - 4x + 2y - 8$ (assuming the original numbers are x and y).
28. $\frac{2}{3}(15 + 6a)$
 $= \frac{2}{3} \times 15 + \frac{2}{3} \times 6a$
 $= 10 + 4a$
29. $94(10+1) = 940 + 94 = 1034$
30. 18×22 is greater
31. $60^2 + 80^2$
 $100^2 = 10,000$

$$60^2 + 80^2$$

$$3600 + 6400 = 10,000.$$

$$32. (a - b)^2 = a^2 - 2ab + b^2 = (200 - 1)^2$$

$$33. 3 \times 3 = 9$$

$$34. (x + 2)(y + 2) = xy + 2x + 2y + 4$$

III. Two-mark questions:

$$35. 94 \times 106 = (100 - 6) \times (100 + 6)$$

$$\text{Apply the identity } (a-b)(a+b) = a^2 - b^2$$

$$\text{where } a = 100 \text{ and } b = 6$$

$$94 \times 106 = (100 - 6)(100 + 6)$$

$$= 100^2 - 6^2$$

$$= (10000 - 36)$$

$$= 9,964$$

$$36. \left(\frac{3a}{2} \times a\right) - \left(\frac{3a}{2} \times b\right) + \left(\frac{3a}{2} \times \frac{1}{4}\right)$$

$$= \frac{3a^2}{2} - \frac{3ab}{2} + \frac{3a}{8}$$

$$37. 4(a + ab - 3b^2) + b(a + ab - 3b^2)$$

$$= 4a + 4ab - 12b^2 + ab + ab^2 - 3b^3$$

$$= 4a + 5ab - 12b^2 + ab^2 - 3b^3$$

$$= 4a + 5ab - 12b^2 + ab^2 - 3b^3$$

$$38. a = -2, b = -3$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$= (-2)^2 - 2(-2)(-3) + (-3)^2$$

$$= 4 - 12 + 9 = 1$$

$$39. x + \frac{1}{x} = 5$$

$$\left(x + \frac{1}{x}\right)^2 = 5^2$$

$$x^2 + 2\left(x\right)\left(\frac{1}{x}\right) + \frac{1}{x^2} = 25$$

$$x^2 + \frac{1}{x^2} = 25 - 2$$

$$x^2 + \frac{1}{x^2} = 23$$

$$40. (-3q + 5)(2q - 2)$$

$$= (-3q)(2q) + (-3q)(-2) + (5)(2q) + (5)(-2)$$

$$= -6q^2 + 6q + 10q - 10$$

$$= -6q^2 + 16q - 10$$

$$41. 101 = (100 + 1)$$

$$4985 \times 101 = 4985 (100 + 1)$$

$$= (4985 \times 100) + (4985 \times 1)$$

$$= 498,500 + 4,985$$

$$= 503,485$$

42. We have a square ABCD where every side has a length of $2x$.

PBCQ is a rectangle.

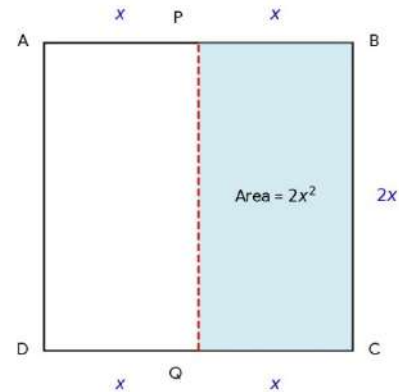
Length $L = 2x$

Breadth $B = x$

Area of PBCQ = $L \times B$

$$= 2x \times x$$

$$= 2x^2$$



$$43. \text{ side} = (5a + 2b)$$

$$\text{Area} = \text{side}^2$$

$$= (5a + 2b)^2$$

$$= (5a)^2 + 2(5a)(2b) + (2b)^2$$

$$\text{Area} = 25a^2 + 20ab + 4b^2$$

$$44. = (7p) \times (3r) \times (p + 2)$$

$$= 21pr(p + 2)$$

$$= 21pr(p) + 21pr(2)$$

$$= 21p^2r + 42pr$$

The final product is $21p^2r + 42pr$

$$45. \text{ First consecutive odd number: } (3q + 2)$$

Second consecutive odd number: $(3q + 4)$

$$\text{Product} = (3q + 2)(3q + 4)$$

$$= (3q \times 3q) + (3q \times 4) + (2 \times 3q) + (2 \times 4)$$

$$= 9q^2 + 12q + 6q + 8$$

$$\text{Product} = 9q^2 + 18q + 8$$

$$46. x(3x + 2y) - y(3x + 2y)$$

$$= (3x^2 + 2xy) - (3xy + 2y^2)$$

$$= 3x^2 + 2xy - 3xy - 2y^2$$

$$= 3x^2 - xy - 2y^2$$

$$47. (y - x)^2 = y^2 - 2yx + x^2$$

$$= x^2 - 2xy + y^2 \rightarrow (1)$$

$$(x - y)^2 = x^2 - 2xy + y^2 \rightarrow (2)$$

From (1) and (2)

$$(y - x)^2 = (x - y)^2 \quad (\text{from axiom})$$

$$48. 16x^2 - Kxy + 9y^2$$

Compare it to the standard identity $(a - b)^2 = a^2 - 2ab + b^2$

$$a^2 = 16x^2 \Rightarrow a = 4x$$

$$b^2 = 9y^2 \Rightarrow b = 3y$$

$$2ab = 2(4x)(3y) = 24xy \quad K = \pm 24$$

$$49. (x - y)^2 = x^2 - 2xy + y^2,$$

where $x = a$ and $y = \frac{1}{2a}$

$$\left(a - \frac{1}{2a}\right)^2 = a^2 - 2 \times a \times \frac{1}{2a} + \left(\frac{1}{2a}\right)^2$$

$$= a^2 - 1 + \frac{1}{4a^2}$$

The constant term is -1

$$50. \text{ Expand using the identity } (a + b)^2 = a^2 + 2ab + b^2$$

$$(\sqrt{x} + \frac{1}{\sqrt{x}})^2 = (\sqrt{x})^2 + 2(\sqrt{x})\left(\frac{1}{\sqrt{x}}\right) + \left(\frac{1}{\sqrt{x}}\right)^2$$

$$= x + 2 + \frac{1}{x}$$

$$51. \left(\frac{2x}{3y} - \frac{3y}{2x}\right)^2$$

Using $(a - b)^2 = a^2 - 2ab + b^2$ identity.

$$\left(\frac{2x}{3y} - \frac{3y}{2x}\right)^2 = \left(\frac{2x}{3y}\right)^2 - 2\left(\frac{2x}{3y}\right)\left(\frac{3y}{2x}\right) + \left(\frac{3y}{2x}\right)^2$$

$$= \frac{4x^2}{3y^2} - 2 + \frac{9y^2}{4x^2}$$

Constant term = -2

$$52. 190 \times 210 = (200 - 10)(200 + 10)$$

$$(200 - 10)(200 + 10) = 200^2 - 10^2$$

$$= 40,000 - 100$$

$$= 39,900$$

$$(a - b)(a + b) = a^2 - b^2$$

53. The length of a rectangular playground is $(x + 5)$ meter and its breadth is $(x - 5)$ meter.

$$\text{Area} = \text{length} \times \text{breadth}$$

$$= (x + 5)(x - 5)$$

$$\text{Area} = x^2 - 25 \text{ m}^2$$

$$\begin{aligned} 54. (x - 1)(x + 1)(x^2 + 1) &= (x^2 - 1)(x^2 + 1) \\ &= (x^2)^2 - 1^2 = x^4 - 1 \end{aligned}$$

$$\begin{aligned} 55. \frac{98^2 - 4^2}{102} &= \frac{(98+4)(98-4)}{102} & a^2 - b^2 &= (a-b)(a+b) \\ &= \frac{94 \times 102}{102} \\ &= 94 \end{aligned}$$

56. Let the original side of the square be x .

$$\text{Original Area} = x^2$$

$$\text{The new side length is } (x - 2)$$

$$\text{New Area} = (x - 2)^2 = x^2 - 4x + 4$$

$$\text{Difference} = \text{Original Area} - \text{New Area}$$

$$\begin{aligned} \text{Difference} &= x^2 - (x^2 - 4x + 4) \\ &= 4x - 4 \end{aligned}$$

New area is less than its original area by $4x - 4$ units

57. The perimeter of the square garden:

$$\text{Perimeter} = 4 \times \text{side} = 4(2x + 5) \text{ meters}$$

$$\text{Total Cost} = 4 \times [4(2x + 5)]$$

$$= 16(2x + 5)$$

Apply the distributive law

$$\text{Total Cost} = (16 \times 2x) + (16 \times 5)$$

$$\text{Total Cost} = 32x + 80$$

$$\text{The expressions is } = 32x + 80$$

58. Since both types of trees are planted in the exact same number of x rows, you can add the trees per row together first, and then distribute the x

$$\text{Total Plants} = x [(x + 4) + (2x - 1)]$$

$$= x (3x + 3)$$

$$= 3x^2 + 3x$$

III. 3-mark questions:

59. The side length of the square is given as 2m

$$\text{Area of the square} = (\text{side})^2 = (2m)^2 = 4m^2$$

$$\text{Radius (r)} = \frac{\text{diameter}}{2} = \frac{2m}{2} = 1m$$

$$\text{Area of the circle} = \pi r^2 = \pi (1m)^2 = \pi m^2$$

$$\text{Area of shaded region} = \text{Area of square} - \text{Area of circle}$$

$$\begin{aligned}\text{Area of shaded region} &= 4m^2 - \pi m^2 \\ &= m^2(4 - \pi)\end{aligned}$$

60. Let the two numbers be a and b.

$$a + b = 20$$

$$ab = 96$$

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$20^2 = a^2 + b^2 + 2(96)$$

$$400 = a^2 + b^2 + 192$$

$$a^2 + b^2 = 400 - 192 = 208$$

61. $(a-b)^2 - (a+b)^2$

Expand both squares using standard identities:

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)^2 = a^2 + 2ab + b^2$$

Subtract the second expansion from the first

$$= (a^2 - 2ab + b^2) - (a^2 + 2ab + b^2)$$

$$= a^2 - 2ab + b^2 - a^2 - 2ab - b^2$$

$$= -2ab - 2ab$$

$$= -4ab$$

62. Find the original area first:

$$\text{Original Area} = a \times b = ab$$

$$\text{New Length} = a - 2, \text{ New Breadth} = b - 2$$

$$\text{New Area} = (a - 2)(b - 2)$$

$$\text{New Area} = ab - 2a - 2b + 4$$

$$\text{Change in Area} = \text{Original Area} - \text{New Area}$$

$$\text{Change in Area} = ab - (ab - 2a - 2b + 4)$$

$$\text{Change in Area} = 2a + 2b - 4$$

The area decreases by $2a + 2b - 4$ square units.

63. The area of a square playground is $9x^2 - 24x + 16$

$$\text{Area} = (\text{side})^2, \quad \text{identity } a^2 - 2ab + b^2 = (a - b)^2:$$

$$9x^2 - 24x + 16 = (3x - 4)^2$$

$$\text{Area} = (3x - 4)^2 \Rightarrow \text{Side length} = 3x - 4$$

$$\text{Perimeter} = 4 (\text{side})$$

$$\text{Perimeter} = 4(3x - 4) = (12x - 16)$$

$$64. \text{Total Area} = x (x) = x^2$$

$$\text{Area of 1 corner square} = y (y) = y^2$$

$$\text{Total Area Cut Out} = 4 y^2 = 4y^2$$

$$\text{Remaining Area} = x^2 - 4y^2$$

$$= (x+2y)(x-2y) \quad a^2 - b^2 = (a+b)(a-b) \quad \text{where } a = x \quad b = 2y$$

65. the first two terms $(2x + 3y - 5z)$ $(2x + 3y + 5z)$ are identical in both expressions.

Let's group them to use the difference of squares identity:

$$(a - b)(a + b) = a^2 - b^2.$$

$$\text{Let } a = (2x + 3y)$$

$$\text{Let } b = 5z$$

Now substitute and expand:

$$\text{Product} = (2x + 3y)^2 - (5z)^2$$

$$(2x + 3y)^2 \text{ using the standard identity } (a+b)^2 = a^2 + 2ab + b^2:$$

$$\text{Product} = [(2x)^2 + 2(2x)(3y) + (3y)^2] - 25z^2$$

$$= 4x^2 + 12xy + 9y^2 - 25z^2$$

66. Let the first number be $A = 7m + 3$ and the second number be $B = 7n + 5$. To quickly find new remainders, operate directly on the original remainders (3 and 5):

$$1. \text{ Sum: } 3 + 5 = 8.$$

Divide 8 by 7, Remainder is 1

$$2. \text{ Difference: } 3 - 5 = -2. \text{ Or } 5 - 3 = 2$$

$$\text{Add 7 to make it a valid positive remainder: } -2 + 7 = 5$$

$$3. \text{ Product: } 3 \times 5 = 15$$

Sum remainder = 1; Difference remainder = 5 (or 2); Product remainder = 1

67. Sum of the numbers: $(x + y)$

$$\text{Half the sum of the numbers: } \frac{x+y}{2}$$

Multiplying them:

$$(x+y) \left[\frac{x+y}{2} \right] = \frac{(x+y)^2}{2}$$

Expanding this expression gives

$$\frac{x^2+2xy+y^2}{2} = \frac{1}{2}x^2 + \frac{1}{2}y^2 + xy$$

68. Total Length of the cloth = $(165 + 2x)$ cm

Total Width of the cloth = $(120 + 2y)$ cm

Perimeter = $2(\text{Length} + \text{Width})$

Perimeter = $2[(165 + 2x) + (120 + 2y)]$

Perimeter = $2(285 + 2x + 2y)$

= $2(285) + 2(2x) + 2(2y)$

= $(570 + 4x + 4y)$ cm

69. Expand the first term $(6n + 2)^2$

Using the identity $(a+b)^2 = a^2 + 2ab + b^2$

$(6n + 2)^2 = (6n)^2 + 2(6n)(2) + 2^2$

$(6n + 2)^2 = 36n^2 + 24n + 4$

Expand the second term $(4n + 3)^2$

Using the same identity:

$(4n + 3)^2 = (4n)^2 + 2(4n)(3) + 3^2$

$(4n + 3)^2 = 16n^2 + 24n + 9$

Subtract the second expanded expression from the first

= $(36n^2 + 24n + 4) - (16n^2 + 24n + 9)$

= $36n^2 + 24n + 4 - 16n^2 - 24n - 9$

Simplified Expression = $20n^2 - 5 = 5(4n^2 - 1)$

As written, the problem cleanly simplifies to $20n^2 - 5$, which satisfies being exactly 5 less than the term $20n^2$

70. Take,

3	4
10	11

Here, $3 \times 11 = 33$ $4 \times 10 = 40$

We observe that difference of diagonal products = $40 - 33 = 7$

a	a+1
a+7	a+8

Reason:

We have diagonal difference = $(a + 7)(a + 1) - a(a + 8)$

$$\begin{aligned}
 &= a(a+1) + 7(a+1) - a(a) - a(8) \\
 &= a^2 + a + 7a + 7 - a^2 - 8a \\
 &= 7
 \end{aligned}$$

71.

$(p - 1)(q - 1)$	$(p - 1)q$	$(p - 1)(q + 1)$
$p(q - 1)$	pq	$p(q + 1)$
$(p + 1)(q - 1)$	$(p + 1)q$	$(p + 1)(q + 1)$

V. 4-mark questions:

72. Using the Distributive Property

$$\begin{aligned}
 (6x + 5)^2 &= (6x + 5)(6x + 5) \\
 &= (6x \times 6x) + (5 \times 6x) + (6x \times 5) + 5 \times 5 \\
 &= (6x)^2 + 2(6x \times 5) + 5^2 \\
 &= 36x^2 + 60x + 25.
 \end{aligned}$$

Using the Identity

$$\begin{aligned}
 (6x + 5)^2 &\text{ this is in the form of } (a + b)^2 \\
 \text{Here } a &= 6x \quad b = 5(a + b)^2 = a^2 + 2ab + b^2 \\
 (6x + 5)^2 &= (6x)^2 + 2(6x)(5) + (5)^2 \\
 &= 36x^2 + 60x + 25 \\
 &= (6x)^2 + 5^2 + 2 \times (6x \times 5) = 36x^2 + 25 + 60x.
 \end{aligned}$$

73. Area = Length x Breadth

$$\begin{aligned}
 480 &= (x + 7)(x - 7) \\
 480 &= x^2 - 49 \\
 x^2 &= 480 + 49 = 529 \\
 x &= \sqrt{529} = 23 \\
 \text{Length} &= x + 7 = 23 + 7 = 30\text{m} \\
 \text{Breadth} &= x - 7 = 23 - 7 = 16\text{m} \\
 \text{Perimeter} &= 2(\text{Length} + \text{Breadth}) \\
 &= 2(30 + 16) = 2(46) = 92 \text{ m}
 \end{aligned}$$

74. Area of two rectangles = $2(2 \times 14) = 56\text{cm}^2$

$$\text{Common small square area} = 2 \times 2 = 4\text{cm}^2$$

$$\text{Area of shaded region} = 56 - 4 = 52\text{cm}^2$$

75. The total surface area TSA of a cube with side length 'a' is given by the formula:

$$TSA = 6a^2$$

$$\text{When } a = (x - 3), \text{ Original cubical Surface Area} = 6(x - 3)^2$$

$$\text{When } a = (x-5)$$

$$\text{New Surface Area} = 6(x - 5)^2$$

$$\text{Difference} = 6(x - 3)^2 - 6(x - 5)^2$$

$$\begin{aligned} \text{Difference} &= 6[(x - 3)^2 - (x - 5)^2] \\ &= 6\{(x - 3 + x - 5)(x - 3) - (x - 5)\} \\ &= 6\{(2x - 8)(2)\} \\ &= 24x - 96 \end{aligned}$$

The difference in surface area is $24x - 96$ square units.

76. Total Area = length $\times$ breadth

$$\text{Total Area} = 40\text{m} \times 30\text{m} = 1200\text{m}^2$$

$$\text{Area of a single square office room} = \text{side}^2 = y^2$$

Since there are 3 identical square rooms, their combined area is:

$$\text{Total Office Area} = 3y^2$$

$$\text{Corridor Area} = \text{Total Area} - \text{Total Office Area}$$

$$\text{Corridor Area} = 1200 - 3y^2$$

77. i)

ii) Step 1 has 1 base dot.

Step 2 has 2 base dots.

Step 3 has 3 base dots.

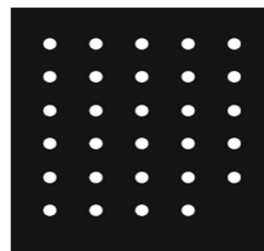
Therefore, in the 10th step, there will be 10 base dots.

iii) The total number of dots is a complete rectangle of size $(n+2) \times (n+1) - 1$

$$\text{Total Dots} = (n + 2)(n + 1) - 1$$

$$\text{Total Dots} = n^2 + 1n + 2n + 2 - 1$$

$$\text{Total Dots} = n^2 + 3n + 1$$



78. The area of each green square plot is given as g^2 sq. ft.

$$\text{Since Area} = (\text{side})^2,$$

the side length of each green square is:

$$(\text{side})^2 = g^2$$

$$\text{Side} = \sqrt{g^2}$$

$$\text{Side} = g \text{ feet}$$

$$\text{Total Width} = W + g + W = 2W + g$$

$$\text{Total Length} = W + g + 2W + g + W = 4W + 2g = 2(2W + g)$$

$$\text{Total Area} = \text{Total Length} \times \text{Total Width}$$

$$\text{Total Area} = 2(2W + g)(2W + g)$$

$$\text{Total Area} = 2(4W^2 + 4Wg + g^2)$$

$$= 8W^2 + 8Wg + 2g^2$$

$$\text{Area of the 2 green plots} = g^2 + g^2 = 2g^2$$

$$\text{Area to be Tiled} = \text{Total Area} - \text{Area of Green Plots}$$

$$\text{Area to be Tiled} = (8W^2 + 8Wg + 2g^2) - 2g^2$$

$$\text{Area to be Tiled} = 8W^2 + 8Wg$$

79. (i) Ticket fare per student = ₹(x + 50)

$$\text{Number of students} = (y + 10)$$

$$\text{Total cost of snacks} = ₹(20y + 100)$$

$$\text{Total Ticket Fare} = (x + 50)(y + 10)$$

$$= x(y + 10) + 50(y + 10)$$

$$= xy + 10x + 50y + 500$$

$$\text{The algebraic expression for the total ticket fare is ₹}(xy + 10x + 50y + 500)$$

(ii) Given $x = 200$ and $y = 40$,

$$\text{Fare per student: } 200 + 50 = 250$$

$$\text{Number of students: } 40 + 10 = 50$$

$$\text{Total Ticket Fare} = 250 \times 50 = ₹12,500$$

iii) Total Cost = Total Ticket Fare + Cost of Snacks

$$\text{Total Cost} = (xy + 10x + 50y + 500) + (20y + 100)$$

$$\text{Total Cost} = xy + 10x + 70y + 600$$

$$\text{iv) Average Cost Per Student} = \frac{\text{Total Cost}}{\text{Number of Students}}$$

$$\text{Average Cost Per Student} = \frac{xy + 10x + 70y + 600}{y + 10}$$

80. Original Area of the field: mn

$$\text{This implies the Original Length} = m \text{ and the Original Breadth} = n.$$

$$\text{New Length: } (m + 5) \text{ meter}$$

$$\text{New Breadth: } (n - 3) \text{ meter}$$

i) The new area expression $= (m + 5)(n - 3) = mn + 5n - 3m - 15$

If the term $(5n - 3m - 15)$ is positive, the area increases.

If the term $(5n - 3m - 15)$ is negative, the area decreases.

It cannot be determined definitively without knowing the values of m and n , as it can either increase or decrease depending on the dimensions.

ii) Let's calculate the new dimensions first:

New Length $= m + 5 = 50 + 5 = 55$ meters

New Breadth $= n - 3 = 40 - 3 = 37$ meters

Now, calculate the new area:

New Area $=$ New Length $\times$ New Breadth

New Area $= 55 \times 37 = 2,035 \text{ m}^2$

The new area is $2,035 \text{ m}^2$

81. Breadth of bigger rectangle $= x$

Length of bigger rectangle $= x + 2y$

Breadth of smaller rectangle $= y$

Length of bigger rectangle $= x$

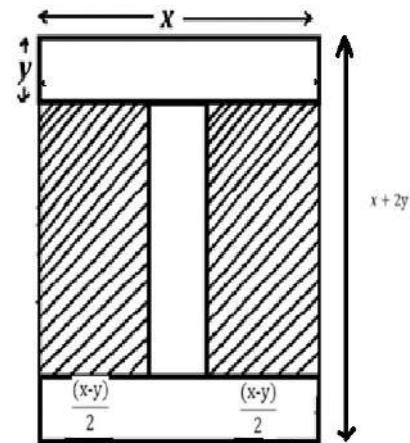
$$\begin{aligned} \text{Area of the hatched lines} &= x(x + 2y) - 3xy \\ &= x^2 + 2xy - 3xy \\ &= x^2 - xy \end{aligned}$$

Alternative method.

Length of the hatched lines rectangle $= x$

$$\text{Breadth} = \frac{x-y}{2}$$

$$\text{Area of the hatched lines rectangle} = 2x\left(\frac{x-y}{2}\right) = x^2 - xy$$



CHAPTER-7 PROPORTIONAL REASONING-1

KEY ANSWERS

I. Multiple choice question:

1. A) 4:3
2. C) $ad = bc$
3. A) 2:3
4. A) $a = b$
5. A) $\frac{x}{(m+n)}$
6. C) $\frac{3}{5}$ times
7. D) 4 : 1
8. C) 1:4
9. B) 2:5

II. One mark questions:

10. When two ratios are equal, then they are said to be in proportion.
11. Fahrenheit $= \frac{9}{5}$ Celsius + 32°
12. The ratio of circumference of two congruent circles is 1: 1
13. The changing factor to express 72:96 in simplest ratio is 24.

III. Answer the following questions:

14. Let x be the factor

Now $14 \times x = 6$

$$x = \frac{6}{14} = \frac{3}{7}$$

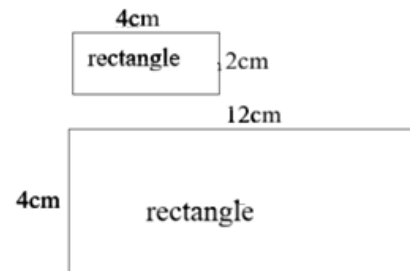
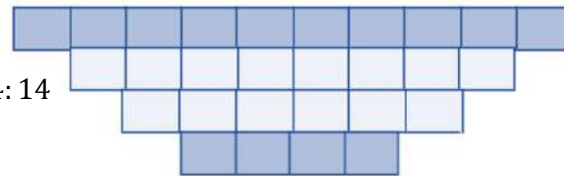
The factor is not an integer

15. The ratios of shaded and non shaded is 14: 14

its simplest form =1: 1

- 16.

rectangles	Length	breadth	simplest form of ratio
rectangle -1	4cm	2cm	2:1
rectangle 2	12cm	4cm	3:1



17. The equivalent ratios of 3: 4 from the given ratios is 75: 100 , 21: 28

18. Given: - 2: 5 and x : 100 is in proportion $\therefore 2 : 5 :: x : 100$

$$5 \times x = 2 \times 100$$

$$x = \frac{200}{5}$$

$$x = 40$$

19. Ratio of age of Manjula and her son is 30 : 5

Their ages in simplest form = 6: 1.

20. If 3: 5 and 51: 102 are in proportion, then $3: 5 = 51: 102$

$$5 \times 51 = 255$$

$$3 \times 102 = 306$$

$$255 \neq 306$$

$\therefore 3: 5$ and 51: 102 is not in proportion

21. Ratio of sugar and lime extract used to prepare one glass of lime juice=2: 1

To prepare 10 glass of juice

$$\therefore x = \frac{10}{1} = 10$$

Ratio of sugar and lime extract used to prepare 10 glass of lime juice = 2(10): 1(10)

$$= 20: 10$$

$\therefore$ 20 spoons of sugar and 10 spoons of lime extract is required

22.

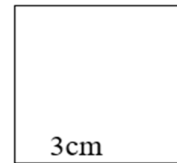
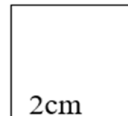
2: 3	4: 6	8: 12	10: 15	20: 30
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23.

$$\text{Area of 1}^{\text{st}} \text{ square} = a^2 = 2^2 = 4\text{cm}^2$$

$$\text{Area of 2}^{\text{nd}} \text{ square} = a^2 = 3^2 = 9\text{cm}^2$$

the ratios of areas of squares = 4: 9



24.

Let distance travelled in 4 hrs be x kms,

We know distance and time are in proportion ie $2\frac{1}{2} \times 90 = x \times 4$

$$x = \frac{90 \times 4}{2\frac{1}{2}}$$

$$x = \frac{90 \times 4 \times 2}{5}$$

$$x = 144 \text{ km}$$

25. Students in school = 45 girls + 46 boys = 91
Teachers = 7 are there in a school.

the ratio of teachers and students = 7 : 91

its simplest form = 1 : 13

26. Number of weeks per year = 52
Let number of kilometres travelled per week be x
Now 940 : 52 :: x : 1

$$x = \frac{940}{52} = \frac{235}{13} \cong 18.07 \text{ million kilometers.}$$

27. Case -1 speed is 50 km/hr.

Distance between Lucknow to Kanpur $50 \times 2 = 100$

Case -2 speed is 75 km/hr.

$$\text{Time taken} = \frac{\text{distance travelled}}{\text{speed}} = \frac{100}{75} = 1\frac{1}{3} \text{ hour} = 1 \text{ hour } 20 \text{ min}$$

28. Sum of ratio = $2 + 3 = 5$

$$\text{First part} = \frac{2}{5} \times 4500 = 1800$$

$$\text{Second part} = \frac{3}{5} \times 4500 = 2700$$

- 29.

Ratio of red and yellow paints in bucket = 3 : 5

quantity of paint in bucket = $3 + 5 = 8$ units

since 1 bucket of yellow paint is added total yellow paint = $5 + 8 = 13$ units and no change in red paint

now ratio of red paint to yellow in new orange paint = $3 : 13$

- 30.

$$\text{Density of population in Delhi} = \frac{\text{population}}{\text{area}} = \frac{30}{1484} = 0.02 \text{ per sqmts}$$

$$\text{Density of population in Mumbai} = \frac{\text{population}}{\text{area}} = \frac{20}{550} = 0.036 \text{ per sqmts}$$

From above Mumbai is more crowded than Delhi

- 31.

Ratio of Harman and her brother age = 1 : 5

Let after x years ratio of their ages become 1 : 2

$$\text{Now } \frac{1+x}{5+x} = \frac{1}{2}$$

$$2 + 2x = 5 + x$$

$$x = 3$$

When Harman's age is 4 years her brother age becomes 8 years and ratio become 1 : 2

32. Sum of ratio = $1 + 5 = 6$

$$\text{Quantity of acid in solution} = \frac{1}{6} \times 204 = 34 \text{ ml}$$

$$\text{Quantity of water in solution} = \frac{5}{6} \times 204 = 170 \text{ ml}$$

IV. Three Marks Questions

33. In Himachal Pradesh,

$$\text{Cost : Weight of tea} = 200 : 200 = 1 : 1$$

In Meghalaya,

$$\text{Cost : Weight of tea} = 800 : 1000 = 4 : 5$$

No, the weight-to-price ratios in both places are not in proportion.

$$1 : 1 = 1$$

$$4 : 5 = 0.8$$

Therefore, Cost of tea packet is expensive in Himachal Pradesh.

34. Number of doctors and nurses in camp = total - (helpers + drivers) = 40 - (10 + 3) = 27

$$\text{Ratio of doctors and nurses} = 1 : 2$$

$$\text{Sum of ratio} = 1 + 2 = 3$$

$$\text{number of doctors} = \frac{1}{3} \times 27 = 1 \times 9 = 9$$

$$\text{number of nurses} = \frac{2}{3} \times 27 = 2 \times 9 = 18$$

35. The ratio of the ingredients of the chapati = 100gram wheat flour : 50ml water = 2 : 1
quantity of ingredients required to prepare such 25 chapatis

$$= 25 (100\text{gram wheat flour} + 50\text{ml water})$$

$$= 2500\text{grams of wheat flour} + 1250\text{ml water}$$

36. Ratio of boys and girls in the school = 2 : 5.

Let number of boys be x

$$\text{Ratio of banana and eggs consumed} = 40 : x$$

Since it is in proportion $2 : 5 = 40 : x$

$$x = \frac{5 \times 40}{2} = \frac{200}{2} = 100$$

$$\text{Number students in the school} = \text{boys} + \text{girls} = 100 + 40 = 140$$

37. Ratio of students and quantity of rice = 140 : 21

Let number of students remaining after absent be x

$$\text{Now Ratio of students and quantity of rice} = x : 15$$

Since these two are in proportion $\therefore 140 : 21 = x : 15$

$$x = \frac{140 \times 15}{21}$$

$$x = 100$$

$$\text{Number of students absent on that day} = 140 - 100 = 40$$

OR

Let number of students remaining after absent be x

Ratio of students = $140 : x$

Ratio of quantity of rice = $21 : 15$

Since these two are in proportion

$$21 : 15 = 140 : x$$

$$x = \frac{15 \times 140}{21} = 100$$

Number of students absent on that day = $140 - 100 = 40$

38. The ratio of Gold and silver = $3 : 1$

Sum of ratio = $3 + 1 = 4$

Gold in the white gold ring = $\frac{3}{4} \times 16 = 12g$

Silver in the white gold ring = $\frac{1}{4} \times 16 = 4g$

Total real price of the ring = $(12 \times 14000 + 4 \times 250) = 1,69,000$

39. Copper : Nickel = $3 : 1$

mass of one coin = $7.74g$.

mass of 10 coin = $7.74 \times 10 = 77.4g$

mass of Copper in 10 coins is = $\frac{3}{4} \times 77.4 = 58.05g$

mass of Nickel in 10 coins is = $\frac{1}{4} \times 77.4 = 19.35g$

Cost of Copper = $\frac{58.05}{1000} \times 1906 = ₹110.64$ * Cost of Nickel = $\frac{19.35}{1000} \times 1341 = ₹25.94$

40.

Image	Length in cm	Breadth in cm
Image -A	60	40
Image-B	40	20
Image -C	30	20
Image -D	90	60
Image -E	60	60

Ratio of length and breadth of image -A = $60cm : 40cm = 3 : 2$

Ratio of length and breadth of image -B = $40cm : 20cm = 2 : 1$

Ratio of length and breadth of image -C = $30cm : 20cm = 3 : 2$

Ratio of length and breadth of image -D = $90cm : 60cm = 3 : 2$

Ratio of length and breadth of image -E = 60cm : 60cm = 1: 1

Ratio of image-A, image-C and image-D is = 3: 2 hence they are in proportion

41. circumference of circle of radius $7\text{ cm} = 2\pi \times 7\text{ cm} = 14\pi\text{ cm}$
circumference of circle of radius $14\text{ cm} = 2\pi \times 14\text{ cm} = 28\pi\text{ cm}$
circumference of circle of radius $21\text{ cm} = 2\pi \times 21\text{ cm} = 42\pi\text{ cm}$
ratios of radii = $7\text{ cm} : 14\text{ cm} : 21\text{ cm} = 1: 2: 3$
ratios of circumference = $14\pi\text{ cm} : 28\pi\text{ cm} : 42\pi\text{ cm} = 1: 2: 3$
since both are same, they are in proportion

42. Let son's age be x yrs
Then Father's age becomes $(24 + x)$ yrs

Ratio of ages of father and his son is 5: 1

$$5: 1 = (24 + x) : x$$

$$(x + 24) = 5x$$

$$4x = 24$$

$$\therefore x = 6$$

Therefore, son's age is 6yrs

43. Present ages of Sudha and her mother is 12 years and 39 years
9 years ago, their age was $12-9=3$ yrs and $39-9=30$ yrs

Ratio of their ages = 3: 30

its simplest form = 1: 10

44. Neelima's mother age = 10 times of Neelima's age = $10 \times 3 = 30$ years
the ratio of Neelima's age to her mother's age = $3: 30 = 1: 10$
difference in Neelima's age = $12 - 3 = 9$
her mother's age becomes = $30 + 9 = 39$
the ratio of Neelima's age to her mother's age when Neelima is 12 years old
= $12: 39 = 4: 12$

Ratio of their ages are not same.

IV. Four marks Questions:

45. Area of room = area of a tile $\times$ number of tiles used
 $= 2 \times 1 \times 20 = 40$ square units

Similarly, Area of room = length $\times$ breadth of room

Let the relation be x

then $5x \times 2x = 40$ square units

$$x^2 = 4$$

$$x = 2 \text{ units}$$

length of room = $5 \times 2 = 10$ units

breadth of room = $2 \times 2 = 4$ units

46. Ratio of length and breadth of room-1 = 14:8

Its simplest form = 7:4

Ratio of length and breadth of room-2 = 12:8

Its simplest form = 3:2

Ratio of length and breadth of kitchen = 10:8

Its simplest form = 5:4

Ratio of length and breadth of living area = 16:8

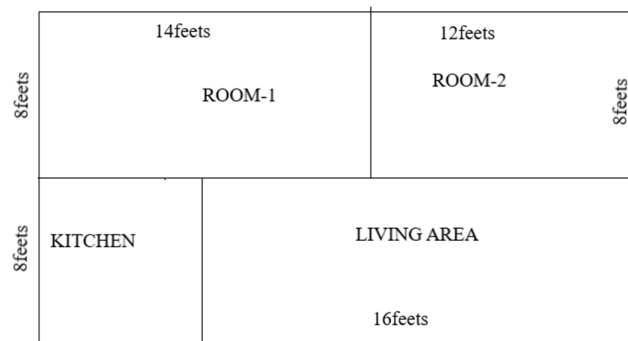
Its simplest form = 2:1

i) No rooms or kitchen or living area or house is similar

ii) All are dissimilar

iii) the length and breadth of the house is 26 feet and 16 feet respectively

iv) Ratio of length and breadth of house = 26:16 Its simplest form = 13:8



CHAPTER– 08: FRACTIONS IN DISGUISE

KEY ANSWERS:

I. Multiple choice questions:

1. B) Centum
2. B) 2 : 5
3. C) 40
4. A) $\frac{5}{10} = 50\%$
5. B) 12
6. A) $\frac{2}{5}$
7. C) 75%
8. C) 33.33 %
9. B) 60%
10. C) 220
11. B) 5%
12. B) ₹5,000
13. B) 75%
14. C) Raju
15. B) 400
16. A) 0.75
17. A) 40%
18. C) $\frac{3}{10}$
19. B) $\frac{1}{200}$
20. A) 0.85
21. A) 25%
22. B) ₹660
23. A) ₹625
24. B) 0.6 minutes
25. C) ₹1170
26. B) 44%
27. B) Principal for the next year

28. D) 60%
29. A) $p \times 1.05$
30. D) 13.5, 27, 162

II. One-Mark Questions

31. Money he used = $\frac{2}{5} \times ₹500 = 2 \times 100 = ₹200$

= Surya spend ₹200 to buy a Canvas.

32.

$$\frac{25}{100} = 0.25$$

$$= 0.25$$

33. Since 60% is exactly double of 30%, the value will also double.

$$60\% \text{ of } K = 2 \times (30\% \text{ of } K) = 2 \times 70 = 140$$

34. Simple Interest = $\frac{\text{PTR}}{100}$

35. Convert all values into decimals to easily compare them

$$\frac{4}{5} = 0.8$$

$$0.7 = 0.7$$

$$65\% = \frac{65}{100} = 0.65$$

Arrange from largest to smallest (Descending order)

$$0.8 > 0.7 > 0.65$$

36. Cakify gives you a flat 50% off original price.

Cakely gives successive discounts. If a cake costs ₹100, a 30% discount drops it to ₹70.

Then, a 20% discount on ₹70 saves you another ₹14, making the final price ₹56. This means the total effective discount is only 44%.

You should choose 'Cakify' bakery because a single direct 50% discount gives you a lower final price than successive discounts of 30% + 20%.

III. Two-Mark Questions

37. To convert a fraction to a percentage, multiply it by 100.

a) $\frac{3}{5} \times 100 = 3 \times 20 = 60\%$

b) $\frac{5}{11} \times 100 = \frac{500}{11} = 45.45\%$

38. Let's break it down into three parts:

1. $\frac{55}{100} \times 160 = \frac{55 \times 16}{10} = 88$

$$2. \frac{24}{100} \times 50 = \frac{24 \times 5}{10} = \frac{120}{10} = 12$$

$$3. \frac{36}{100} \times 150 = \frac{36 \times 15}{10} = \frac{540}{10} = 54$$

Now, substitute the values back into the equation:

$$88 + 12 - 54 = 100 - 54 = 46$$

39. Let the original number be X .

Increasing the number by 20% means the new number is 120% of X.

$$1.20 \times X = 90$$

$$X = \frac{90}{1.20} = \frac{9000}{120} = \frac{900}{12} = 75$$

The number is 75.

$$40. \text{Sugar quantity} = 120 \times \frac{25}{100} = 120 \times \frac{1}{4} = 30\text{g}$$

The quantity of sugar consumed is 30g.

41. 80% of the total marks (75).

$$\text{Minimum score} = 75 \times \frac{80}{100} = 75 \times \frac{4}{5}$$

$$\text{Minimum score} = 15 \times 4 = 60$$

The minimum score required is 60 marks.

$$42. \text{Loss} = \text{Cost Price (CP)} - \text{Selling Price (SP)} = 500 - 450 = ₹50$$

$$\text{Loss Percentage} = \frac{\text{Loss}}{\text{Cost Price}} \times 100$$

$$= \frac{50}{500} \times 100 = 10\%$$

His loss percentage is 10%.

$$43. \text{Decrease in price} = 30 - 18 = ₹12$$

$$\text{Percentage Decrease} = \frac{\text{Decrease}}{\text{Original Price}} \times 100$$

$$= \frac{12}{30} \times 100 = 4 \times 10 = 40\%$$

The percentage decrease in price is 40%.

44. The total Cost Price (CP), which includes the purchase price plus repair costs.

$$\text{Total CP} = 30,000 + 5,000 = ₹35,000$$

$$\text{Net Profit} = \text{SP} - \text{Total CP} = 42,000 - 35,000 = ₹7,000$$

His net profit is ₹7,000.

45. A loss of 12% means the selling price is $100 - 12 = 88\%$ of the original Cost Price (CP).

Set up the equation where $88\% \times \text{CP} = ₹44$

$$\frac{88}{100} \times \text{CP} = 44$$

$$\text{CP} \times 88 = 44 \times 100$$

$$\text{CP} = \frac{44 \times 100}{88} = \frac{100}{2} = 50$$

The original cost price of the vegetables is ₹50 per kg.

46.

Simple Interest (SI)	Compound Interest (CI)
Remains constant throughout the entire loan/investment period.	Changes every year because the interest from the previous period is added to it.
Calculated only on the original principal amount.	Calculated on the principal amount plus the accumulated interest from previous periods ("interest on interest").
Grows linearly (the amount of interest added each year is identical).	Grows exponentially (the amount of interest added increases each year).
$\text{SI} = \frac{p \times r \times T}{100}$	$\text{CI} = P \left(1 + \frac{R}{100}\right)^T$

47. 10% of a day

$$1 \text{ day} = 24 \text{ hours}$$

$$10\% \text{ of } 24 \text{ hours} = \frac{10}{100} \times 24 = 2.4 \text{ hours}$$

1% of a week

$$1 \text{ week} = 7 \text{ days} = 7 \times 24 = 168 \text{ hours}$$

$$1\% \text{ of } 168 \text{ hours} = \frac{1}{100} \times 168 = 0.01 \times 168 = 1.68 \text{ hours}$$

Compare the values

$$2.4 \text{ hours (10\% of a day)} > 1.68 \text{ hours (1\% of a week)}$$

Yes, 10% of a day (2.4 hours) is longer than 1% of a week (1.68 hours).

48. Price Increase = ₹42 – ₹38 = ₹4

the percentage increase (Inflation Rate):

$$\begin{aligned} \text{Inflation Rate} &= \frac{\text{Price Increase}}{\text{Original Price (2024)}} \times 100 \\ &= \frac{4}{38} \times 100 \end{aligned}$$

$$= \frac{2}{16} \times 100 = \frac{200}{16} = 10.53\%$$

49. Price Increase = $100 - 60 = ₹40$

$$\text{Percentage Increase} = \frac{\text{Increase}}{\text{Original price}} \times 100$$

$$= \frac{40}{60} \times 100 = \frac{400}{6} = 66.67\%$$

The percentage increase in the price of petrol is 66.67%.

$$50. \text{Discount} = 300 \times \frac{25}{100} = 3 \times 25 = ₹75$$

$$\text{Final Price} = 300 - 75 = ₹225$$

Anwar has to pay ₹225.

51. Given: Revenue (R) = ₹2.5 crores

$$\text{Profit Margin} = 25\%$$

$$\text{Profit} = \text{Profit Margin} \times \text{Revenue}$$

$$\text{Profit} = 25\% \times 2.5 \text{ crores}$$

$$= \frac{25}{100} \times 2.5 \text{ crores}$$

$$= 0.25 \times 2.5 = 0.625 \text{ crores}$$

$$\text{Expenditure} = \text{Revenue} - \text{Profit}$$

$$\text{Expenditure} = 2.5 - 0.625 = 1.875 \text{ crores}$$

$$₹1.875 \text{ crores (or ₹1,87,50,000)}$$

52. Cost Price (CP) = ₹75

$$\text{Selling Price (SP)} = ₹110$$

$$\text{Profit} = \text{SP} - \text{CP} = 110 - 75 = ₹35$$

$$\text{Profit Percentage} = \frac{\text{Profit}}{\text{Cost price}} \times 100$$

$$= \frac{35}{75} \times 100 = \frac{35 \times 4}{3} = \frac{140}{3} = 46.67\%$$

$$53. \text{SP} = \frac{27}{25} \times \text{CP}$$

Since $\frac{27}{25} > 1$, it is a profit.

$$\text{Let CP} = x, \text{ then SP} = 27$$

$$\text{Profit} = 27 - 25 = 2$$

$$\text{Profit Percentage} = \frac{2}{25} \times 100$$

$$= 2 \times 4 = 8\%$$

8% Profit

54. Laptop Cost = ₹50,000

GST Rate = 18%

Total Tax Amount = 18% of 50,000

$$= \frac{18}{100} \times 50000$$

$$= 18 \times 500 = 9000$$

$$= ₹9,000$$

55. Price per bag = ₹350

GST Rate = 28%

Quantity = 100 bags

Total Cost of bags (before tax) = $350 \times 100 = ₹35,000$

Total GST = 28% of 35,000

$$\text{Total GST} = \frac{28}{100} \times 35,000 = 28 \times 350 = ₹9,800$$

56. Service Costs = ₹8,000, ₹6,500, and ₹9,500

GST Rate = 18%

Total Cost of Services = $8,000 + 6,500 + 9,500 = ₹24,000$

GST Amount = 18% of 24,000

$$= \frac{18}{100} \times 24,000 = 18 \times 240 = ₹4,320$$

Total Amount to Pay = Total Cost + GST Amount

$$\text{Total Amount to Pay} = 24,000 + 4,320 = ₹28,320$$

57. Counting the intervals (spaces between dots) of the full outer boundary rectangle:

Width: 8 units wide (9 columns of dots).

Height: 6 units high (7 rows of dots).

Total Area of the large rectangle: $8 \times 6 = 48$ square units

2. Analyse Section E:

Sections D and E combined form a square on the bottom left.

Width of this square: 4 units.

Height of this square: 3 units.

Area of D + E rectangle: $4 \times 3 = 12$ square units.

The diagonal line divides this 4×3 sub-rectangle perfectly into two right-angled triangles (D and E).

$$\text{Area of section E} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$= \frac{1}{2} \times 4 \times 3 = 2 \times 3 = 6 \text{ square units}$$

$$\text{Percentage} = \frac{\text{Area of E}}{\text{Total Area}} \times 100$$

$$= \frac{6}{48} \times 100 = \frac{100}{8} = 12.5\%$$

$$= 12.5\%$$

58. Cost Price (CP) = ₹2,500

Selling Price (SP) = ₹1,800

Since $SP < CP$, the merchant incurs a **loss** rather than a profit.

$$\text{Loss} = CP - SP = 2,500 - 1,800 = ₹700$$

$$\text{Loss Percentage} = \frac{\text{Loss}}{CP} \times 100$$

$$= \frac{700}{2500} \times 100$$

$$= \frac{7}{25} \times 100$$

$$\text{Loss Percentage} = 28\%$$

59. 6% of 5000

$$= \frac{6}{100} \times 5000 = 6 \times 50 = 300 \text{ litres}$$

$$\text{The amount of water left in the tank is} = 5000 - 300 = 4,700 \text{ litres}$$

60. Last year's harvest = 260 kg

This year's harvest = 850 kg

$$\text{Increase in harvest} = 850 - 260 = 590\text{kg}$$

$$\text{Percentage Increase} = \frac{\text{Increase}}{\text{Last year's harvest}} \times 100$$

$$= \frac{590}{260} \times 100$$

$$= \frac{59}{26} \times 100$$

$$= \frac{5900}{26}$$

$$= 226.92\%$$

61. Increase = 34,500 - 34,000 = ₹500

Calculate percentage increase

$$\text{Percentage Increase} = \frac{\text{Increase}}{\text{Original Price}} \times 100$$

$$\text{Percentage Increase} = \frac{500}{34,000} \times 100 =$$

$$= \frac{50}{34} = 1.47\% \quad = 1.47\%$$

IV. Three-Mark Questions

62. The price after the 10% increase:

Increase amount: 10% of ₹10,000

$$= \frac{10}{100} \times 10000 = ₹1,000$$

Increased price: ₹10,000 + ₹1,000 = ₹11,000

The 15% festival discount on the new price:

Discount amount: 15% of ₹11,000

$$= \frac{15}{100} \times 11000 = ₹1,650$$

Final price: ₹11,000 – ₹1,650 = ₹9,350

63. Let's assume Ravi's original income is ₹100.

Initial Income = ₹100

Initial Expenditure = 75% of ₹100 = ₹75

Initial Savings = Income - Expenditure = ₹100 - ₹75 = ₹25

New Income (increased by 20%) = ₹100 + 20% of ₹100 = ₹120

New Expenditure (increased by 10%) = ₹75 + 10% of ₹75 = ₹75 + ₹7.5 = ₹82.5

New Savings = New Income - New Expenditure = ₹120 - ₹82.5 = ₹37.5

Increase in Savings = ₹37.5 - ₹25 = ₹12.5

Percentage Increase = $\frac{\text{Increase}}{\text{Initial Savings}} \times 100$

$$= \frac{12.5}{25} \times 100 = 12.5 \times 4 = 50\%$$

64. Let the total distance be x km.

According to the question, 40% of the total distance is 92 km:

$$\frac{40}{100} \times x = 92$$

$$40 \times x = 100 \times 92$$

$$x = \frac{100 \times 92}{40} = 10 \times 23 = 230 \text{ km}$$

Remaining percentage to travel = 100% - 40% = 60%

Remaining Distance = Total Distance - Distance Covered

$$= 230 \text{ km} - 92 \text{ km} = 138 \text{ km}$$

65.

Percentage	50%	1%	43%
Fraction	$= \frac{50}{100}$	$= \frac{1}{100}$	$= \frac{43}{100}$
Decimal	= 0.5	= 0.01	= 0.43

66. Cost Price (CP) = ₹2,650

Loss Percentage = 18%

Loss Amount = 18% of ₹2,650

$$= 18 \times 2650$$

$$= \frac{18}{100} \times 2650 = 1.8 \times 265 = ₹477$$

Selling Price (SP) = Cost Price - Loss Amount

$$SP = ₹2,650 - ₹477 = ₹2,173$$

New Selling Price = ₹3,000

Profit = New SP - CP

$$Profit = ₹3,000 - ₹2,650 = ₹350$$

Profit Percentage:

$$Profit \% = \frac{Profit}{CP} \times 100$$

$$= \frac{350}{2650} \times 100 = \frac{3500}{265} = 13.21\%$$

$$Profit \% = 13.21$$

67. Total Target for 2 days = $2 \times ₹5,000 = ₹10,000$

Actual Sales achieved in 2 days = ₹3,500

$$Percentage\ Achieved = \frac{Actual\ Sales}{Total\ Target} \times 100$$

$$= \frac{3500}{10000} \times 100 = 35\%$$

$$Percentage\ Achieved = 35\%$$

68. The problem states the amount of fodder given and eaten each day follows a pattern:

Day 1: Given 2 units, Ate 1 unit

Day 2: Given 3 units, Ate 2 units

Day 3: Given 4 units, Ate 3 units

Day 99: Given 100 units, Ate 99 units

$$\text{Percentage eaten} = \frac{\text{Units eaten}}{\text{Units given}} \times 100$$

2. Percentage Calculations

$$\text{Day 1: } \frac{1}{2} \times 100 = 50\%$$

$$\text{Day 2: } \frac{2}{3} \times 100 = 66.67\%$$

$$\text{Day 3: } \frac{3}{4} \times 100 = 75\%$$

$$\text{Day 99: } \frac{99}{100} \times 100 = 99\%$$

69. Given: Selling Price (SP) = ₹4,40,000

Selling price = Original price $\times$ (1 – discount percentage)

$$4,40,000 = x (1 - 0.15)$$

$$x = \frac{4,40,000}{0.85} = 517647.06$$

The original price of the car was approximately ₹5,17,647.06.

70. Given: Cost of materials (CP) = ₹475

Desired Profit = 50%

Profit Amount = $475 \times 50\%$

$$= \frac{50}{100} \times 475$$

$$= 50 \times 4.75$$

$$= ₹237.50$$

$$\text{Selling Price} = \text{CP} + \text{Profit} = 475 + 237.50 = ₹712.50$$

He should sell the chair at ₹712.50.

71. Buying Price = ₹4,800

Transportation Cost = ₹1,200

Total Cost Price (CP) = $4,800 + 1,200 = ₹6,000$

Selling Price (SP) = ₹5,820

CP (₹6,000) is greater than SP (₹5,820), it is a Loss.

Loss Amount = $6,000 - 5,820 = ₹180$

$$\text{Loss Percentage} = \frac{180}{6000} \times 100 = \frac{18}{6} = 3\%$$

The merchant incurred a 3% loss.

72. Given: Current Population (P) = 1.5 crores (1,50,00,000)

Growth Rate (R) = 3% per year

Time (n) = 3 years

$$A = P \left(1 + \frac{R}{100} \right)^T$$
$$= 1.5 \left(1 + \frac{3}{100} \right)^3 = 1.5 \left(\frac{103}{100} \right)^3 = 1.5 (1.03)^3$$
$$A = 1.5 \times 1.092727 = 1.6390905 \text{ crores}$$

The expected population after 3 years will be approximately 1.64 crores (or 1,63,90,905).

73. Given: Initial Bacteria Count (P) = 5,06,000

Growth Rate (R) = 2.5% per hour

Time (T) = 2 hours

$$A = P \left(1 + \frac{R}{100} \right)^T$$
$$= 5,06,000 \left(1 + \frac{2.5}{100} \right)^2$$
$$A = 5,06,000 (1.025)^2$$
$$A = 5,06,000 (1.050625) = 5,31,616.25$$

Since the bacteria count must be a whole number, the count at the end of 2 hours is 5,31,616.

74. Let the initial bus fare be 100.

After Year 1 (3% increase):

$$100 + (3\% \times 100) = 100 + \frac{3}{100} \times 100 = 103$$

After Year 2 (4% increase on the new fare):

$$103 + (4\% \times 103) = 103 + \frac{4}{100} \times 103 = 103 + 4 \times 1.03 = 103 + 4.12 = 107.12$$

Overall Increase:

$$107.12 - 100 = 7.12\%$$

The overall percentage increase in the fare over the last 2 years is 7.12%.

75. Initial State:

Total people = 100

Left-handed people = 99% of 100 = 99

Right-handed people = 1% of 100 = 1

Let x be the number of left-handed people who leave the room.

The number of right-handed people remains exactly 1.

right-handed people must represent exactly 2% of the total remaining population

(100% - 98% = 2%).

$$2\% \times \text{New Total Population} = 1$$

$$\frac{2}{100} \times x = 1$$

$$0.02 \times (100 - x) = 1$$

$$100 - x = \frac{1}{0.02}$$

$$100 - x = 50$$

$$x = 50$$

Exactly 50 left-handed people must leave the room.

(Alternative method)

No. of people in room = 100

No. of left handers = 99% of 100 = 99

No. of right-handers = 1

Let x people leave.

No. of left-handers is 98%.

and no. of right-handers is 2%.

Then

$$\frac{99-x}{100-x} = \frac{98}{100}$$

$$\Rightarrow 100(99 - x) = 98(100 - x)$$

$$\Rightarrow 9900 - 100x = 9800 - 98x$$

$$\Rightarrow 9900 - 9800 = 100x - 98x$$

$$\Rightarrow 2x = 100$$

$$\Rightarrow x = 50$$

$\therefore$ 50 left-handers must leave the room

76. Given: Selling Price (SP) = ₹6,500

Loss is equal to one-tenth of the Cost Price (CP)

(i) The cost price of those goods

$$\text{Loss} = \left(\frac{1}{10}\right) \text{ of CP}$$

$$\text{SP} = \text{CP} - \text{Loss}$$

$$6,500 = \text{CP} - \left(\frac{1}{10}\right) \text{ CP}$$

$$6,500 = \frac{9}{10} \text{ CP}$$

$$\text{CP} = \frac{10}{9} \times 6,500$$

$$\text{CP} = ₹7,222.22$$

The cost price is ₹7,222.22.

(ii) The loss incurred

$$\text{Loss} = \frac{1}{10} \times \text{CP}$$

$$\text{Loss} = \frac{1}{10} \times 7,222.22.$$

The loss incurred is ₹722.22.

(iii) The loss percentage

$$\begin{aligned}\text{Loss Percentage} &= \frac{\text{Loss}}{\text{CP}} \times 100 \\ &= \frac{722.22}{7,222.22} \times 100 \\ &= 9.99\end{aligned}$$

The loss percentage is 10%.

77. Let the **cost price (CP)** of the radio be x .

Since the radio is sold for ₹605 at a **10% profit**:

$$\begin{aligned}605 &= 110\% \text{ of } x \\ x &= \frac{605 \times 100}{110} = ₹550\end{aligned}$$

Now, to earn a **16% profit**, the selling price should be:

$$\begin{aligned}\text{SP} &= 116\% \text{ of } 550 \\ &= \frac{116}{100} \times 550 = ₹638\end{aligned}$$

He should sell the radio for ₹638 to earn a 16% profit.

78. Given: Candidates failed in English (E) = 30%

Candidates failed in Mathematics (M) = 35%

Candidates failed in both subjects = 27%

(i) The total percentage of candidates who failed

$$\text{Total Failed} = E + M - (E \& M)$$

$$\text{Total Failed} = 30\% + 35\% - 27\% = 38\%$$

The total percentage of candidates who failed is 38%.

(ii) The total percentage of candidates who passed

$$\text{Total Passed} = 100\% - \text{Total Failed}$$

$$\text{Total Passed} = 100\% - 38\% = 62\%$$

The total percentage of candidates who passed (in both subjects) is 62%.

(iii) Find the total number of candidates who appeared

Let the total number of candidates be x .

$$62\% \text{ of } x = 248$$

$$\frac{62}{100}(x) = 248$$

$$\frac{62x}{100} = 248$$

$$62x = 100 \times 248$$

$$x = \frac{100 \times 248}{62}$$

$$= 100 \times 4 = 400$$

The total number of candidates who appeared for the exam is 400.

79. Given: Amount after 4 years (A_4) = ₹3,825

Amount after 6 years (A_6) = ₹4,050

Find the Simple Interest (SI) for 2 years

$$\text{SI for 2 years} = (A_6) - (A_4) = 4,050 - 3,825 = ₹225$$

Find the Simple Interest for 1 year and 4 years

$$\text{SI for 1 year} = \frac{225}{2} = ₹112.50$$

$$\text{SI for 4 years} = 112.50 \times 4 = ₹450$$

Find the Principal Amount (P)

$$P = (A_4) - \text{SI for 4 years}$$

$$P = 3,825 - 450 = ₹3,375$$

Find the Rate of Interest (R)

$$\text{SI} = \frac{p \times T \times R}{100}$$

$$\text{SI for 1 Year } 112.50$$

$$112.50 = \frac{3375 \times R \times 1}{100}$$

$$112.50 \times 100 = 3,375 \times R$$

$$11,250 = 3,375 \times R$$

$$R = \frac{11,250}{3,375}$$

$$R = 3.33\%$$

Principal Amount: ₹3,375

Rate of Interest: 3.33% per annum

80. Giridhar's Simple Interest

Principal (P) = ₹12,500

Rate (R) = 12%

$$SI = \frac{p \times T \times R}{100}$$

$$SI = \frac{12500 \times 12 \times 3}{100}$$

$$= 125 \times 12 \times 3$$

$$SI = ₹4,500$$

Raghava's Compound Interest

Principal (P) = ₹12,500

Rate (R) = 10%

Time (T) = 3 years

$$\text{Amount (A)} = P \left(1 + \frac{R}{100} \right)^T$$

$$= 12,500 \left(1 + \frac{10}{100} \right)^3$$

$$= 12,500 + 1.331$$

$$= ₹16,637.50$$

$$CI = A - P = 16,637.50 - 12,500 = ₹4,137.50$$

Giridhar pays more interest.

$$\text{Difference} = 4,500 - 4,137.50 = ₹362.50$$

81. Simple Interest Received

Principal (P) = ₹50,000

Rate (R) = 7%

Time (T) = 3 years

$$SI = \frac{p \times T \times R}{100}$$

$$= \frac{50,000 \times 3 \times 7}{100}$$

$$= 500 \times 3 \times 7$$

$$= ₹10,500$$

He receives ₹10,500 under simple interest.

Additional Interest under Compound Interest

$$\text{Amount (A)} = 50,000 \left(1 + \frac{7}{100} \right)^3$$

$$= 50,000 \left(\frac{107}{100} \right)^3$$

$$= 50,000(1.07)^3$$

$$= 50,000 \times 1.225043$$

$$= ₹61,252.15$$

$$CI = 61,252.15 - 50,000 = ₹11,252.15$$

$$\text{Difference} = 11,252.15 - 10,500 = \text{₹}752.15$$

He would have received ₹752.15 more under compound interest.

IV . Four marks questions

82. Let the original length be L and the original breadth be B. The original Area is:

$$\text{Area} = L \times B$$

The new length (L') is increased by 10%

$$L' = L + 0.10L = 1.1L$$

Let the new breadth be B'. Since the area remains unchanged:

$$L' \times B' = L \times B$$

$$1.1L \times B' = L \times B$$

Solve for B':

$$B' = \frac{L \times B}{1.1L}$$

$$= \frac{B}{1.1} = \frac{10}{11} B = 0.91B$$

$$\text{Decrease} = B - B' = B - \frac{10}{11} B = B - 0.91B = 0.09B$$

The breadth decreases by 9.09%

83. (i) Class 8 students make up 40% of the total students.

Girls make up 60% of that 40%

$$\text{Percentage of Class 8 girls} = 60\% \text{ of } 40\% = 0.60 \times 40\% = 24\%$$

24% of the total students are Class 8 girls.

(ii) We know from part (i) that Class 8 girls represent 24% of the total students.

$$\text{Number of Class 8 girls} = 24\% \text{ of } 150 = 0.24 \times 150 = 36$$

There are exactly 36 Class 8 girls.

84. A halwa recipe for 4 people contains ingredients in the following proportions: Semolina (Rava)

40%, Sugar 40%, and Ghee 20%.

i) The proportions remain exactly the same regardless of the number of people, as scaling up a recipe changes the total quantity, not the percentage ratio of ingredients.

Required Proportions: Semolina (40%), Sugar (40%), and Ghee (20%).

ii) Total weight = 2 kg = 2000 grams

Semolina (Rava): 40 of 2 kg = $0.40 \times 2000 \text{ g} = 800 \text{ g} = 0.8 \text{ Kg}$

Sugar: 40 of 2 kg = $0.40 \times 2000 \text{ g} = 800 \text{ g} = 0.8 \text{ Kg}$

Ghee: 20 of 2 kg = $0.20 \times 2000 \text{ g} = 400 \text{ g} = 0.4 \text{ Kg}$

85. Total Selling Price (SP):

$$\text{Total SP} = 80,000 + 80,000 = ₹1,60,000$$

Cost Price of the First Buffalo (CP- 1) Profit = 5%

$$\text{Profit} = 100 + 5 = 105$$

$$\text{CP-1} = \frac{80,000 \times 100}{105} = 76,190.50$$

Cost Price of the second Buffalo (CP- 2) Loss = 10%

$$\text{Loss} = 100 - 10 = 90$$

$$\text{CP-2} = \frac{80,000 \times 100}{90} = 88,888.90$$

$$\text{Total Cost Price} = 76,190.50 + 88,888.90 = 1,65,079.4$$

Selling price is less than cost price

$$\text{Loss} = 1,65,079.4 - 1,60,000 = 5079.4$$

$$\text{Loss}\% = \frac{5079.4}{1,65,079.4} \times 100 = 3.1\%$$

The milkman incurred an overall loss of ₹5,079.37.

86. Simple Interest (SI)

To double the principal ($P = ₹1000$), the target amount (A) is ₹2000, meaning the Interest (I) earned must equal the principal ($I = ₹1000$).

$$\text{SI} = \frac{P \times T \times R}{100}$$

$$1000 = \frac{1000 \times T \times 10}{100}$$

$$1000 = 10 T \times 10 \Rightarrow T = \frac{1000}{100}$$

$$T = 10 \text{ years}$$

Compound Interest (CI)

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$2000 = 1000 \left(1 + \frac{10}{100}\right)^T$$

$$\frac{2000}{1000} = \left(\frac{110}{100}\right)^T = 7.27 \text{ years}$$

Growth Types

Yes, compound interest is an example of exponential growth because the amount grows by a constant percentage factor $(1 + r)^T$ each period, meaning interest earns interest.

Yes, simple interest is an example of linear growth because the value increases by a fixed, constant absolute amount

87. (i) Shop A ("Buy 1, Get 1 Free"): You pay for 1 item (₹100) and get 2 items total.

$$\text{Effective price} = \frac{100}{2} = ₹50$$

Shop B ("Buy 2, Get 1 Free"): You pay for 2 items (₹200) and get 3 items total.

$$\text{Effective price} = \frac{200}{3} = ₹66.67$$

Shop C ("Buy 3, Get 1 Free"): You pay for 3 items (₹300) and get 4 items total.

$$\text{Effective price} = \frac{300}{4} = ₹75$$

Order (Cheapest to Costliest): Shop A → Shop B → Shop C

(ii) Discount Percentage = $(\frac{\text{Total Items} - \text{Free Items}}{\text{Total Items}}) \times 100\%$

Shop A: 1 free item out of 2 total items $\rightarrow (\frac{1}{2}) \times 100\% = 50\%$

Shop B: 1 free item out of 3 total items $\rightarrow (\frac{1}{3}) \times 100\% \approx 33.33\%$

Shop C: 1 free item out of 4 total items $\rightarrow (\frac{1}{4}) \times 100\% = 25\%$

(iii) Shop A: To get 4 items, you buy 2 and get 2 free.

$$= 2 \times ₹100 = ₹200.$$

Shop B: Buying 2 gets you 1 free (3 items total for ₹200).

Total cost: $200 + 100 = ₹300$.

Shop C: You buy 3 and get 1 free, giving you exactly 4 items.

Total cost: $3 \times ₹100 = ₹300$.

Choice: You should choose Shop A because it is the most economical, costing only ₹200 to get exactly 4 items.

88. Ingredient Weight Calculations

Potato (70%)

$$65\text{g} \times 0.70 = 45.5\text{g}$$

Vegetable oil (24%)

$$65\text{g} \times 0.24 = 15.6\text{g}$$

Salt (3%)

$$65\text{g} \times 0.03 = 1.95\text{g}$$

Spices (3%)

$$65\text{g} \times 0.03 = 1.95\text{g}$$

Summary Table

Ingredient	Percentage (%)	Exact Weight (g)
Potato	70%	45.5g
Vegetable oil	24%	15.6g
Salt	3%	1.95g
Spices	3%	1.95g
Total	100%	65g

89. Total Cost Price (CP): ₹4,500

Target Overall Profit: 12%

Total Target Selling Price (SP):

$$\text{Total Target SP} = 4500 \times \left(1 + \frac{12}{100}\right) = 4500 \times 1.12 = ₹5,040$$

Cost Price of the first $\frac{1}{3}$ of the rice:

$$\text{CP- first} = \frac{1}{3} \times 4500 = ₹1,500$$

Selling Price of the first $\frac{1}{3}$ of the rice (at 10% profit):

$$\text{SP-first} = 1500 \times \left(1 + \frac{10}{100}\right) = 1500 \times 1.10 = ₹1,650$$

Cost Price of the remaining $\frac{2}{3}$ of the rice:

$$= 4500 - 1500 = ₹3,000$$

(i) The selling price of the remaining rice.

$$= 5040 - 1650 = ₹3,390$$

The selling price of the remaining rice must be ₹3,390.

(ii) The profit percentage required on the remaining rice.

the profit needed on the remaining rice:

$$= 3390 - 3000 = ₹390$$

the profit percentage based on the remaining cost price (₹3,000):

$$= \frac{390}{3000} \times 100 = \frac{39}{3} = 13\%$$

The required profit percentage on the remaining rice is 13%.

90. Given that

Principal (P): ₹9,600

Rate (R): 10% per annum (compounded annually)

Time: 3 years

(i) The interest for the first year.

$$\begin{aligned} \text{Interest} &= \frac{P \times T \times R}{100} \\ &= \frac{9600 \times 1 \times 10}{100} = 96 \times 10 = ₹960 \end{aligned}$$

The interest for the first year is ₹960.

(ii) The total amount at the end of the first year.

Amount = Principal + Interest

$$= 9600 + 960 = ₹10,560$$

∴ The total amount at the end of the first year is ₹10,560.

(iii) The interest for the second year.

For compound interest, the opening amount of the second year becomes the principal for that year:

$$\text{Interest} = \frac{10560 \times 1 \times 10}{100} = ₹1056$$

∴ The interest for the second year is ₹1,056.

(iv) The interest for the third year.

First, calculate the total amount at the end of the second year:

$$\text{Amount} = \text{Amount} + \text{Interest} = 10560 + 1056 = ₹11,616$$

$$\text{Interest} = \frac{11616 \times 2 \times 10}{100} = ₹1161.60$$

∴ The interest for the third year is ₹1,161.60.

91. Initial Loan Principal (P): ₹12,000

Compound Interest Rate (R): 10% per annum

Repayment at the end of Year 1: ₹8,000

(i) The total amount due at the end of the first year before making the repayment.

$$\begin{aligned} \text{Interest for Year 1} &= \frac{P \times T \times R}{100} \\ &= \frac{12000 \times 1 \times 10}{100} = ₹1,200 \end{aligned}$$

Amount due (Year 1) = Principal + Interest

$$= 12000 + 1200 = ₹13,200$$

∴ The total amount due before repayment is ₹13,200.

(ii) The balance amount left at the end of the first year after making the repayment.

Balance = Amount due – Repayment

$$\text{Balance left} = 13200 - 8000 = ₹5,200$$

∴ The balance amount left after repayment is ₹5,200.

(iii) The principal amount for the second year.

Principal for Year 2 = Balance amount left at the end of Year 1 = ₹5,200

∴ The principal amount for the second year is ₹5,200.

(iv) The total amount to be paid at the end of the second year to completely clear the account.

$$\text{Interest for Year 2} = \frac{P \times T \times R}{100}$$

$$\text{Interest for Year 2} = \frac{5200 \times 1 \times 10}{100} = ₹520$$

Final Amount due (Year 2) = P + Interest for Year 2

$$\text{Final Amount due (Year 2)} = 5200 + 520 = ₹5,720$$

∴ The total amount to be paid to completely clear the account is ₹5,720.

CHAPTER-9 THE BOUDHAYANA -PYTHAGORUS THEOREM

KEY ANSWERS

I. Multiple Choice Questions

1. C) Irrational
2. D) 1.41421
3. A) $x^n + y^n = z^n$
4. D) (ka, kb, kc) becomes a triple.
5. B) All three a, b, c can be even numbers. (e.g., scaled versions like 6, 8, 10)
6. D) 100 (Since $60^2 + 80^2 = 3600 + 6400 = 10000 = 100^2$)
7. A) (9, 12, 15)
8. A) (10, 24, 26)
9. A) (30, 40, 50)
10. B) (3, 4, 5)
11. C) $c = \sqrt{a^2 + b^2}$
12. B) $b = \sqrt{c^2 - a^2}$
13. D) 68 cm (Diagonals bisect at right angles, forming a right triangle with sides 15 and 8. The hypotenuse is $\sqrt{15^2 + 8^2} = 17$. Perimeter = $17 \times 4 = 68$)
14. A) $\sqrt{x^2 + y^2}$ (Diagonals bisect each other forming right triangles with legs x and y)
15. A) (15, 8, 17)
16. A) Around 800 BCE
17. C) Baudhāyana's Śulba-Sūtra
18. B) twice (double)
19. D) square
20. $\frac{a}{\sqrt{2}}$ (Because the area of the original square is half the area of the square on the diagonal, $s^2 = \frac{a^2}{2}$)
21. A) Double the area
22. C) $\sqrt{2}$ units
23. B) Euclid's Elements

24. A) $c^2 = 2a^2$

25. B) $a\sqrt{2}$

II. One-Mark Questions

26. Baudhāyana triple: A triple (a, b, c) of positive integers satisfying the equation

$$a^2 + b^2 = c^2.$$

27. General form of a scaled triple: (ka, kb, kc) where k is any positive integer.

28. Triple < 20 : $(3, 4, 5)$.

29. Value of a in $(15, a, 20)$: If this is meant to be a scaled $(3, 4, 5)$ right triangle where 20 is the hypotenuse, then

$$15^2 + a^2 = 20^2,$$

$$225 + a^2 = 400,$$

$$\text{giving } a = \sqrt{175}.$$

30. Scaled version of $(5, 12, 13)$: $(10, 24, 26)$.

31. Primitive Baudhāyana triple: A Baudhāyana triple that does not have any common factor greater than 1.

32. Primitive for (ka, kb, kc) : (a, b, c) .

33. Area of square on diagonal: $2a^2$.

34. Baudhāyana's combining statement: "The area of the square produced by the diagonal is the sum of the areas of the squares produced by the two sides."

35. Baudhāyana's theorem: If a right-angled triangle has sidelengths a, b , and c , where c is the length of the hypotenuse, then $a^2 + b^2 = c^2$.

36. French mathematician: Fermat.

III. Two-Marks Questions

37. Prove $(5k, 12k, 13k)$ is a triple:

$$(5k)^2 + (12k)^2 = 25k^2 + 144k^2 = 169k^2.$$

Since $(13k)^2 = 169k^2$, the statement holds true.

38. Value of x (First figure): The left triangle has sides 5 and hypotenuse 13, making its base $\sqrt{13^2 - 5^2} = 12$.

The right triangle shares this base of 12 and has a hypotenuse of 20. Therefore, $x = \sqrt{20^2 - 12^2} = \sqrt{400 - 144} = \sqrt{256} = 16$.

39. Value of x : The total height is $10 + 2 = 12$,

and the horizontal base is 5.

By Baudhāyana's theorem, $x = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$.

40. Dotted square double area: The original square is made up of two small congruent triangles, while the new dotted square constructed on the diagonal is made up of four of these identical triangles, thus doubling the area.

41. Area and hypotenuse of side 10 cm: Area = $\frac{1}{2} \times 10 \times 10 = 50$ sq cm. Hypotenuse = $\sqrt{10^2 + 10^2} = \sqrt{200} = 10\sqrt{2}$ cm.

42. Hypotenuse $\sqrt{128}$ units: For an isosceles right triangle,

$$a^2 + a^2 = c^2.$$

$$2a^2 = 128 \Rightarrow a^2 = 64 \Rightarrow a = 8 \text{ units.}$$

43. Missing side lengths:

○ i) $c = \sqrt{7^2 + 11^2} = \sqrt{49 + 121} = \sqrt{170}$ cm.

○ ii) $b = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = 12$ cm.

44. First four $(3k, 4k, 5k)$ triples: $(3, 4, 5)$, $(6, 8, 10)$, $(9, 12, 15)$, $(12, 16, 20)$.

45. Length of BC: In triangle ABC, if angle B is 90° , $10^2 + x^2 = (\sqrt{200})^2$. $100 + x^2 = 200 \Rightarrow x^2 = 100 \Rightarrow x = 10$ cm.

46. Infinitely many triples: Take $(3, 4, 5)$. Multiplying by any positive integer k produces $(3k, 4k, 5k)$. Because $(3k)^2 + (4k)^2 = 9k^2 + 16k^2 = 25k^2 = (5k)^2$, and there are infinitely many positive integers k , infinitely many triples exist.

47. Hypotenuse (sides 12): $c = \sqrt{12^2 + 12^2} = \sqrt{288}$ units.

48. Other two sides (hypotenuse $\sqrt{72}$): $2a^2 = 72 \Rightarrow a^2 = 36 \Rightarrow a = 6$ units.

49. Missing sides in figures:

○ Sides 7, 9: Hypotenuse = $\sqrt{49 + 81} = \sqrt{130}$.

○ side 10, side 4: hyp. $\sqrt{100 + 16} = \sqrt{116}$.

○ Side $\sqrt{150}$, side 10: Missing side = $\sqrt{150 + 100} = \sqrt{250}$.

○ Sides 27, 45 (hypotenuse): Missing side = $\sqrt{45^2 - 27^2} = \sqrt{2025 - 729} = \sqrt{1296} = 36$.

50. In the right angled triangle, with sides (a, b, c) being Baudhāyana triple,

$$c^2 = a^2 + b^2$$

$$c^2 > a^2 \text{ and } c^2 > b^2$$

therefore, c is the biggest side.

Whether $a > b$ or $b > a$, finally c is the largest.

IV. Three-Marks Questions

51. Three scaled versions of (3, 4, 5): (6, 8, 10), (9, 12, 15), (12, 16, 20).

52. Length of PQ: $P(0,6)$ and $Q(8,0)$. $PQ = \sqrt{8^2 + 6^2} = \sqrt{64 + 36} = \sqrt{100} = 10$ units.

53. Length of QS: Triangle PQR has sides 9 and hypotenuse 15, so $QR = \sqrt{15^2 - 9^2} = 12$.

Triangle RST has hypotenuse 15 and side 12, so $RS = \sqrt{15^2 - 12^2} = 9$. Total length $QS = QR + RS = 12 + 9 = 21$ units.

54. Traveler distance: The displacement forms a right triangle with legs 150 m and 200 m.

Distance $= \sqrt{150^2 + 200^2} = \sqrt{22500 + 40000} = \sqrt{62500} = 250$ meters.

55. In $\triangle ABC$, $AB=BC$, $\angle B = 90^\circ$

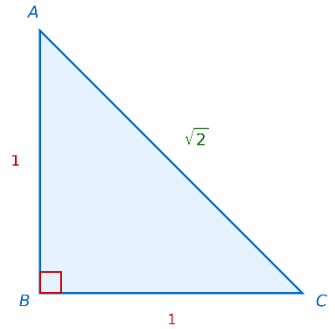
$$AC^2 = AB^2 + BC^2$$

$$= (1)^2 + (1)^2$$

$$= 1 + 1$$

$$AC^2 = 2$$

$$AC = \sqrt{2} \text{ unit}$$



56. Prove $\sqrt{2} \neq m/n$: If $\sqrt{2} = \frac{m}{n}$, then $2 = \frac{m^2}{n^2}$, giving $2n^2 = m^2$. In prime factorization, squares have even powers of primes. The left side has an odd power of 2, while the right side has an even power. This is impossible, proving $\sqrt{2}$ cannot be expressed as a fraction.

57. Hypotenuse of side 5 and bounds: $c = \sqrt{5^2 + 5^2} = \sqrt{50}$. We know $7.0^2 = 49$ and $7.1^2 = 50.41$. Thus, the bounds are $7.0 < \sqrt{50} < 7.1$.

58. Fill in the blanks:

1. $c = 25$

2. $b = 15$

3. $a = 12$

4. $b = 36$

5. $a = 3$

6. $b = 12$

59. Lotus problem: Let x be the depth of the lake.

The total stem length is $x + 1$.

When it sways 3 units away, it forms a right triangle:

$$x^2 + 3^2 = (x + 1)^2.$$

$$x^2 + 9 = x^2 + 2x + 1,$$

$$2x = 8, \text{ so } x = 4 \text{ units.}$$

60. Rhombus sides (30, 72): The diagonals bisect at right angles, creating legs of 15 and 36.

$$\text{Side} = \sqrt{15^2 + 36^2} = \sqrt{225 + 1296}$$

$$= \sqrt{1521} = 39 \text{ units.}$$

61. Rhombus sides (24, 70): Legs are 12 and 35.

$$\text{Side} = \sqrt{12^2 + 35^2} = \sqrt{144 + 1225} = \sqrt{1369} = 37 \text{ units.}$$

62. Construct difference square: You want a square of area $7^2 - 5^2 = 49 - 25 = 24$. Draw a right-angled triangle with a hypotenuse of 7 units and one side of 5 units. The remaining side will have a length of $\sqrt{24}$ units. Construct your square on this third side.

63. If (a, b, c) is a Baudhāyana triple, then, $a^2 + b^2 = c^2$

Now, Let us check for,

$$\begin{aligned} & \text{consider} \left(\frac{a}{f} \right)^2 + \left(\frac{b}{f} \right)^2 \\ &= \frac{a^2}{f^2} + \frac{b^2}{f^2} = \frac{a^2 + b^2}{f^2} = \frac{c^2}{f^2} \end{aligned}$$

Therefore, $\left(\frac{a}{f}, \frac{b}{f}, \frac{c}{f} \right)$ is a Baudhāyana triple.

When (9, 12, 15) is a Baudhāyana triple. The common factor is 3 then,

$$a' = \frac{9}{3} = 3; b' = \frac{12}{3} = 4; c' = \frac{15}{3} = 5;$$

$(a', b', c') = (3, 4, 5)$ is a Baudhāyana triple.

64. AP is an angular bisector. Therefore $AP \perp BC$ and AP bisects BC.

Therefore, $BP = PC = 3\text{cm}$

In triangle APC

$$BP^2 = AP^2 + CP^2$$

$$6^2 = AP^2 + 3^2$$

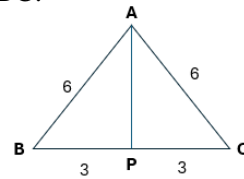
$$36 = AP^2 + 9$$

$$AP^2 = 36 - 9 = 27;$$

$$AP = \sqrt{27} = 3\sqrt{3}$$

Area of Triangle,

$$A = \frac{1}{2} \times \text{base} \times \text{height}$$



$$A = \frac{1}{2} \times 6 \times 3\sqrt{3} \quad a = 9\sqrt{3} \text{ cm}^2$$

V. Four-Marks Questions

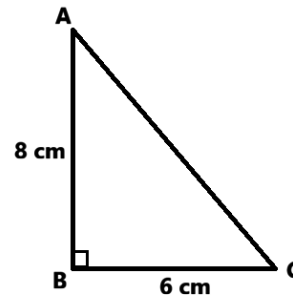
65. In the figure AC measures 10 cm

Verification using Baudhayanas Theorem

Hypotenuse check (6, 8):

$$\text{Length} = \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$$

$$= \sqrt{100} = 10 \text{ cm.}$$



66. Third side check (8, 17): $\text{Length} = \sqrt{17^2 - 8^2} = \sqrt{289 - 64} = \sqrt{225} = 15 \text{ cm.}$

67. Lattice squares:

a) 2 sq units: Draw the diagonal of a 1×1 grid square; building a square on it gives area 2.

b) 3 sq units: Not possible on an integer grid because no two integers satisfy $x^2 + y^2 = 3$.

c) 4 sq units: Draw a standard 2×2 grid square.

68. Bamboo problem: Let x be the height where the bamboo breaks. The broken piece forms the hypotenuse, measuring $32 - x$. The base is 16.

Using the theorem:

$$x^2 + 16^2 = (32 - x)^2.$$

$$x^2 + 256 = 1024 - 64x + x^2. \text{ Simplifying yields}$$

$$64x = 768, \text{ so } x = 12 \text{ feet.}$$

CHAPTER-10 PROPORTIONAL REASONING-2

ANSWER KEY

I.

1. A) $\frac{bc}{a}$
2. C) $2 \times 10 = 4 \times 5$
3. C) 1:2 and 2:4
4. A) $2:3 :: 4:6$
5. C) 9
6. D) ₹800
7. A) $5:75 = 12:180$
8. B) ₹400
9. B) Distance travelled and time taken in uniform speed
10. B) 30
11. C) As the speed of the cycle increases time taken to travel a particular distance decrease
12. D) $x \propto \frac{1}{y}$
13. A) $ab=k$
14. D) $\frac{1}{n}$

II. One mark

15. The side of the square and its area are in direct proportion
16. The areas of concentric circles are in direct proportion
17. $a:b:c:d$ and $p:q:r:s$ are in direct proportion then $a:b:c:d :: p:q:r:s$
18. If one of the two quantities in direct proportion increases then other quantities also increase.
19. If one of the two quantities in inverse proportion become double, what will be the other quantity become half.
20. It can cut into 5 pieces.
21. Flour-2kg, Sugar-3kg, Ghee-4kg.

III. Two marks

22. The ratio length and breadth of national flag = 3:2
Let the breadth of our national flag be 'x'm
Now $3:2 = 4.5:x$
 $3x = 2 \times 4.5$
 $3x = 9$
 $x = 3$
The breadth of our national flag is 3m
23. Ratio of yellow and blue colour mixed to prepare green colour = 2:3
quantity of green colour prepared = 15 liters
Ratio of yellow and blue colour = $x:15$
Now $2:3 = x:15$

$$3x = 2 \times 15$$

$$3x = 30$$

$$x = 10$$

10 litres of yellow colour is used to prepare 15 liters of green colour

24. Ratio length and breadth of a rectangle = 7: 5

its perimeter is 24 cm = 2(length + breadth) = ~~24~~cm

$$(length + breadth) = ~~12~~cm$$

Sum of ratio = 12cm = length + breadth of rectangle

Length = 7cm breadth = 5cm

25. The ratio adjacent angles of a parallelogram = 3: 7

Sum of ratio = 3 + 7 = 10

Measure of first angle = $\frac{3}{10} \times 180^\circ = 54^\circ$

Measure of second angle = $\frac{7}{10} \times 180^\circ = 126^\circ$

26. $4: 1 = 36: x$

$$4 \times x = 1 \times 36$$

$$x = 9$$

27. The ratio of interior angles of a triangle = 1: 3: 5

Sum of ratio = 1 + 3 + 5 = 9

Measure of second angle = $\frac{3}{9} \times 180^\circ = 60^\circ$

Measure of remaining angle = $\frac{1}{9} \times 180^\circ = 20^\circ$

28. No, because sum of two sides of a triangle is more than its biggest side,

ie $2x + 3x > 7x$

But $5x < 7x$

29. Ratio of number of taps and time taken = 3: 16 = $3 \times 16 = 48 = f$

if one more tap of same kind is added the ratio = $4: x = 4x = f$

$$\text{now } ~~48~~ = 4x$$

$$x = 12$$

if one more tap of same kind is added, then it takes 12 hrs to fill the trough completely

30. Ratio of number of students and provision to feed = $60 \times 15 = 900 = f$

Let number of days provision to feed remaining students be x then $= 40 \times x = 40x = f$

Now ~~900~~ = $40x$

$$x = 22.5$$

31. Ratio of ingredients = 2: 5: 7

Sum of ratio = 2 + 5 + 7 = 14

least ingredient used = $\frac{2}{14} \times 196 = 28$ kg

$$\text{least ingredient used} = \frac{7}{14} \times 196 = 98 \text{ kg}$$

32. The situation is in inverse proportion.

$$\text{The relation between speed of car and time taken} = 60 \times 2 = 120 = f \dots (1)$$

Let speed of car while return be x km/hr

$$\text{Now the relation between speed of car and time taken} = 1.5 \times x = 1.5x = f \dots (2)$$

From (1) and (2)

$$1.5x = 120$$

$$x = 80$$

Car has to travel with 80km/hr to return in 1:30min

33. Cost price of 18 pens = cost price of 12 notebooks

$$\frac{\text{cost price of 1 pen}}{\text{cost price of 1 note book}} = \frac{12}{18} = \frac{2}{3}$$

34. Triangles constructed in the ratio 3: 4: 5 need not be congruent but they are similar.

35. The relation between number of workers and number of days = $30 \times 4 = 120 = f$

Let number of days be x then

$$\text{The relation between number of workers and number of days} = 10 \times x = 10x = f$$

$$\text{Now } 10x = 120$$

$$x = 12$$

10 workers can complete the work in 12 days

36. The relation between number of workers and number of days = $4 \times 15 = 60 = f$

$$\text{The relation between number of workers and number of days} = 12 \times 5 = 60 = f$$

Since both constants are same this situation can happen.

37. In the ratio of paints 2: 3: 5, white paint corresponds to 5 parts

$$\text{ie } 5x = 10 \Rightarrow x = 2$$

$$\text{red} = 2 \text{ parts} = 2 \times 2 = 4 \text{ litres}$$

$$\text{blue} = 3 \text{ parts} = 3 \times 2 = 6 \text{ litres}$$

4 litres of red and 6litres of blue paint should she add to get the same shade of purple.

38. Case -1 motorcycle

speed is 30 km/hr.

$$\text{Distance between Lucknow to Kanpur } 30 \times 3 = 90 \text{ km}$$

Case -2 Car

speed is 60 km/hr.

$$\text{Time taken} = \frac{\text{distance travelled}}{\text{speed}} = \frac{90}{60} = 1\frac{1}{2} \text{ hour} = 1 \text{ hour } 30 \text{ min}$$

long it will take 1 hour 30 min to reach Kanpur

39. Let time taken by 4 taps(2+2) be x hrs

$$\text{Now } 2 \times 18 = 4 \times x$$

$$x = 9 \text{ hrs}$$

Tank can be filled in 9 hours

40. Let food last for x days
 Total number of students $= 80 + 20 = 100$
 Now $80 \times 15 = 100 \times x$
 $x = 12$ days
 the provision last for 12 days

IV. Three Marks Questions

- 41.
- Simplest form of $6:3$ and $4:2 = 2:1$ and $2:1$
 Since both ratios in simplest form is same, these two are in proportion.
 - $7:5$ and $9:5$ both ratios are in simplest form, but they are not same so they are not in proportion
42. The ratio interior angles of a triangle $= 5:6:7$
 Sum of ratios $= 5 + 6 + 7 = 18$
 Sum of interior angles of triangles $= 180^\circ$
 Measure of first angle $= \frac{5}{18} \times 180^\circ = 50^\circ$
 Measure of second angle $= \frac{6}{18} \times 180^\circ = 60^\circ$
 Measure of third angle $= \frac{7}{18} \times 180^\circ = 70^\circ$
43. The ratio interior angles of a triangle $= 3:4:5$
 Sum of ratios $= 3 + 4 + 5 = 12$
 Sum of interior angles of triangles $= 180^\circ$
 Measure of first angle $= \frac{3}{12} \times 180^\circ = 45^\circ$
 Measure of second angle $= \frac{4}{12} \times 180^\circ = 60^\circ$
 Measure of third angle $= \frac{5}{12} \times 180^\circ = 75^\circ$
 It is an acute triangle.
44. The ratio of red, blue, and white colours $= 2:3:5$
 Sum of ratios $= 2 + 3 + 5 = 10$
 Colours used to prepare 15 liters of purple colour
 Used red colour $= \frac{2}{10} \times 15 = 3$ liters
 Used blue colour $= \frac{3}{10} \times 15 = 4.5$ liters
 Used white colour $= \frac{5}{10} \times 15 = 7.5$ liters
 Colours used to prepare 20 liters of purple colour
 Used red colour $= \frac{2}{10} \times 20 = 4$ liters
 Used blue colour $= \frac{3}{10} \times 20 = 6$ liters
 Used white colour $= \frac{5}{10} \times 20 = 10$ liters
 Let the relation be x
 Used yellow colour $= 45 \text{ liter} = 3x$
 $x = 5$

Used red colour = $5 \times 2 = 10$ liters

Used blue colour = $5 \times 5 = 25$ liters

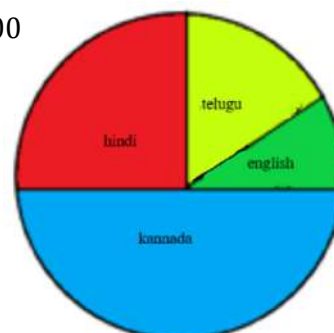
Sum of ratio = $2 + 3 + 5 = 10$

quantity of brown colour prepared = $10 \times 5 = 50$ liters

45. i) Number of people talk in kannada = $\frac{180^\circ}{360^\circ} \times 1000 = 500$

ii) Number of people talk in hindi = $\frac{90^\circ}{360^\circ} \times 1000 = 250$

iii) the least used language in the village is english



46. 1 unit of concrete = cement + sand + gravel = $1 + 1.5 + 3 = 5.5$ units

Number of units of concrete needed = 110

Number of units of cement = $\frac{1}{5.5} \times 110 = 20$ units

Number of units of sand = $\frac{1.5}{5.5} \times 110 = 30$ units

Number of units of gravel = $\frac{3}{5.5} \times 110 = 60$ units

47. Let the work can be completed in x days

Now $3 \times 4 = 4 \times x$

$x = 3$ days

it takes them to finish the work in 3 days

the assumptions we need to make are

Capacity of each worker is same.

each worker performs equally daily.

age of the worker has no role to play

experience of the worker is not considered

48. Ratio of Number of workers and bricks prepared = $5:4000 = 1:800$

Let number of workers required to prepare 12000 bricks be x

Now $1:800 = x:12,000$

~~$800x = 12000$~~ $x = 15$

15 workers are required

It is in direct proportion

49. Quantity of milk to be distributed to each student = $\frac{10000}{100} = 100$ ml

Quantity of milk given to each student = $\frac{10000}{125} = 80$ ml

Difference between milk distributed = $100\text{ml} - 80\text{ml} = 20$ ml

Ratio of to be distributed and distributed milk = $100:80 = 5:4$

It is in inverse proportion

50. If 12 workers can complete a work in 20 days. Then the relation is

$$= 12 \times 20 = 240 = f$$

if 15 workers can complete a work in x days. Then the relation =

$$15 \times x = 15x = f$$

$$\text{now } 15x = 240$$

$$x = 16$$

15 workers can complete the work in 16 days

$$\text{One day's work of each worker} = \frac{1}{240}$$

51. Ratio of students enrolled to college = 1: 2: 3

$$\text{Sum of ratio} = 1 + 2 + 3 = 6$$

Let total number of students enrolled to college be x

We know number of students enrolled to arts = 150

$$\begin{aligned} \text{Then, } &= \frac{1}{6} \times x = 150 \\ &= 150 \times 6 \\ &= 900 \end{aligned}$$

- 52.

x	16	12	3	36
y	9	12	48	4

53. If ,30 workers can complete the work in 6 days,

$$\text{then the relation is } = 30 \times 6 = 180 = f$$

let number of workers be x and number of days is 9 then

$$\text{the relation is } = 9 \times x = 9x = f$$

$$\text{now } 9x = 180$$

$$x = 20$$

20 workers are required to complete the work in 9

This situation is in inverse proportion

54. There are 40 students in section A and B of

In B section

Ration of boys and girls = 2: 3

$$\text{Sum of ratio} = 2 + 3 = 5$$

$$\text{Number of boys} = \frac{2}{5} \times 40 = 16$$

$$\text{Number of girls} = \frac{3}{5} \times 40 = 24$$

In section a ratio of boys and girls is in inverse proportion of section B

Number of boys = 24

Number of girls = 16

V. Four marks

55. Ratio of coins = 4: 3: 2: 1

$$\text{Sum of ratio} = 4 + 3 + 2 + 1 = 10$$

$$\text{Number of Rs 10 coins} = \frac{4}{10} \times 100 = 40$$

$$\text{Number of Rs 5 coins} = \frac{3}{10} \times 100 = 30$$

$$\text{Number of Rs 2 coins} = \frac{2}{10} \times 100 = 20$$

$$\text{Number of Rs 1 coins} = \frac{1}{10} \times 100 = 10$$

$$\text{Total money with him} = 40 \times 10 + 30 \times 5 + 20 \times 2 + 10 \times 1$$

$$= 400 + 150 + 40 + 10 = 600$$

56. If students are arranged in 15 rows as 40 students in each row, then

$$\text{ratio is} = 15:40 = 3:8$$

total number of students in the school = number of students in each row $\times$ number of columns $= 15 \times 40 = 600$

if this order is changed

let number of rows be x

$$\text{then } x = \frac{600}{20} = 30$$

Ratio of time students arranged in 30 rows as 20 students in each row

$$= 20:30 = 2:3$$

57. The part of tank that the small pump can fill in one hour $= \frac{1}{5}$

The part of tank that the larger pump can fill in one hour $= \frac{1}{3}$

The part of tank that the both pumps can fill in one hour $= \frac{1}{5} + \frac{1}{3} = \frac{3+5}{15} = \frac{8}{15}$

Time required to fill the tank if both pumps are used together $= \frac{15}{8} = 1 \frac{7}{8}$ hour

or 1 hour 52 minutes

58.

Direct proportion

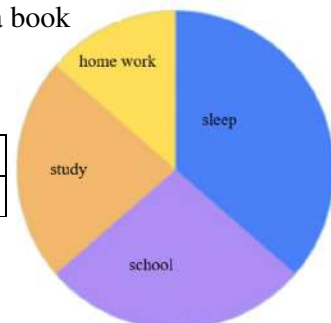
- Primary colours used in making shades of the same colour
- pens and their prices
- Sides of an equilateral triangle and their perimeter

Inverse proportion

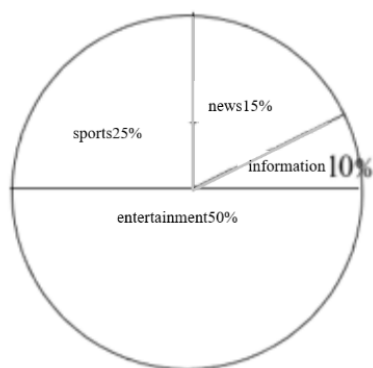
- Time taken to fill a tank and the number of taps
- Speed and time taken to cover a fixed distance
- Number of pages read and number of pages left to read in a book
- 4 people do a work, 6 people can do it

59.

sleep	school	read	homework	games
8 hours	6 hours	5 hours	3 hours	2 hours

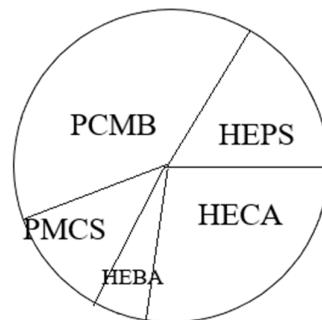


60.



61.

HEPS	PCMB	PMCS	HEBA	HECA
75	125	50	25	100



62. i) The most common mode of transport is Bus

ii) $\frac{1}{12}$ of the students travel by car

Since 18 students travel by car, and it constitutes 30° from the figure.

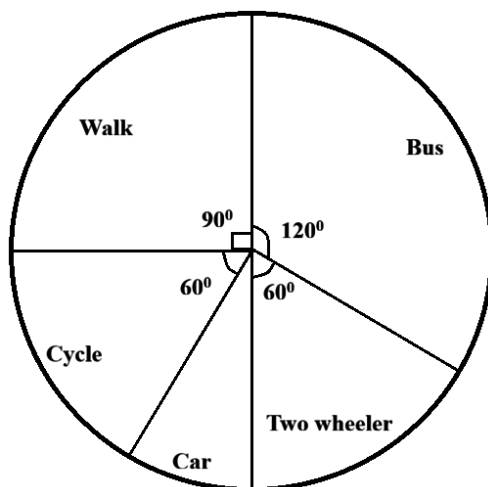
If the total students participated in a survey is n then it is given by

$$\frac{n}{360} \times 30 = 18$$

$$\therefore n = \frac{18 \times 360}{30} = 216$$

iii) 216 children took part in survey, 36 students travel by cycle.

iv) Cycle and two wheeler transport is equal.



CHAPTER-11 EXPLORING SOME GEOMETRICAL THEMES

KEY ANSWERS

I. Multiple choice questions:

1. C) 11
2. C) 6
3. C) 4
4. B) Hexagonal prism
5. B) Hexagonal pyramid
6. D) 6
7. C) Square prism
8. A) Triangular pyramid
9. B) Square
10. B) 11
11. D) Circle or Rectangle
12. A) AB
13. B) Isometric projection
14. C) The same or similar pattern repeats
15. B) 64
16. B) 3^n
17. C) 8
18. C) Net
19. C) 3

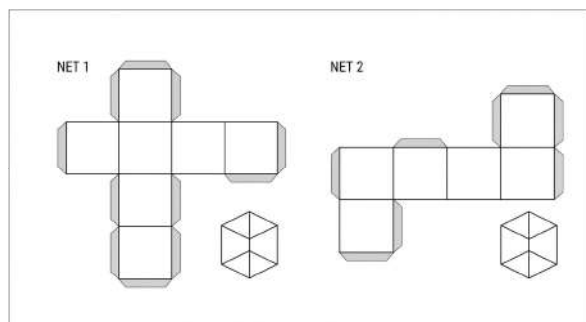
II. One Mark Questions

20. A cuboid can have 54 distinct mathematical nets.
21. Fern leaves, snowflakes, Romanesco broccoli, and branching river networks.
22. The first step requires 4 non-overlapping congruent equilateral triangles to form the basic star shape (one large central triangle and three smaller ones added to its sides).
23. 6 faces.
24. $R_n = 8^n$ (where n is the step number).
25. It is made of 4 congruent equilateral triangles.
26. It is an isometric projection.
27. (10-sided): $2n = 20$ vertices.
28. 12 edges (6 around the base, 6 extending to the apex).

29. 5 vertices (4 on the base, 1 apex).
30. A projection is the representation of a three-dimensional object on a two-dimensional surface.
31. A method of visually representing three-dimensional objects in two dimensions where all three coordinate axes appear equally foreshortened and the angles between any two of them are 120 degrees.
32. It creates a circle (when viewed from the top/bottom) and a triangle (when viewed from the side/front).
33. Equilateral triangles.

III. Two Marks Questions

34. A 2D pattern that can be folded along its edges to form a 3D solid. For example, a cross pattern consisting of six identical squares forms the net of a cube.
35. Sierpinski Triangle sequences:
 Remaining triangles at step n : 3^n
 Number of holes at step n : $H_n = \frac{3^n - 1}{2}$
36. The number of sides at the n^{th} step is 3×4^n .
37. A regular tetrahedron's net consists of four equilateral triangles. Among the standard shapes shown, valid nets are A and C
- 38.

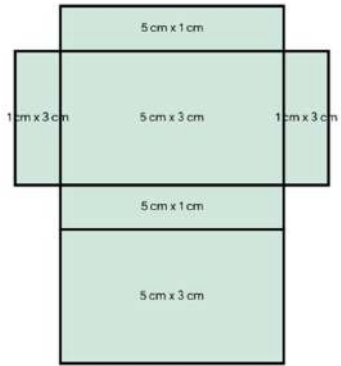


39. Faces and Edges:
 Face: A distinct, flat 2D surface that makes up the boundary of a solid 3D object.
 Edge: A line segment on the boundary of a solid where two faces meet.
40. Prism vs. Pyramid: A prism has two congruent, parallel polygonal bases connected by rectangular side faces. A pyramid has only one polygonal base connected to a single point (apex) by triangular side faces.
41. There are 20 identical cubes in the triangular stack (1 on top, 3 below it, 6 below that, and 10 on the bottom layer).

42. As indicated in the image, there are 20 identical cubes in the stack.

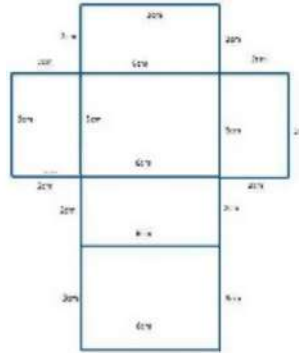
43.

a)

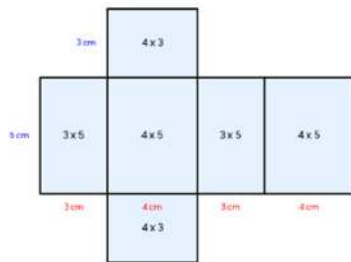


Net of a 5cm x 4cm x 3cm Cuboid

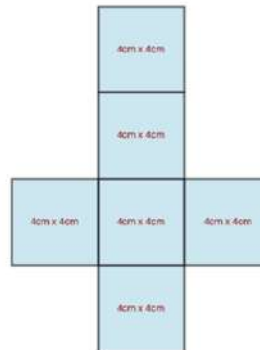
b)



c)



d)



IV. Three-Marks Questions

44. A fractal is a complex, non-regular geometric shape that exhibits self-similarity across different scales (zooming in reveals shapes similar to the whole).

Examples in nature include lightning paths, coastlines, and blood vessel networks.

45. Sierpinski Gasket Construction:

Step 0: Start with a solid equilateral triangle.

Step 1: Find the midpoints of its three sides and connect them to form a central, inverted equilateral triangle. Remove this central triangle.

Step 2: Repeat the midpoint connection and removal process for the remaining three smaller solid triangles. Continue this recursively.

46. By unfolding a 3D object into a 2D net, the surface becomes flat. The shortest path between any two points across the object's faces can then be drawn as a straight, direct line connecting the points on the 2D plane.

47. Koch Snowflake Construction:

Step 0: Start with an equilateral triangle.

Step 1: Divide each line segment into three equal parts.

Step 2: Remove the middle segment and replace it with two line segments of the same length forming an outward-pointing "V" (like an equilateral triangle missing its base).

Repeat recursively for all new line segments.

48. A single 2D projection flattens depth, making it impossible to determine the true shape and all dimensions of a 3D object. Three mutually perpendicular views (front, top, side) accurately capture the object's length, width, and height without geometric ambiguity.

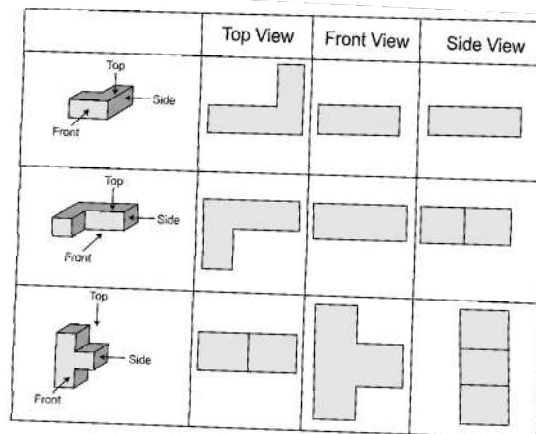
49. (iii) , (iv) and (vi)

50. 10-sided Pyramid:

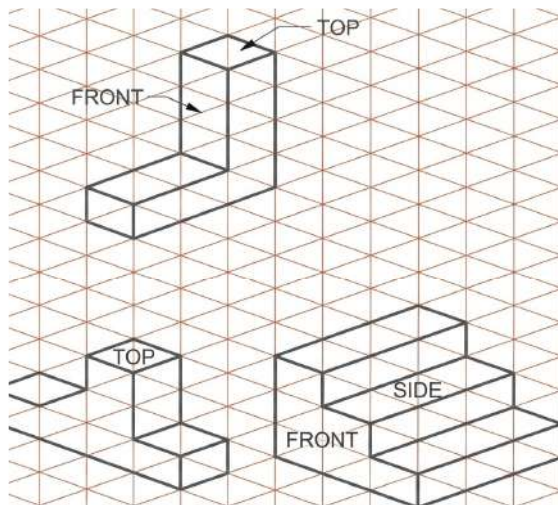
Faces = $n + 1 = 11$ faces

Edges = $2n = 20$ edges

51. Orthographic Drawings:



52. Isometric Grid Exercise:



53. Matching Projections:

- (a) Bottle → Side View (iii), Top View (iv)
- (b) Weight → Side View (i), Top View (v)
- (c) Flask → Side View (iv), Top View (iii)
- (d) Cup and Saucer → Side View (v), Top View (ii)
- (e) Container → Side View (ii), Top View (i)

V. Four-Marks Questions

54. Sierpinski Carpet Construction & Calculations:

Process: Start with a square. Divide it into a 3x3 grid (9 smaller squares). Remove the central square. Repeat this recursively for all remaining solid squares.

Step 0: Squares remaining (R_0) = 1, Holes (H_0) = 0.

Step 1: Squares remaining (R_1) = 8, Holes (H_1) = 1.

Step 2: Squares remaining (R_2) = 64, Holes (H_2) = 9 (1 large hole from step 1 + 8 new smaller holes).

55. An isometric projection is a visual representation where 3D objects are drawn on a 2D plane with lines of width, depth, and height separated by exactly 120 degrees. It is highly significant in engineering drawing because it provides a realistic, unified 3D view of an object while allowing the viewer to directly measure dimensions along the axes in true proportion, unskewed by perspective distortion.

56. Concept of Views & Projections:

Front View: Looking at the object directly from the front (reveals height and width).

Top View: Looking down at the object from directly above (reveals width and depth).

Side View: Looking at the object from the left or right side (reveals height and depth).

Why one view is insufficient: A single 2D projection inevitably hides one of the three dimensions (e.g., a top view shows a cylinder and a sphere as identical circles). Multiple perpendicular views provide the missing spatial data required to understand the actual 3D volume, contours, and concealed features of the object.

CHAPTER-12 TALES BY DOTS AND LINES

KEY ANSWERS

I. Multiple Choice questions:

1. B) Increases by 7
2. C) divided by 5
3. B) Decreases by 3
4. D) The sum of the distances on both sides
5. C) Doubled
6. A) 12
7. C) Remains unchanged
8. A) Increases
9. A) 40
10. B) 20
11. C) The average of the 5th and 6th values
12. B) 154
13. B) Cell
14. B) Letters (A, B, C...)
15. A) =MAX(C1:C20)
16. D) =AVERAGE(B2:B10)
17. B) Row 5, Column C
18. B) =B4+D4
19. B) =MIN()
20. C) Frequency of the data
21. C) =COUNT(A1:A5)
22. C) Line graph
23. C) 16
24. C) Mean of the data
25. C) Trends over time

II. One mark questions:

26. Mean (**AVERAGE**) = $\frac{\text{sum of the scores}}{\text{No of scores}} = \frac{12+8+15+10+5}{5} = \frac{50}{5} = 10$

27. First 5 natural even numbers (2, 4, 6, 8, 10):

$$\text{Mean} = \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$$

28. Distances below the mean: $(7 - 3) = 4$ and $(7 - 5) = 2$. Total distance = $4 + 2 = 6$.

Distances above the mean: $(9 - 7) = 2$ and $(11 - 7) = 4$. Total distance = $2 + 4 = 6$.

Since the distances on both sides are equal ($6 = 6$), it is in equilibrium.

29. New mean = {Old mean} $\times 3 + 5 = 20 \times 3 + 5 = 60 + 5 = 65$.

30. The mean acts as the "center of gravity" of the data. The total distance of values to the left of the mean is always equal to the total distance of values to the right of the mean

31. The mean lies at the balance point.

32. Removed number = (Sum of 7 numbers) - (Sum of 6 numbers).

$$\text{Removed number} = 70 - 54 = 16.$$

33. Total sum = $5 \times 20 = 100$.

34. Mean (**AVERAGE**).

35. It is the intersection point of Column A and Row 1.

36. (Mean formula): =AVERAGE(range).

37. It is called a Cell.

38. Equal sign (=).

39. The mean also increases by 10.

40. Data must be arranged in ascending or descending order.

41. =AVERAGE(A1:A10)

42. =SUM(B2:B5)

43. Median = 8

44. The difference between the maximum value and the minimum value (Range).

45. 15 (It does not change).

46. It typically represents the independent variable.

47. Line Graph. Because it clearly shows changes occurring over time.

III. Two mark questions:

48. Data: 42, 45, 48, 50, 45

Number of students: 5

$$\text{Mean:} = \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{42+45+48+50+45}{5} = \frac{230}{5} = 46$$

Average weight of students is 46 kg.

49. Data: 10, 12, 8, 15, 5, 20, 10

Total values: 7

$$\text{Mean: } \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{410+12+8+15+5+20+10}{7} = \frac{80}{7} = 11.43$$

Average rainfall in the week = 11.43 mm.

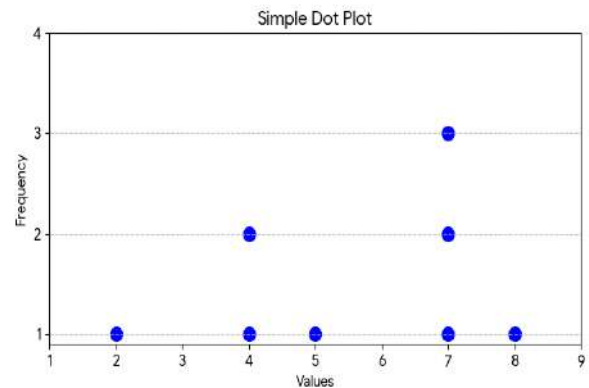
50. Sum of 10 numbers = Mean $\times$ Count

$$\text{Sum} = 50 \times 10 = 500$$

Additional sum when 10 is added to each number = $10 \times 10 = 100$

$$\text{New Mean} = \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{500+100}{10} = \frac{600}{10} = 60$$

51.



52. Data: 4, 7, 9, 12, 15, 18 (Total 6 numbers)

Newly added values: 8 and 11

$$\text{Sum of all numbers: } 4 + 7 + 9 + 12 + 15 + 18 + 8 + 11 = 84$$

Total count (n): 8

$$\text{New mean} = \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{84}{8} = 10.5$$

53. Old sum: Mean $\times$ Count = $15 \times 8 = 120$

$$\text{Sum after adding new value: } 120 + 24 = 144$$

$$\text{New count of numbers: } 8 + 1 = 9$$

$$\text{New mean} = \frac{\text{sum of the scores}}{\text{No of scores}} = \frac{144}{9} = 16$$

The old mean was 15, now it has risen to 16. Therefore, the mean has increased.

54. If each number in a data set is multiplied by a certain constant, the new mean is equal to the product of the old mean and that constant.

Old mean: 45

Constant: 3

$$\text{New mean: } 45 \times 3 = 135$$

The new mean will be 135.

55. Average age of 5 friends: 16 years

Total sum of ages of 5 friends: $16 \times 5 = 80$ years

Sum of ages of four friends: $12 + 14 + 18 + 20 = 64$ years

Age of the fifth friend = Total sum - Sum of four friends

$= 80 - 64 = 16$ years

The fifth friend's age is 16 years.

56. Mean of 6 numbers: 12

Total sum of 6 numbers: $12 \times 6 = 72$

Numbers remaining after removing one: 5

New mean of these 5 numbers: 11

New sum of 5 numbers: $11 \times 5 = 55$

Removed number = Old sum - New sum

$= 72 - 55 = 17$

The removed number is 17.

57. Mean: Showing that the sum of deviations of all points from the mean is zero.

Let's look at the sum of differences when the mean (8) is subtracted from each data point:

$2 - 8 = -6$ $5 - 8 = -3$ $8 - 8 = 0$ $10 - 8 = 2$ $15 - 8 = 7$

Sum of these deviations: $(-6) + (-3) + 0 + 2 + 7 = -9 + 9 = 0$

Therefore, the sum of all distances from the mean is zero.

58. Mean = $\frac{\text{Sum of all numbers}}{\text{Total count of numbers}}$

$$10.375 = \frac{8 + 13 + 10 + 4 + 5 + 20 + y + 10}{8}$$

$$10.375 \times 8 = 70 + y$$

$$83 = 70 + y$$

$$83 - 70 = y$$

$$y = 13$$

IV. Three Marks Questions:

59. Total weight of 8 players = $8 \times 39.2 \text{ kg} = 313.6 \text{ kg}$

Sum of weight of 7 players: $42 + 40 + 39 + 33 + 48 + 38 + 42 = 282 \text{ kg}$

Weight of the 8th player = Total weight - Weight of 7 players

$= 313.6 \text{ Kg} - 282 \text{ Kg} = 31.6 \text{ Kg}$

60. Incorrect Sum = Mean $\times$ Number of students
Incorrect Sum = $75 \times 6 = 450$

Correct Sum = Incorrect Sum - Incorrect Value + Correct Value

$$\text{Correct Sum} = 450 - 60 + 90 = 480$$

$$\text{Correct Mean} = \frac{480}{6} = 80$$

61. i) Minimum Value = MIN(C2:C12)

ii) Maximum Value = MAX(D1:D20)

-iii) Total = SUM(E5:E15)

62. i) Mean = $\frac{10+10+11+17}{4} = \frac{48}{4} = 12$

ii) Deviations below the mean = $(12-10) + (12-10) + (12-11) = 2 + 2 + 1 = 5$

Deviation above the mean (17) = $17 - 12 = 5$

Since $5 = 5$, the sum of deviations is equal.

iii) New set of values: 10, 10, 11, 17, 22

$$\text{Mean} = \frac{10+10+11+17+22}{5} = \frac{70}{5} = 14$$

63. i) Mean = $\frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$

ii) New data after multiplying each value by 2 is 4, 8, 12, 16, 20

$$\text{New Mean} = \frac{4+8+12+16+20}{5} = \frac{60}{5} = 12$$

iii) Relationship between original and new mean: Original Mean = 6, New Mean = 12. Since each value was multiplied by 2, the new mean is double the original mean.

64. i) Adding two values to keep the mean at 9:

For the mean to remain 9, the sum of the two new values must be $9 \times 2 = 18$

New total: $45 + 18 = 63$

New count: $5 + 2 = 7$

$$\text{New mean} = \frac{63}{7} = 9.$$

ii) Adding a value less than 9 and a value greater than 9: Example: 6 and 12.

New total: $45 + 6 + 12 = 63$

New count: 7

$$\text{New mean} = \frac{63}{7} = 9.$$

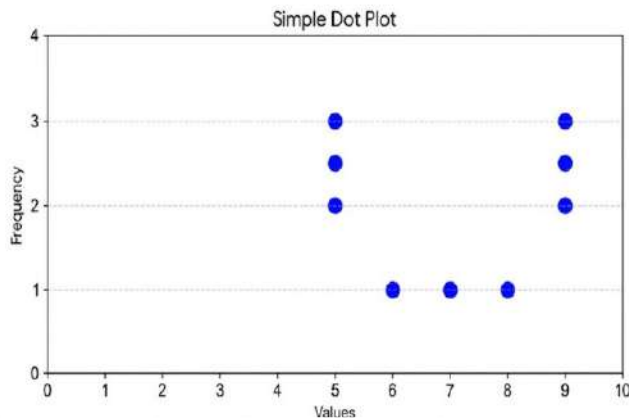
iii) The mean does not change when you remove a value equal to the mean (9) because the average of the remaining numbers remains the same.

65. Mean = $\frac{5+5+5+6+7+8+9+9+9}{9} = \frac{63}{9} = 7$

To find the median, arrange the data in ascending order: 5, 5, 5, 6, 7, 8, 9, 9, 9

The median is the middle value.

Here, the middle value is 7.



66. i) =MAX(A1:A10) = Finds the maximum value in cells A1 to A10.

ii) =SUM(B2:B10) = Calculates the total sum of numbers in cells B2 to B10.

iii) =AVERAGE(C1:C5) = Calculates the average of numbers in cells C1 to C5.

67. Total salary of 20 people = $20 \times ₹5000 = ₹100,000$

Total salary of 21 people = $21 \times ₹5500 = ₹115,500$

Manager's salary = $₹115,500 - ₹100,000 = ₹15,500$.

68. Number of trees = 15

Incorrect Mean = 25.6

Incorrect Total Coconuts = $15 \times 25.6 = 384$

Correct Total = $384 - 3 = 381$

Correct Mean = $\frac{381}{15} = 25.4$

The correct average coconut yield for these 15 trees is 25.4.

69. i) It was hottest at 2:00 PM. Temperature: 32°C

ii) Average Temperature: = $\frac{20+24+30+32+28}{5} = \frac{134}{5} = 26.8^{\circ}\text{C}$

iii) Range is the difference between the maximum and minimum temperatures. Temperature Range = $32^{\circ}\text{C} - 20^{\circ}\text{C} = 12^{\circ}\text{C}$

70.



V. Four marks questions:

71. Analysis of Bicycle Rides

Total number of students (N): $3+1+4+8+8+5+4+6+3+2 = 44$

(i) Total number of rides:

$$(0 \times 3) + (1 \times 1) + (2 \times 4) + (3 \times 8) + (4 \times 8) + (5 \times 5) + (6 \times 4) + (7 \times 6) + (8 \times 3) + (10 \times 2)$$

$$= 0 + 1 + 8 + 24 + 32 + 25 + 24 + 42 + 24 + 20 = 200$$

$$\text{Mean} = \frac{200}{44} \approx 4.55.$$

Students have cycled an average of approximately 4.55 times.

(ii) Median: Since there are 44 students (an even number), the median is the average of the two middle values (22nd and 23rd).

Cumulative frequency: 0-2 rides = 8 students; 0-3 rides = 16 students; 0-4 rides = 24 students.

The 22nd and 23rd values fall in the "4 rides" group.

Median = 4.

72. Arrange the scores in ascending order 8,10, 19,23,26,34,40,41,41,48,51,55,70,84,91,92

Total number of observations (n) = 16 (even)

Finding the Median:

Since n = 16 is an even number, the median is the average of the two middle terms:

$$\text{Median} = \frac{8\text{th term} + 9\text{th term}}{2} = \frac{41 + 41}{2} = 41$$

(i) Including one value without changing the median:

Adding 1 value makes the total number of observations 17 (odd).

The new median will be the 9th term in sorted order.

Since both the 8th and 9th terms of the original list are 41, adding any value

(e.g., 41) will keep the 9th term as 41.

Possible Value: 41 (or any real number)

(ii) Including two values without changing the median:

Adding 2 values makes the total number of observations 18 (even).

The new median will be the average of the new 9th and 10th terms.

Adding 41 and 41 ensures both central terms remain 41. Alternately, adding one value ≤ 41 and another ≥ 41 (such as 40 and 42) also maintains the median as 41.

Possible Values: 41 and 41 (or 40 and 42)

(iii) Removing one value without changing the median:

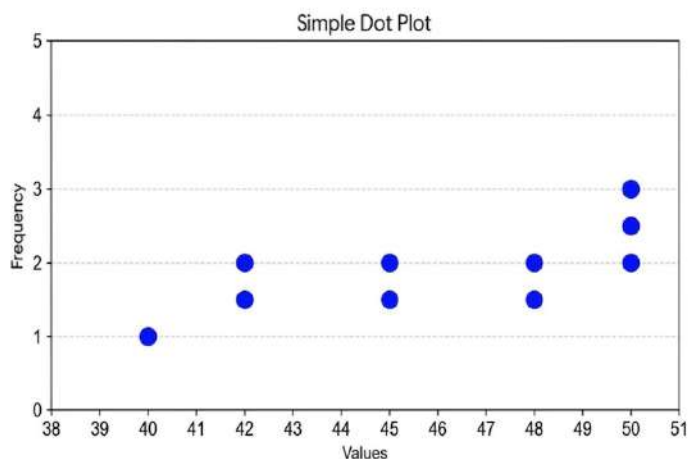
Removing 1 value makes the total number of observations 15 (odd).

The new median will be the 8th term in sorted order.

Removing any single value from the dataset leaves one of the existing 41 at the 8 position.

Possible Value to Remove: 41 (or any existing value like 8, 10, etc.)

73. (i) Dot Plot Analysis



$$(ii) \text{ Mean: } = \frac{40+42+42+45+45+48+48+50+50+50}{10} = \frac{460}{10} = 46$$

$$(iii) \text{ Median: } = \frac{45+48}{2} = 46.5$$

Mode: The value that appears most frequently (50).

74. Mean Calculations

$$(i) \text{ Mean of the first 50 natural numbers } = \frac{(n+1)}{2} = \frac{50+1}{2} = \frac{51}{2} = 25.5$$

(ii) Mean of the first 50 odd numbers:

The mean of the first n odd numbers is n. Mean = 50.

(iii) Mean of the first 50 multiples of 4: First term = 4, 50th term = 200.

$$\text{Mean} = \frac{4+200}{2} = \frac{204}{2} = 102$$

75. Climate Graph (Punjab vs. Kerala)

(i) Temperature in Punjab is highest in June (approx 38°C).

- (ii) Estimated temperature in Kerala in July is 29°C.
- (iii) The lines intersect in April and November.
- (iv) Punjab is cooler during November and December as its temperature line is below Kerala's.

76. Space Launch Data (2012-2024)

- (i) The country that launched the most objects is the USA.
- (ii) There is a sharp increase in global launches since 2020 (Green line rose from 1,250 to over 2,800).
- (iii) In 2020, the USA launched approximately 1,000 objects.
- (iv) Total global launches in 2024 are between 2,800 and 2,900.

77. School Student Population (School A & B)

- (i) In 2024, School A had the highest number of students (500).
- (ii) Mean of School B for the last 5 years = $\frac{280+300+330+390+500}{5} = \frac{1800}{5} = 360$
- (iii) The difference between schools is smallest in 2024 (500 - 500 = 0).
- (iv) In 2024, both schools have the same number of students (500).

78. Company Profit Trends

- (i) The company earned the highest profit in the 9th year (5,00,000 Rs).
- (ii) The lowest profit was in the 3rd year (1,50,000 Rs).
- (iii) The profit increased continuously from the 6th to the 9th year.
- (iv) Post-5th year trend: Slight dip in the 6th year, followed by steady, rapid growth from the 7th to 9th year, and a minor decrease in the 10th year. Overall, the trend is positive.

79. Rainfall Data (July, Udupi, January, November)

- (i) The highest rainfall occurs in July.
- (ii) Udupi receives more rain than Mumbai in June.
- (iii) Kovalam is at its lowest in January.
- (iv) Mumbai's rainfall drops to near zero by November.

CHAPTER-13 ALGEBRA PLAY

KEY ANSWERS:

I.

1. (C) $2x + 4$
2. (B) 5
3. (C) 37
4. (C) Three times
5. (A) 48, 23, 25
6. (C) 6
7. (C) $a + 2b + c$
8. (C) Virahanka Fibonacci Sequence
9. (C) Add 7 to the smallest number and multiply by 4
10. (C) 21
11. (B) 7
12. (B) 6
13. (C) 14
14. (C) $a + 7$
15. (D) $4a + 16$
16. (C) 53×9
17. (C) 9
18. (D) 5

II. One - mark questions

19. $3x + 7 = 19$ -----> $x = 4$
20. $5x - 3 = 12$ -----> $x = 5$
21. $2x + 4 = 10$ -----> $x = 3$
22. $x + 5 = 20$, $x = 15$ years
23. $4x = 24$, $x = 6$ cm
24. $5 + 8 = 13$
25. $20 - 12 = 8$
26. $x + 4 = 9$, $x = 5$
27. 8
28. 7
29. The number directly below it is $(n+7)$
30. $(x + 3)$
31. 25
32. 0, 2, 4, 6 or 8
33. $10a + b$
34. $C = 0$ or $C = 5$
35. Divisible by 99

III. Two marks questions

36. $2(2y + 5) = 30$
 $2y + 5 = 15$
 $y = 5$

37. $\frac{1}{2}(2x + 10) = 15$
 $2x + 10 = 30$
 $x = 10$
38. Top row : 74 , Middle Row : 15 , 21 , Bottom Row : 5
39. 7th number : $5 + 8 = 13$, 8th number : $8 + 13 = 21$, 9th number : $13 + 21 = 34$
40. $x + (x + 3) = 2x + 3$
41. Numbers : 5 , $(5x + 1)$, $(5 + 7)$, $(5 + 8) = 5, 6, 12, 13$
Total : $5 + 6 + 12 + 13 = 36$
42. Mother's age = $3 \times$ Daughter's age
 $28 + x = 3(4 + x)$
 $28 + x = 12 + 3x$
 $28 - 12 = 3x - x$
 $16 = 2x$, $x = 16/2 = 8$
After 8 years, mother's age will be three times her daughter's age.
43. Number : 724 , reversed number : 427
Difference : $724 - 427 = 297$
Division : $297 \div 99 = 3$
Result : The difference (297) is divisible by 99.
44. Fibonacci sequence :
First 10 numbers : 1 , 1 , 2 , 3 , 5 , 8 , 13 , 21 , 34 , 55
Sum of first 10 numbers : 143
11TH NUMBER : $34 + 55 = 89$
12TH NUMBER : $55 + 89 = 144$
Verification : $144 - 1 = 143$ (The sum is indeed 1 less than the 12 th number.

IV. Three marks questions

45. Let the numbers in a 2×2 calendar grid be a , $a + 1$, $a + 7$, $a + 8$
Their sum : $a + (a + 1) + (a + 7) + (a + 8) = 4a + 16$
Calculation : $4a + 16 = 52 - 16 = 36$, $a = 36/4 = 9$
The numbers are : $a = 9$, $a + 1 = 10$, $a + 7 = 16$, $a + 8 = 17$
46. Possible products : $14 \times 8 = 112$, $18 \times 4 = 72$, $41 \times 8 = 328$, $48 \times 1 = 48$
 $81 \times 4 = 324$, $84 \times 1 = 84$
Largest product : $41 \times 8 = 328$
47. $abc = 100a + 10b + c$
 $bca = 100b + 10c + a$
 $cab = 100c + 10a + b$
sum = $111a + 111b + 111c = 111(a + b + c)$ where, $111 = 3 \times 37$
it is divisible by 3 , 37 and 111
48. i) $a = 4$, $b = 13$, $c = 3$, $4 + 2(13) + 8 = 38$
ii) $a = 7$, $b = 11$, $c = 3$, $7 + 2(11) + 3 = 32$
iii. $a = 10$, $b = 14$, $c = 25$, $10 + 2(14) + 25 = 63$

V. Four marks questions

49. Grid 1 , Blue square = x , Red circle = y

Row 1 : $x + x + y = 27$, $2x + y = 27$ ----- (1)

Row 2 : $y + y + x = 21$, $2y + x = 21$ ----- (2)

From (1) we get $y = 27 - 2x$, substitute this in (2)

$2 (27 - 2x) + x = 21$, $3x = 33$, $x = 11$

Finding 'y '

$Y = 27 - 2 (11) = 5$

Row 3 : $y + x + y = 5 + 11 + 5 = 21$

Grid 2 : Blue circle = a , Purple diamond = b

Row 1 : $a + b + b = 15$, $a + 2b = 15$ ----- (1)

Row 2 : $b + a + a = 15$, $2a + b = 15$ ----- (2)

Solving (1) and (2) multiply (1) by 2

$2a + 4b = 30$, subtract (2) , $(2a + 4b) - (2a + b) = 30 - 15$, $3b = 15$, $b = 5$

Substitute in (1) $a + 2(5) = 15$, $a = 5$

Values found blue circle : 5 , purple diamond : 5

ROW 3: (EMPTY TOTAL): $b + a + a = 5 + 5 + 5 = 15$

50. The first three numbers of the sequence are 1, 2 and 3.

Bottom row: 1, 2, 3.

Second row: left side — $1 + 2 = 3$; right side — $2 + 3 = 5$.

Top row: $3 + 5 = 8$.

The numbers appearing in the grid are 1, 2, 3, 5, 8.

The number at the top is 8. All of these are Virahanka–Fibonacci numbers.

51. Let the number of horses be x and the number of chickens be y . $x + y = 55$ — (1)

$4x + 2y = 150$; simplifying, $2x + y = 75$ — (2)

Subtract (1) from (2): $2x + y - x - y = 75 - 55$, so $x = 20$.

Substitute x into (1): $20 + y = 55$, so $y = 55 - 20 = 35$.

Therefore, horses = 20 and chickens = 35.

VI. Five marks question

52. a) Three consecutive dates in a single row : a , $a + 1$, $a + 2$

b) Sum = 36 : $a + (a + 1) + (a + 2) = 36$

$3a + 3 = 36$, $3a = 33$, $a = 11$

The three dates are : $a = 11$, $a + 1 = 12$, $a + 2 = 13$

Verification : $11 + 12 + 13 = 36$

c) $3 \times 1 =$ Vertical coloumn : (since the calender has 7 days in a week)

TOP : a , middle : $a + 7$, bottom : $a + 14$

SUM : $a + a + 7 a + 14 = 3a + 21$

To find ' a ' from a known sum " S "

$$3a + 21 = S = 3a = S - 21 = a = S - 21 / 3$$

Example : $S = 48$ then $a = 48 - 21 / 3 = 9$

DATES : $a, a + 7, a + 14$

$$9, 9 + 7, 9 + 14$$

$$9, 16, 23.$$

CHAPTER-14 AREAS

KEY ANSWERS

I.

1. A) 24 cm^2
2. C) 12 cm
3. D) 25 cm^2
4. B) 20 cm^2
5. A) a^2
6. D) $\text{base} \times \text{height}$
7. A) Half of the area of parallelogram
8. B) 60 cm^2
9. A) 4 cm
10. C) 12 cm and 4 cm
11. B) Parallel sides
12. D) 32 cm^2

II. One-mark questions

13. The area increases by four times.
14. Parallelogram
15. 23 cm (Perimeter $= 2 \times (\text{Length} + \text{Breadth}) = 46$) Therefore, $(\text{Length} + \text{Breadth}) = 46/2 = 23 \text{ cm}$
16. 5 cm (Height $= \frac{\text{Area}}{\text{Base}} = \frac{50}{10} = 5 \text{ cm}$)
17. Rhombus (note – Square is a rhombus).
18. 30 cm (Perimeter $= 4 \times \text{Side} = 4 \times 7.5 = 30$)
19. 196 cm^2
20. Area $= \frac{h}{2} [a + b]$

III. Two marks questions

21. Length $= 3x$ Breadth $= 2x$
Area $= \text{Length} \times \text{Breadth} = (3x)(2x) = 6x^2$
 $600 = 6x^2$
 $x^2 = \frac{600}{6} = 100$
 $x = \sqrt{100} = 10 \text{ m}$
Length $= 3x = 3 \times 10 = 30 \text{ m}$
Breadth $= 2x = 2 \times 10 = 20 \text{ m}$
22. A diagonal of a rectangle divides it into two equal right-angled triangles.
Area of the Triangle $= \frac{1}{2} \text{length} \times \text{Breadth} = \frac{1}{2} (18 \times 10) = 9 \times 10 = 90 \text{ cm}^2$
23. Area $= 96 \text{ cm}^2$, Length $= 8 \text{ cm}$
Area $= \text{Length} \times \text{Breadth}$

$$96 = 8 \times \text{Breadth}$$

$$\text{Breadth} = \frac{96}{8} = 12 \text{ cm}$$

$$\text{Perimeter} = 2(\text{Length} + \text{Breadth}) = 2(8 + 12) = 2(20) = 40 \text{ cm}$$

24. Rectangle, $L = 12 \text{ cm}$, $B = 8 \text{ cm}$

$$\text{Area} = LB = 12 \times 8 = 96 \text{ cm}^2$$

$$\text{Area of a Triangle} = \frac{1}{2}bh$$

$$96 = \frac{1}{2}(12 \times h)$$

$$96 = 6h$$

$$\text{Height of Triangle} = \frac{96}{6} = 16 \text{ cm}$$

25. Area of Square $= a^2 = 441 \text{ cm}^2$

$$\text{Side } (a) = \sqrt{441} = 21 \text{ cm}$$

$$\text{Perimeter} = 4 \times \text{Side} = 4 \times 21 = 84 \text{ cm}$$

26. An A4 sheet is rectangular in shape.

$$\text{Length} = 29.7 \text{ cm}, \text{Breadth} = 21 \text{ cm}$$

$$\text{Area} = \text{Length} \times \text{Breadth} = 21 \times 29.7 = 623.7 \text{ cm}^2$$

27. The general formula for the area of a quadrilateral given a diagonal

$$\text{Area} = \frac{d}{2}[h_1 + h_2] = \frac{22}{2}[3 + 3] = 11(6) = 66 \text{ cm}^2$$

28. Area of Triangle SUB

Given that line SE is perpendicular to the base, it divides the symmetric triangle into two equal parts.

$$\text{Area of Triangle SUB} = [2 \times \text{Area of Triangle SEB}]$$

$$\text{Area} = 2 \times 24 = 48 \text{ Sq. units}$$

29. Area of 1 Plate $= 120 \text{ cm}^2$

$$\text{Area of 5 Plates} = 5 \times 120 = 600 \text{ cm}^2$$

30. Area of a rhombus $= \frac{1}{2}[d_1 \times d_2] = \frac{1}{2}[16 \times 12] = 8 \times 12 = 96 \text{ cm}^2$

31. Let the diagonals of the rhombus be $3x$ and $4x$.

$$\text{Area of the rhombus} = \frac{1}{2}[d_1 \times d_2]$$

$$54 = \frac{1}{2} \times (3x)(4x)$$

$$54 = 6x^2$$

$$x^2 = \frac{54}{6}$$

$$x^2 = 9$$

$$x = 3 \text{ cm}$$

Therefore, the diagonals are:

$$d1 = 3(3) = 9 \text{ cm}$$

$$d2 = 4(3) = 12 \text{ cm}$$

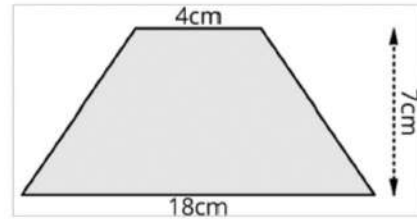
$$32. \text{ Area of a trapezium} = \frac{h}{2} [a + b]$$

$$= \frac{7}{2} [4 + 18]$$

$$= \frac{7}{2} [22]$$

$$= 7(11)$$

$$= 77 \text{ cm}^2$$



$$33. \text{ Area of a trapezium} = \frac{h}{2} [a + b]$$

Given: Area = 162 cm^2 , $h = 9 \text{ cm}$, $a = 15 \text{ cm}$

$$162 = \frac{9}{2} [15 + b]$$

$$324 = 9(15 + b)$$

$$\frac{324}{9} = 15 + b$$

$$36 - 15 = b$$

$$b = 21 \text{ cm}$$

Therefore, the other parallel side is 21 cm.

34. Comparison of Rectangle and Parallelogram Area

Common base for both figures = 5 cm.

Height of both figures = 4 cm.

Area of Rectangle = length $\times$ breadth = $5 \times 4 = 20 \text{ cm}^2$

Area of Parallelogram = base $\times$ height = $5 \times 4 = 20 \text{ cm}^2$

Conclusion: Since both geometric figures share the exact same base of 5 cm and the same height of 4 cm, their calculated areas are equal.

IV. Three marks questions

35. Given: Length (l) = 9 cm, Breadth (b) = 3 cm

Area of the rectangle (A) = $l \times b = 9 \times 3 = 27 \text{ cm}^2$

Perimeter of the rectangle (P) = $2(l + b) = 2(9 + 3) = 2(12) = 24 \text{ cm}$

Ratio ($A : P$) = $27 : 24$

Ratio = $9 : 8$

36. Difference Between the Heights of a Triangle and a Rectangle

Area of Rectangle = length $\times$ breadth

$$50 = 10 \times h$$

$$h = \frac{50}{10} = 5 \text{ cm}$$

Area of a Triangle = $\frac{1}{2}bh$

$$50 = \frac{1}{2}(10 \times h)$$

$$50 = 5h$$

$$h = \frac{50}{5} = 10\text{cm}$$

Difference between their heights = $10\text{cm} - 5\text{cm} = 5\text{cm}$

37. Area of a Path Inside a Park

Outer Rectangle (Entire Park):

Length = 50m Breadth = 40m

$$\text{Area} = \text{Length} \times \text{Breadth} = 50 \times 40 = 2000\text{m}^2$$

Inner Rectangle (Excluding the Path):

Length = $50 - (2 + 2) = 46\text{m}$, Breadth = $40 - (2 + 2) = 36\text{m}$

$$\text{Area} = \text{Length} \times \text{Breadth} = 46 \times 36 = 1656\text{m}^2$$

Area of the Path = Outer Area - Inner Area

$$\text{Area} = 2000 - 1656 = 344\text{m}^2$$

38. Dividing a Pentagon into Triangles

Let the pentagon be named ABCDE.

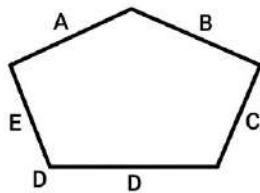
Draw diagonals from vertex 'A' to vertices 'C' and 'D'.

The pentagon is now divided into three triangles: $\triangle ABC$, $\triangle ACD$ and $\triangle ADE$.

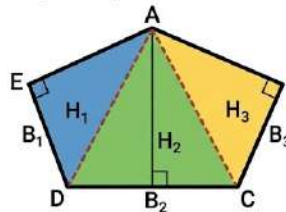
By finding the area of each individual triangle and adding them together, you get the total area of the pentagon.

Calculating Area by Dividing Polygons into Triangles

An example of an irregular pentagon



Measuring an irregular pentagon A, B, C, D, E directly is difficult.



By drawing diagonals from vertex 'A', the pentagon is divided into three triangles.

By finding the area of each triangle ($\frac{1}{2} \times \text{base} \times \text{height}$) and adding them up, the total area of the pentagon is found.

$$\text{Total Area} = \text{Area}(\text{ABC}) + \text{Area}(\text{ACD}) + \text{Area}(\text{ADE})$$

39. Area of a triangle = $\frac{1}{2}bh$

Area of a triangle ABC using base BC and height AX

$$\text{Area of a triangle ABC} = \frac{1}{2}(6 \times 4) = 12 \text{ Square units}$$

Area of a triangle ABC using base AC and height BY

$$\text{Area of a triangle } ABC = \frac{1}{2}(AC \times BY)$$

$$12 = \frac{1}{2}(8 \times BY)$$

$$12 = (4 \times BY)$$

$$BY = \frac{12}{4} = 3 \text{ units}$$

40. Area of the shaded portion

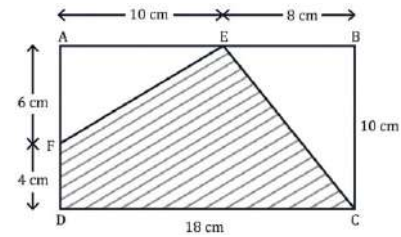
= Area of a rectangle – Area of a triangle AEF – Area of a triangle CBE

$$= lb - \frac{1}{2}b_1h_1 - \frac{1}{2}b_2h_2$$

$$= 18 \times 10 - \frac{1}{2}(6 \times 10) - \frac{1}{2}(8 \times 10)$$

$$= 180 - 30 - 40$$

$$= 110 \text{ cm}^2$$



41. In $\triangle ZYA$ and $\triangle BXA$

$\angle YAZ = \angle XAB$ (Vertically opposite angles)

$YA = AX$ (Given that A is the midpoint of XY)

$\angle ZYA = \angle BXA$ (Alternate interior angles)

$\triangle ZYA \cong \triangle BXA$ By the ASA criteria

Area of $\triangle ZYA$ = Area of $\triangle BXA$

Area of Trapezium $ZYXW$ = Area of Quadrilateral $ZWXA$ + Area of $\triangle ZYA$

Area of Trapezium $ZYXW$ = Area of Quadrilateral $ZWXA$ + Area $\triangle BXA$

Area of Trapezium $ZYXW$ = Area of $\triangle ZWB$

42. Formula to find the Area of a Triangle

$$\text{Area} = \frac{1}{2}bh$$

(i) Triangle ABC:

Base = 4cm Height = 3cm

$$\text{Area} = \frac{1}{2}bh = \frac{1}{2}(4 \times 3) = 2 \times 3 = 6 \text{ cm}^2$$

Base = 5cm Height = 3.2cm

$$\text{Area} = \frac{1}{2}bh = \frac{1}{2}(5 \times 3.2) = 5 \times 1.6 = 8 \text{ cm}^2$$

Base = 3cm Height = 4cm

$$\text{Area} = \frac{1}{2}bh = \frac{1}{2}(3 \times 4) = 3 \times 2 = 6 \text{ cm}^2$$

43. Area of a Parallelogram = $b \times h$

Based on the given figures, here are the calculations:

(i) First Parallelogram:

Base = 7cm Height = 4cm

$$\text{Area} = bh = (7 \times 4) = 28\text{cm}^2$$

(ii) Second Parallelogram:

Base = 5cm Height = 3cm

$$\text{Area} = bh = (5 \times 3) = 15\text{cm}^2$$

44. To understand this problem easily, let's first assume the side length of each square is x .
According to the figure, ABCD, BCEF, and BFGH are identical squares.

Therefore, the Area of each square = x^2

(i) If the shaded Area is 49 square units, find the hatched lines Area:

The shaded part is a triangle (HDC).

Base of this triangle (DC) = x (Side of the square ABCD)

Height of this triangle (HC) = $x + x = 2x$ (Height of two squares combined)

$$\text{Area of a Triangle} = \frac{1}{2}bh$$

$$49 = \frac{1}{2}x(2x)$$

$$49 = x^2$$

This means the area of one square is 49 square units.

The hatched lines section inside square ABCD. Observing the figure, the base of this triangle is $AD = x$ and its height is half the length of the square's side (since the diagonal divides the square into two equal halves).

Simply put, the total area of square ABCD is $x^2 = 49$. The triangle occupies half of this square's capacity in that region. Therefore, the hatched triangle area equals the remaining half of that section.

Hatched lines region Area = 24.5 square units.

45. A rhombus has four equal sides.

Perimeter = 52 cm

$$\text{Since all 4 sides are equal, One Side (s)} = \frac{\text{perimeter}}{4} = \frac{52}{4} = 13\text{cm}$$

Length of the second diagonal

The diagonals of a rhombus bisect each other at right angles (90°). This creates four right-angled triangles inside the rhombus, where the side of the rhombus acts as the hypotenuse,

and the halves of the diagonals act as the base and height.

First Diagonal (d_1) = 24 cm

Half of the first diagonal = 12 cm

By Pythagoras' Theorem: $a^2 + b^2 = c^2$

Half of $d_2^2 = c^2 - (\text{Half of } d_1^2)$

Half of $d_2^2 = 13^2 - 12^2 = 169 - 144 = 25 = 5$ cm

Therefore, the Second Diagonal (d_2) = 5 cm $\times$ 2 = 10 cm

Area of the Rhombus

Formula: $\text{Area} = \frac{1}{2} d_1 \times d_2$

$\text{Area} = \frac{1}{2} 24 \times 10 = 12 \times 10 = 120 \text{ cm}^2$

Conclusion: The area of this rhombus is 120 cm².

46. Analyzing the Rectangle ABCD

Given measures for rectangle $ABCD$:

$BC = 8$ cm (Therefore, opposite side $AD = 8$ cm)

$DC = 12$ cm (Therefore, opposite side $AB = 12$ cm)

Since E is the midpoint of AD : $AE = ED = \frac{8}{2} = 4$ cm

1. Area of Triangle ABE

It is a right-angled triangle because $\angle A = 90^\circ$

Base (AE) = 4 cm Height (AB) = 12 cm

Area of a Triangle = $\frac{1}{2}bh = \frac{1}{2}(4 \times 12) = 2 \times 12 = 24 \text{ cm}^2$

2. Area of Trapezium EBCD

It is a trapezium with parallel sides ED and BC .

Parallel sides: $ED = 4$ cm and $BC = 8$ cm

Height (DC) = 12 cm

Area of a trapezium = $\frac{h}{2}[a + b]$

$= \frac{12}{2}[4 + 8] = 6(12) = 72 \text{ cm}^2$

47. Area of a Trapezoidal Land

Consider a trapezoidal land where the parallel sides are $a = 25$ m and $b = 35$ m, and the non-parallel sides are 13 m each (an isosceles trapezium).

According to Pythagoras' Theorem:

$$h^2 + 5^2 = 13^2$$

$$h^2 + 25 = 169$$

$$h^2 = 169 - 25$$

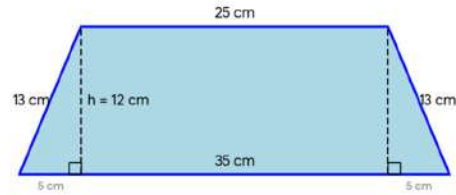
$$h^2 = 144$$

$$h = 12\text{m}$$

Area Calculation

$$\text{Area of a trapezium} = \frac{h}{2} [a + b]$$

$$\text{Area of a trapezium} = \frac{12}{2} (25 + 35) = 6 \times 60 = 360\text{m}^2$$



48. Converting a Trapezium into a Rectangle of Equal Area

A trapezium can be converted into a rectangle of equal area by cutting and rearranging it along the midpoints of its non-parallel sides.

Identify the mid-height line of the trapezium.

Draw a line parallel to the base through the midpoints of the non-parallel sides.

Cut along this line and rotate/rearrange the top section to align next to the bottom section to form a rectangle.

The length of this new rectangle will be the average of the two parallel sides $\frac{(a+b)}{2}$, and its breadth (height) will remain the same as the original trapezium's height if cut vertically from corners, or the height gets modified depending on the slice geometric arrangement.

Generally, Area = Average of parallel sides $\times$ Height.

Using the dimensions from the previous problem (25 m and 35 m parallel sides, 12 m height):

$$\text{Rectangle Length} = \frac{25+35}{2} = 30\text{ m}$$

$$\text{Rectangle breadth} = 12\text{ m}$$

$$\text{Rectangle Area} = \text{Length} \times \text{breadth} = 30 \times 12 = 360\text{ m}^2 \text{ (This matches the area of the trapezium perfectly).}$$

49. Ratio of Areas in a Regular Hexagon

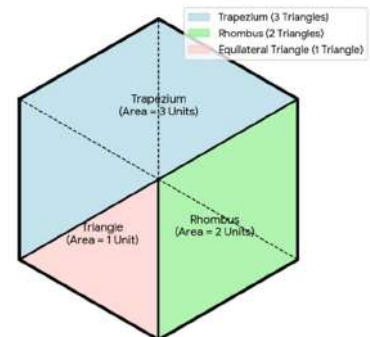
A regular hexagon can be divided into 6 equilateral triangles of equal area by drawing lines from its central point to all its vertices.

Let the area of one individual equilateral triangle be A.

Area of Formed Shapes:

Equilateral Triangle: Contains exactly 1 basic triangle. Area = 1A

Rhombus: Formed by placing 2 basic equilateral triangles side-by-side. Area = 2A



Trapezium: Formed by joining 3 basic equilateral triangles together (which is exactly half of the hexagon). Area=3A

Ratio of Areas:

Following the exact sequence requested in the question:

Area of Trapezium :Area of Equilateral Triangle :Area of Rhombus

$$=3A:1A:2A \quad =3:1:2$$

V. Four marks questions

50. Diagonal 1, $d_1 = 50$ m, Diagonal 2, $d_2 = 120$ m

Half of $d_1 = 25$ m, Half of $d_2 = 60$ m

$$\text{Using the Pythagorean Theorem: } S = \sqrt{25^2 + 60^2} = \sqrt{625 + 3600} = \sqrt{4225} = 65 \text{ m}$$

The total boundary to fence is (Perimeter of a Rhombus) $= 4 \times 65 = 260$ m

Total Cost = Perimeter $\times$ Rate per meter

$$\text{Total Cost} = 260 \times 25 = ₹ 6,500$$

The total cost to fence around the ground is ₹ 6,500.

51. $a = 45$ m, $b = 65$ m, $h = 30$ m

$$\text{Area of a trapezium} = \frac{h}{2} [a + b]$$

$$= \frac{30}{2} [45 + 65]$$

$$= 15[110]$$

$$= 1650 \text{ m}^2$$

Total Yield = Area $\times$ Yield per square meter

$$\text{Total Yield} = 1,650 \times 10 = 16,500 \text{ kg}$$

52. $a = 12$ m, $b = 18$ m, $h = 10$ m

$$\text{Area of a trapezium} = \frac{h}{2} [a + b]$$

$$= \frac{10}{2} [12 + 18]$$

$$= 5[30]$$

$$= 150 \text{ m}^2$$

Total Cost = Area $\times$ Rate per square meter

$$\text{Total Cost} = 150 \times 50 = ₹ 7,500$$