S2 Mathematics Practice Paper: Algebra, Linear Equations, Percentages and Ratios, Geometry, Area and Volume, Statistics

S2 | Mathematics | Time: 60 minutes | Total: 100 marks | 24 questions

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Part 1: Algebra and Factorisation (16 marks)

Answer all questions. 4 marks each.

1. Expand (x + 3)(x - 5). [4]

Answer: x^2 - 2x - 15 - multiply term by term: x*x + x*(-5) + 3*x + 3*(-5) = x^2 - 5x + 3x - 15.

2. Factorise x^2 - 9x + 20. [4]

Answer: (x - 4)(x - 5) - find two numbers whose product is 20 and sum is -9: -4 and -5.

3. Simplify 3(2a - 4) - 2(a - 5). [4]

Answer: 4a - 2 - expand to 6a - 12 - 2a + 10, then collect like terms to get 4a - 2.

4. Given a = 3 and b = -2, find the value of a^2 - 2ab. [4]

Answer: 21 - a^2 = 9 and 2ab = 2 x 3 x (-2) = -12, so 9 - (-12) = 21.

Part 2: Linear Equations and Applications (16 marks)

Solve each equation or problem. 4 marks each.

5. Solve 5x - 7 = 3x + 9. [4]

Answer: x = 8 - subtract 3x from both sides: 2x - 7 = 9; add 7: 2x = 16, so x = 8.

6. Solve 3(x - 2) = x + 8. [4]

Answer: x = 7 - expand to 3x - 6 = x + 8, rearrange to 2x = 14, so x = 7.

7. Four times a number plus 5 equals 37. Find the number. [4]

Answer: 8 - let the number be x: 4x + 5 = 37, so 4x = 32 and x = 8.

8. The sum of two consecutive integers is 45. Find the two integers. [4]

Answer: 22 and 23 - let the smaller be x: x + (x + 1) = 45, so 2x = 44 and x = 22.

Part 3: Percentages and Ratios (16 marks)

Work out each answer. 4 marks each.

9. Find 20% of 45. [4]

Answer: 9 - 45 x 20/100 = 9.

10. An item costs $250 and is sold at a profit of 20%. Find the selling price. [4]

Answer: $300 - the profit is 250 x 20% = $50, so the selling price is 250 + 50 = $300.

11. Simplify the ratio 24 : 36. [4]

Answer: 2 : 3 - divide both terms by the HCF 12.

12. Increase 60 by 15%. What is the result? [4]

Answer: 69 - the increase is 60 x 15% = 9, so the result is 60 + 9 = 69 (or 60 x 1.15).

Part 4: Geometry and Angles (16 marks)

Work out each answer. 4 marks each.

13. Two angles of a triangle are 55 and 65 degrees. Find the third angle. [4]

Answer: 60 degrees - the angle sum of a triangle is 180, so 180 - 55 - 65 = 60.

14. Find the size of each interior angle of a regular octagon. [4]

Answer: 135 degrees - the angle sum is (8 - 2) x 180 = 1080, so each angle is 1080 / 8 = 135.

15. A transversal cuts two parallel lines. One corresponding angle is 115 degrees. Find the other corresponding angle. [4]

Answer: 115 degrees - corresponding angles are equal when a transversal cuts parallel lines.

16. The sum of the interior angles of a polygon is 1080 degrees. How many sides does it have? [4]

Answer: 8 sides - (n - 2) x 180 = 1080, so n - 2 = 6 and n = 8.

Part 5: Area and Volume (18 marks)

Work out each answer. Note the marks for each question.

17. A parallelogram has base 14 cm and height 6 cm. Find its area. [4]

Answer: 84 cm2 - area = base x height = 14 x 6 = 84 cm2.

18. A trapezium has parallel sides 8 cm and 14 cm and height 5 cm. Find its area. [4]

Answer: 55 cm2 - area = (8 + 14) x 5 / 2 = 55 cm2.

19. A cylinder has radius 7 cm and height 10 cm. Find its volume (take pi = 22/7). [5]

Answer: 1540 cm3 - volume = pi x r x r x h = 22/7 x 7 x 7 x 10 = 1540 cm3.

20. The total surface area of a cube is 216 cm2. Find its side length. [5]

Answer: 6 cm - the six faces are equal, so each is 216 / 6 = 36 cm2, and the side is the square root of 36 = 6 cm.

Part 6: Statistics and Averages (18 marks)

Work out each answer. Note the marks for each question.

21. The sum of 6 numbers is 84. Find their mean. [4]

Answer: 14 - mean = total / number of values = 84 / 6 = 14.

22. Find the median of 12, 8, 15, 9 and 20. [4]

Answer: 12 - in order: 8, 9, 12, 15, 20. There are 5 values, so the middle one is 12.

23. A shop sells 12, 18, 15 and 20 items on four days. Find the mean daily sales. [5]

Answer: 16.25 items - the total is 12 + 18 + 15 + 20 = 65, and 65 / 4 = 16.25.

24. The mean of 5 numbers is 18. After one more number is added, the mean of the 6 numbers is 20. Find the number added. [5]

Answer: 30 - the original total is 18 x 5 = 90 and the new total is 20 x 6 = 120, so the number added is 120 - 90 = 30.
