S4 Mathematics Practice Paper 2 | trigonometry, 3D solids, statistics, linear programming

Senior Secondary Mathematics

S4 Maths practice paper 2 with answers: trigonometric ratios, sine and cosine rules, 3D solids, statistics, coordinate geometry, linear programming and probability.

1. Trigonometric ratios and solving triangles (16 marks)

Show working in all parts; give answers to 3 significant figures or 1 decimal place.

#	Question
1	(a) In a right-angled triangle the opposite side is 7 cm and the adjacent side is 24 cm. Find the hypotenuse and sin θ, cos θ, tan θ to 3 decimal places, where θ is the angle opposite the 7 cm side.
2	(b) From a point on level ground 40 m from the foot of a tower, the angle of elevation of the top is 32 degrees. Find the height of the tower (1 decimal place).
3	(c) In triangle ABC, angle A = 48 degrees, angle B = 67 degrees and a = 12 cm. Find angle C and b (1 decimal place).
4	(d) Two sides of a triangle are 9 cm and 12 cm with an included angle of 55 degrees. Find the third side and the area (1 decimal place).

2. 3D solids and measurement (18 marks)

Take pi as 3.142 and give answers to 1 decimal place.

#	Question
5	(a) A cone has base radius 5 cm and height 12 cm. Find its slant height, volume and total surface area.
6	(b) A sphere has radius 5 cm. Find its surface area and volume.
7	(c) A solid cylinder has radius 4 cm and height 10 cm. Find its total surface area and volume.
8	(d) A box measures 30 cm by 20 cm by 15 cm. Find its surface area. How many 5 cm cubes fill it? If 4 cm cubes are packed in rows instead, what is the maximum number and what volume of the box is left empty?

3. Statistics and data analysis (16 marks)

Test scores of 8 students in ascending order: 12, 15, 15, 18, 20, 22, 25, 28. Show working or explain.

#	Question
9	(a) Find the mean (2 decimal places) and the range.
10	(b) Find the median and the mode.
11	(c) Find the lower quartile, upper quartile and interquartile range.
12	(d) Find the standard deviation of the 8 scores (population, 2 decimal places).

4. Coordinate geometry and the circle (18 marks)

Show working throughout.

#	Question
13	(a) Given A(2, -1) and B(7, 11), find the length of AB and the coordinates of its midpoint.
14	(b) Find the slope of the line through A(2, -1) and B(7, 11) and write its equation in the form ax + by + c = 0.
15	(c) Find the coordinates of the intersection of the lines 3x + y = 10 and x - 2y = 1.
16	(d) A circle has equation x^2 + y^2 - 6x + 8y - 11 = 0. Find its centre, radius, circumference and area (pi = 3.142, 1 decimal place).

5. Linear inequalities and linear programming (16 marks)

Show working or explain throughout.

#	Question
17	(a) Solve the inequality 5x - 7 > 2x + 8.
18	(b) Solve the inequality -3x + 4 >= 19.
19	(c) Subject to x + y = 0, y >= 0, find the maximum of P = 3x + 2y and the point where it occurs.
20	(d) Using the region in (c), find its area in square units.

6. Probability and counting (16 marks)

Show working throughout; probabilities may be given as fractions or decimals.

#	Question
21	(a) A bag holds 5 red, 3 blue and 2 green balls. One ball is drawn at random. Find P(red) and P(not green).
22	(b) Two balls are drawn from the same bag without replacement. Find the probability that both are red, as a fraction.
23	(c) Five students stand in a row. Find the number of arrangements; if two named students must stand together, find the number of arrangements.
24	(d) Three students are chosen from 8 to form a committee. Find the number of committees and the probability that one named student is included.