Measurement & Geometry

Question 1 **(6 marks)**

A decorative solid is formed by joining a cone of radius 6 cm and height 8 cm to a hemisphere of the same radius 6 cm, so that the cone's circular base and the hemisphere's flat face coincide exactly. The resulting solid has a single pointed vertex at the bottom of the cone and a rounded dome at the top; it has no flat (exposed) faces.

(a) Calculate the slant height of the cone. (1 mark)

(b) Calculate the volume of the whole solid, correct to 2 decimal places. (3 marks)

(c) Calculate the total surface area of the whole solid (the curved surface area of the cone plus the curved surface area of the hemisphere), correct to 2 decimal places. (2 marks)

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Question 2 **(6 marks)**

In triangle ABC, the angle at A is 35°, the angle at B is 82°, and the side AB = 9.5 m.

(a) Find the size of angle C. (1 mark)

(b) Use the sine rule to find the length of side BC, correct to 2 decimal places. (3 marks)

(c) Hence find the area of triangle ABC, correct to 2 decimal places. (2 marks)

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Number & Algebra

Question 3 **(5 marks)**

(a) Factorise and hence solve: $x^2 - 5x - 24 = 0$. (2 marks)

(b) Solve $2x^2 + 3x - 7 = 0$ using the quadratic formula, giving your answers correct to 2 decimal places. (3 marks)

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Question 4 **(8 marks)**

(a) Evaluate $8^{-2/3}$, showing your working. (2 marks)

(b) Simplify $(m^4n^{-3}) \div (m^{-1}n^2)$, giving your answer with positive indices only. (2 marks)

(c) Simplify $\sqrt{45} + \sqrt{20}$, giving your answer as a single surd in simplest form.

Then, using a similar idea, rationalise the denominator of $\frac{6}{\sqrt{3}}$, giving your answer in simplest surd form. (4 marks)

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Statistics & Probability

Question 5 **(5 marks)**

The table below shows the number of hours of exercise per week (x) and the resting heart rate in beats per minute (y) for 7 adults. x (hours): 1, 2, 3, 4, 5, 6, 7 y (bpm): 78, 74, 70, 68, 64, 60, 58

(a) State whether the correlation between exercise hours and resting heart rate is positive or negative. (1 mark)

(b) Describe the strength of this correlation, and justify your answer using the data. (2 marks)

(c) A line of best fit for this data is given by $y = -3.2x + 81$. Use this equation to estimate the resting heart rate of a person who exercises for 10 hours a week, and state whether this estimate is an example of interpolation or extrapolation. (2 marks)

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Question 6 **(9 marks)**

The number of goals scored by a basketball team in its last 5 games was: 2, 4, 6, 8, 10.

(a) Calculate the mean and the standard deviation of this data set, giving the standard deviation correct to 2 decimal places. (4 marks)

A bag contains 5 red marbles and 3 blue marbles. A marble is drawn at random, its colour is recorded, and it is then returned to the bag before a second marble is drawn (the two draws are independent).

(b) Using a tree diagram or otherwise, find the probability that both marbles drawn are red. (2 marks)

Suppose instead that the first marble is NOT returned to the bag before the second marble is drawn (the draws are now dependent).

(c) Find the probability that the first marble drawn is red and the second marble drawn is blue. (3 marks)

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