

d) Solve the equation $\sin 2x = 0.5$ for $0 \leq x \leq 180^\circ$. 7 marks

14. When objects are launched upwards through a fluid with an initial velocity, v metres per second, they achieve a maximum height of h metres.

h is directly proportional to the square of v . When $v = 10$, $h = 5$.

a) Work out an equation for h in terms of v , evaluating any constants.

b) Calculate the value of v when $h = 8.45$.

Two identical balls are launched upwards. The ratio of their initial speeds is 5:2.

c) Work out the ratio of the maximum heights achieved. 6 marks

15. A student is analysing the results from a game of chance, which had 20 rounds. In the last 20 rounds, he won 8 rounds, lost 4 rounds, and drew 8 rounds.

Estimate the probability that—

a) In the next two rounds, they win one round and lose the other.

b) They lose the next three rounds. 4 marks

16. A is the point $(4, 1)$, B is the point $(-3, 5)$ and O is the point $(0,0)$.

a) i) Write \vec{AB} as a column vector.

ii) Find the length of \vec{AB} leaving your answer as a surd.

D is a point such that BD is parallel to $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$ and the length of \vec{AD} is the same as the length of \vec{AB} .

b) Find OD as a column vector.

C is the point such that $ABCD$ is a rhombus.

c) Find the coordinates of C . 8 marks

17. The lengths of the sides, in metres, of a rectangle are $3 - \sqrt{5}$ and $3 + \sqrt{5}$ respectively.

Find, in their simplest forms—

a) The rectangle's perimeter.

b) The rectangle's area. 4 marks

18. Make Q the subject of the equation, $\frac{Q}{V^2} = 2Qp + 12$ 4 marks

19. Solve the equation, $\frac{1}{x} + \frac{6x}{x-1} = 6$ 5 marks

20. a) Show that the x -coordinate of the points of intersection of the line $y = 2x + 2$ and the circle $x^2 + y^2 = 8$ must satisfy the equation $5x^2 + 8x - 4 = 0$.

b) Hence find the coordinates of the points where the line $y = 2x + 2$ intersects the circle $x^2 + y^2 = 8$.

6 marks