

Additional Mathematics

Grade Gobbler 2

40 Mark Paper

Question 1

Write each of the following in the form, $k\sqrt{2}$, where k is an integer.

(i) $\sqrt{50}$ (ii) $\sqrt{6} \times \sqrt{48}$ (iii) $\frac{14}{\sqrt{2}}$

[3 marks]

Question 2

Determine the value of, $\int_1^3 \frac{x^3 + 3x^2}{2x} dx$

Hint : Wedge it !

[5 marks]

Question 3

(a) Use the nC_r button on your calculator to determine the values of,

(i) 5C_2

(ii) 8C_3

(iii) ${}^{15}C_5$

[3 marks]

(b) Show where 5C_2 is on a diagram of Pascal's Triangle.

[2 marks]

(c) A coin is biased such that, when tossed, the probability of it landing heads is 0.4. This coin is tossed ten times.

Use the formula;

$$P(r \text{ heads}) = {}^nC_r p^r q^{n-r}$$

to calculate the probability that exactly four of the ten tosses are heads.

Give your answer to three decimal places.

In this formula,

n is the number of times the coin is tossed

r is the number of heads

p is the probability of heads occurring

q is the probability of heads NOT occurring

[4 marks]

Question 4

A straight line has equation $y = 2x + 4$

A circle has equation $(x + 1)^2 + (y - 3)^2 = 10$

- (i) Write down the coordinates of the centre of the circle.

[2 marks]

- (ii) Determine, accurate to two decimal places, the radius of the circle.

[1 mark]

- (iii) Find the coordinates of the two points where the line and circle intersect.

[6 marks]

Question 5

A rocket is catapulted vertically upwards from its launch pad.

Its height in metres, h , at time, t seconds, is given by;

$$h = 0.5t^3 - 4t^2 + 10t$$

- (i) How high is the rocket when $t = 2$?

[1 mark]

- (ii) Find $\frac{dh}{dt}$, an expression for the vertical velocity of the rocker at time t .

[2 marks]

- (iii) With what vertical velocity was the rocket launched ?

[1 mark]

- (iv) Find $\frac{d^2h}{dt^2}$, an expression for the vertical acceleration at time t .

[1 mark]

The rocket, as it travels upwards, is initially slowing down until the weight of fuel burnt makes it light enough to start accelerating upwards.

- (v) For how long is the rocket's acceleration upwards negative ?

[3 marks]

Question 6

Expand the brackets, $(x - 1)(x + 1)^3$

[6 marks]

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