

Additional Mathematics

Grade Gobbler 3

40 Mark Paper

Question 1

The circumference of a circle with centre $(8, -15)$ passes through the origin.

(i) What is the radius of the circle?

[2 marks]

(ii) Write down the equation of the circle.

[2 marks]

Question 2

Use Pascal's triangle to expand the brackets;

$$(5 - 2x)^3$$

Give each term in your expansion in as simple a form as possible.

The following may be of help in setting out your working....

$$\begin{aligned}(5 - 2x)^3 &= \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \\ &+ \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \\ &+ \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \\ &+ \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix} \times \begin{pmatrix} \\ \\ \end{pmatrix}\end{aligned}$$

[4 marks]

Question 3

Solve the following equation for $0^\circ \leq \theta \leq 360^\circ$

$$2 \sin^2 \theta - \sin \theta - 1 = 0$$

[5 marks]

Question 4

$$f(x) = \sqrt{x} (1 + \sqrt{x})$$

Find $f'(x)$

[3 marks]

Question 5

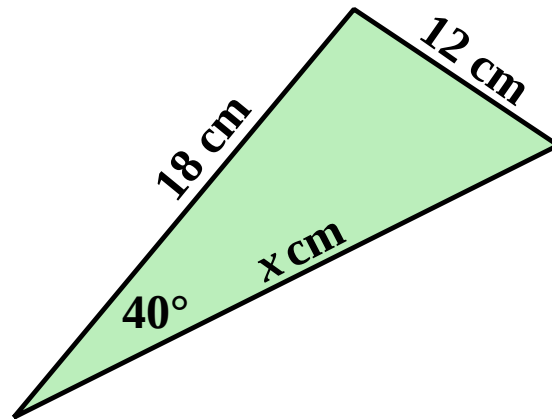
A car accelerates uniformly at 4 m s^{-2} for 12 seconds.

Initially, the car was moving at 13 m s^{-1}

What distance does the car cover during this period of acceleration ?

[3 marks]

Question 6



- (i) Find the length of the side marked x in the diagram above.

[3 marks]

- (ii) Find the area of the triangle.

[2 marks]

Question 7

Find, to 3 significant figures, the value of;

(i) $\sqrt[7]{\pi^3}$

(ii) $\left(\frac{1}{\pi} \right)^\pi$

[2 marks]

Question 8

A circle has equation $x^2 + y^2 - 10x - 8y + 16 = 0$

(i) Write the equation of this circle in the form

$$(x - a)^2 + (y - b)^2 = r^2$$

where a , b and r are constants with values to be found.

(ii) State the coordinates of the circle's centre, and its radius.

[3 marks]

(iii) Find the two points where the circle intersects in x -axis.

[2 marks]

(iv) Where does the circle intersect the y -axis ?

[2 marks]

(v) The point $(9, 7)$ is on the circumference of the circle.
Find the equation of the tangent to the circle at $(9, 7)$.

[1 marks]

[4 marks]

Question 9

$$f(x) = x^3 + x$$

Prove that $f(x)$ has no turning points.

[3 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk