IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper O

Difficulty Rating: 3.5600/1.6393

Time: 1 hour 30 minutes

Candidates may use any calculator allowed by the Regulations of the Joint Council for Qualifications.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
The standard booklet "Mathematical Formulae and Statistical Tables" may be used.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 9 questions in this question paper.
The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.
Non exact answers should be given to an appropriate degree of accuracy.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1

The polynomial $p(x)$ is defined as

$$p(x) = 2x^3 - 11x^2 + 20x - 12 .$$

a) Use the factor theorem to show that $(x-2)$ is a factor of $p(x)$. **(2)**

b) Express $p(x)$ as the product of three linear factors. **(2)**

c) Find the remainder when $p(x)$ is divided by $(x+2)$. **(1)**

d) Determine the value of each the constants a, b and c so that

$$p(x) = (x+2)\left(2x^2 + ax + b\right) + c .$$ **(3)**

Question 2

A circle C has equation

$$x^2 + y^2 = 8x + 4y .$$

a) Determine the coordinates of the centre of C and the size of its radius. **(3)**

The circle meets the coordinate axes at the origin O and at two more points A and B.

b) Find the coordinates of A and B. **(3)**

c) Sketch the graph of C. **(2)**

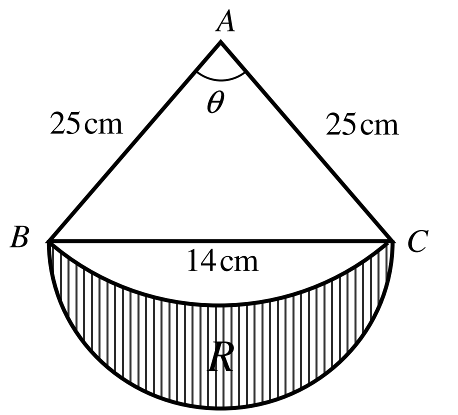
d) **State** with full justification but **without** any further calculations the length of AB. **(1)**

Question 3

Solve the following logarithmic equation

$$\log_2(2z+1) = 2 + \log_2 z \, . \qquad (3)$$

Question 4



not drawn accurately

The figure above shows an isosceles triangle ABC attached to a semicircle with BC as its diameter.

It is further given that $|AB| = |AC| = 25$ cm , $|BC| = 14$ cm and the angle BAC is θ radians.

A circular arc BC is drawn inside the semicircle, centred at A with radius 25 cm .

a) Determine the area of the triangle ABC . **(3)**

b) Show that $\theta = 0.568$ radians, correct to three significant figures. **(2)**

c) Find the area of the region R , shown shaded in the figure. **(3)**

Question 5

The first three terms of a geometric series are

$$(2k-5),\ k \text{ and } (k-6) \text{ respectively,}$$

where k is a non zero constant.

a) Show that k is a solution of the equation

$$k^2 - 17k + 30 = 0. \qquad \mathbf{(2)}$$

b) Given that the series converges, find its sum to infinity. **(5)**

c) Given instead that series does not converge, find the sum of its first ten terms. **(2)**

Question 6

$$f(x) \equiv (k+x)^n,\ x \in \mathbb{R},$$

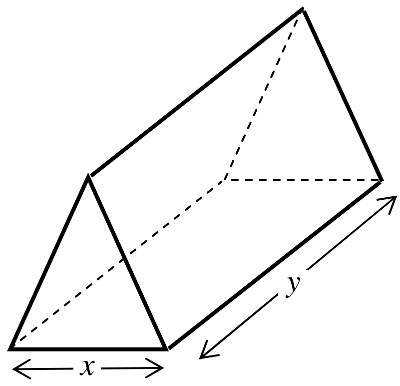
where k and n are constants such that $k \in \mathbb{R}$, $k \neq 0$, $n \in \mathbb{N}$, $n > 3$.

a) Given the coefficients of x^2 and x^3 in the binomial expansion of $f(x)$ are equal, show clearly that

$$n = 3k + 2. \qquad \mathbf{(5)}$$

b) Given further that $k = 2$, determine the coefficient of x^4 in the binomial expansion of $f(x)$. **(2)**

Question 7



The figure above shows a triangular prism whose triangular faces are parallel to each other and are in the shape of **equilateral** triangles of side length x cm.

The length of the prism is y.

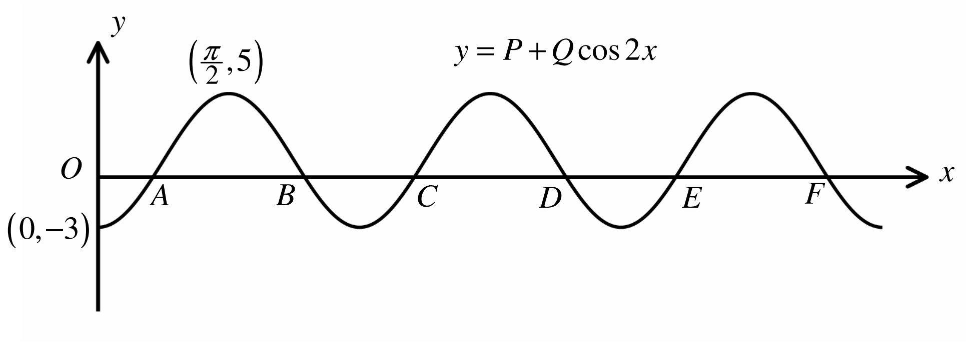
a) Given that total surface area of the prism is exactly $54\sqrt{3}$ cm^2, show clearly that the volume of the prism, V cm^3, is given by

$$V = \frac{27}{2}x - \frac{1}{8}x^3 .$$ **(5)**

b) Find the maximum value of V, fully justifying the fact that it is indeed the maximum value. **(6)**

c) Determine the value of y when V takes this maximum value. **(2)**

Question 8



The figure above shows part of the graph of

$$y = P + Q\cos 2x, \quad x \geq 0,$$

where P and Q are constants.

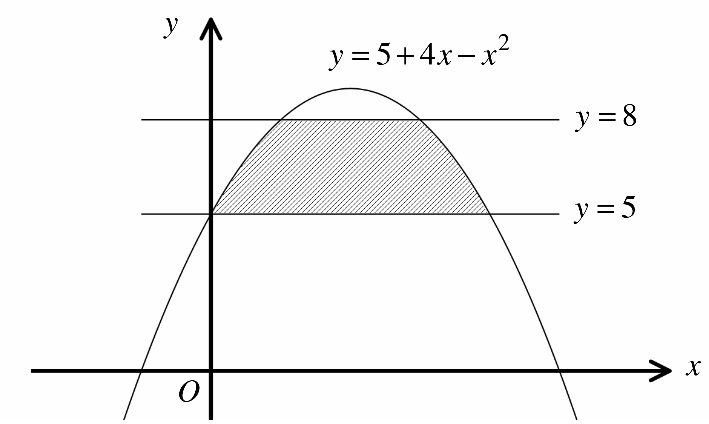
The points $(0,-3)$ and $\left(\dfrac{\pi}{2},5\right)$ lie on the graph of y.

a) Find the value of P and the value of Q. **(3)**

The first six x intercepts of the graph are labelled A to F.

b) Determine to two decimal places the x coordinates of the six points, labelled as A to F. **(6)**

Question 9



The figure above shows the curve C with equation

$$y = 5 + 4x - x^2,$$

intersected by the horizontal straight lines with equations $y = 5$ and $y = 8$.

Calculate the exact area of the shaded region, bounded by C and the two straight lines.

(9)