IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper H

Difficulty Rating: 3.1733/1.4151

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 11 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

a) Find the first four terms, in ascending powers of x, in the binomial expansion of $(1+3x)^8$. **(4)**

b) Determine the coefficient of x^6 in the binomial expansion of $(1+3x)^8$. **(1)**

Question 2

The common ratio of a geometric series is twice as large as its first term.

a) Given that the sum to infinity of the series is 1, find the exact value of the first term of the series. **(4)**

b) Determine, as an exact fraction, the value of the fifth term of the series. **(3)**

Question 3

$$f(x) \equiv x^3 + px^2 + qx + 6$$

a) Find the value of each of the constants p and q, given that …

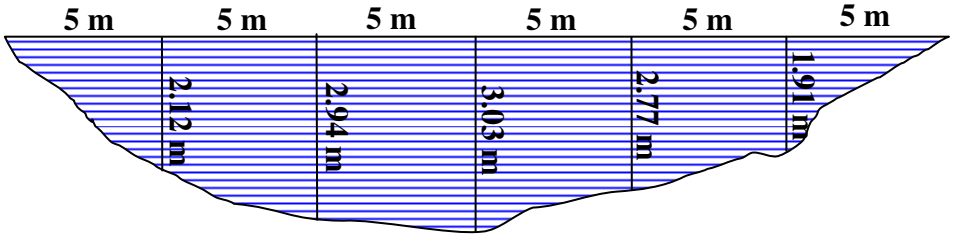
… $(x-1)$ is a factor of $f(x)$

… when $f(x)$ is divided by $(x+1)$ the remainder is 8. **(6)**

b) Hence solve the equation $f(x) = 0$. **(4)**

Question 4

The figure below shows the cross section of a river.



The depth of the river, in metres, from one river bank directly across to the other river bank, is recorded at 5 metre intervals.

Estimate the cross sectional area of the river, by using the trapezium rule with all the measurements provided in the above figure. **(4)**

Question 5

Solve the following trigonometric equation in the range given.

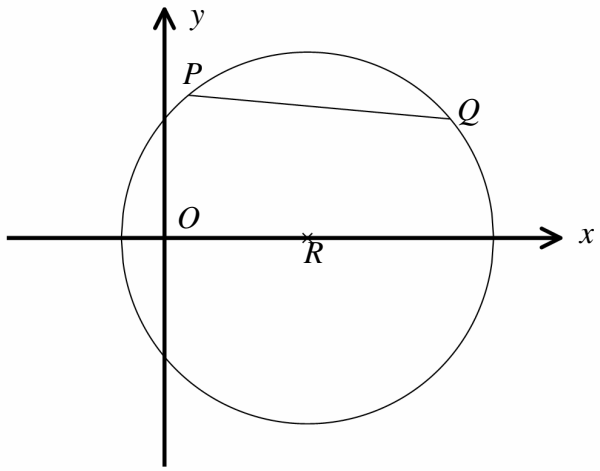
$$2\sin\theta = 5\cos\theta, \quad 0° \le \theta < 360°. \qquad \textbf{(4)}$$

Question 6

Solve the following logarithmic equation

$$\log_a x + \log_a (x-3) = \log_a 10. \qquad \textbf{(5)}$$

Question 7



A circle C passes through the points $P(1,6)$ and $Q(12,5)$.

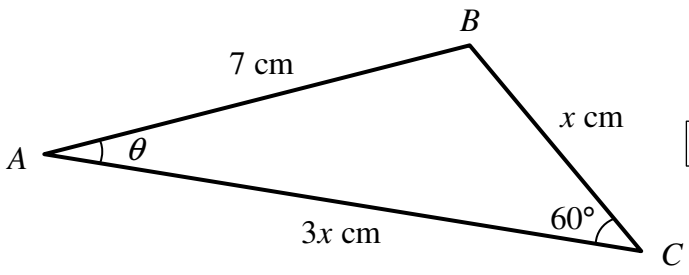
a) Find the gradient of PQ. **(2)**

The centre of C is the point R which lies on the x axis.

b) Show that the coordinates of R are $(6,0)$. **(5)**

c) Determine an equation for C. **(3)**

Question 8



not drawn accurately

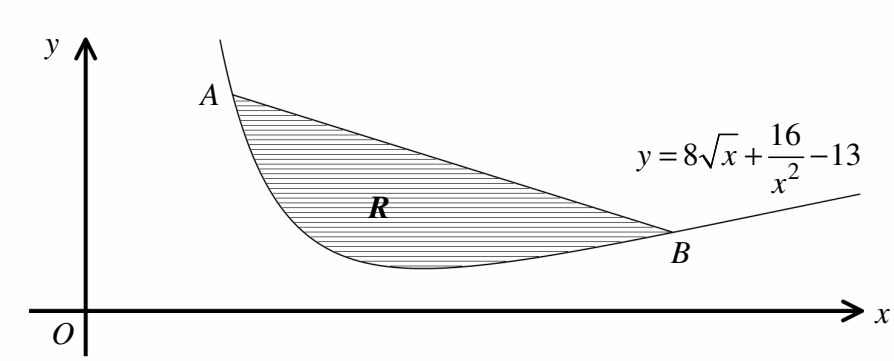
The figure above shows a triangle ABC with side lengths $|AB| = 7$ cm, $|BC| = x$ cm and $|AC| = 3x$ cm.

The sizes of the angles ACB and BAC are $60°$ and $\theta°$, respectively.

By using the **cosine** rule first to find the value of x, and the **sine** rule afterwards,, show clearly that

$$\sin\theta = \frac{\sqrt{21}}{14} \qquad (\mathbf{6})$$

Question 9



The figure above shows part of the curve with equation

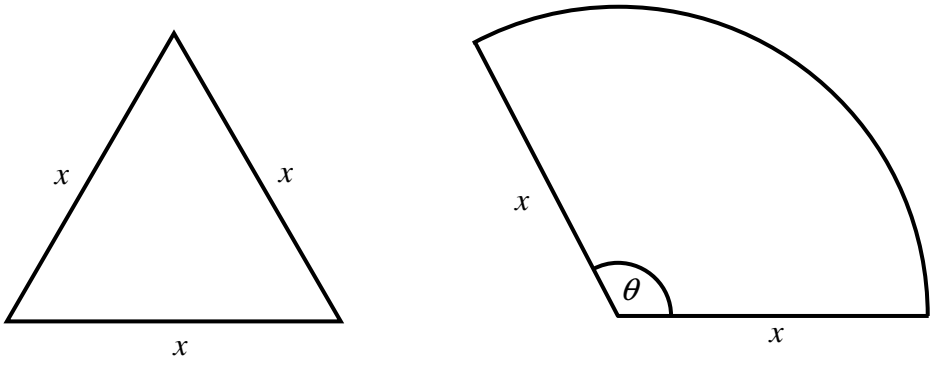
$$y = 8\sqrt{x} + \frac{16}{x^2} - 13 , \ x > 0 .$$

The points A and B lie on the curve where $x = 1$ and $x = 4$, respectively.

The finite region R is bounded by the curve, the straight line segment AB.

Determine the exact area of R. **(8)**

Question 10



A wire of total length 60 cm is to be cut into two pieces.

The first and piece is bent to form an equilateral triangle of side length x cm and the second piece is bent to form a circular sector of radius x cm.

The circular sector subtends an angle of θ radians at the centre.

a) Show that

$$x\theta = 60 - 5x \,. \qquad (\mathbf{2})$$

The **total** area of the **two** shapes is A cm^2.

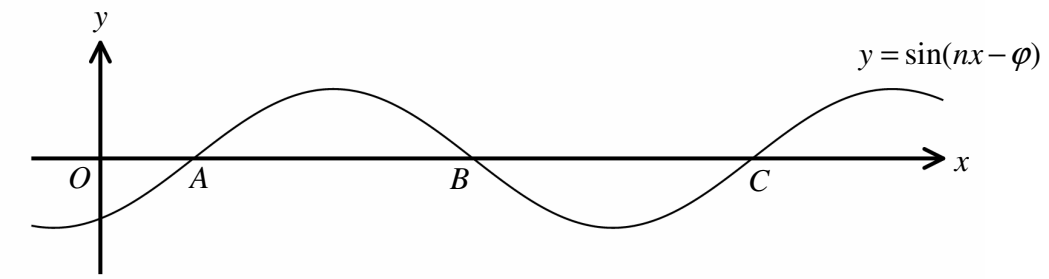
b) Show clearly that

$$A = \frac{1}{4}\left(\sqrt{3} - 10\right)x^2 + 30x \,. \qquad (\mathbf{3})$$

c) Use differentiation to find the value of x for which A is stationary. $(\mathbf{4})$

d) Find, to three significant figures, the maximum value of A, justifying the fact that it is the maximum value of A. $(\mathbf{3})$

Question 11



The figure above shows part of the graph of

$$y = \sin(nx - \varphi),$$

where n and φ are positive constants, with $0 \le \varphi < \frac{\pi}{2}$.

The graph of $y = \sin(nx - \varphi)$ crosses the x axis at the points A, B and C with respective coordinates $\left(\frac{\pi}{9}, 0\right)$, $\left(\frac{4\pi}{9}, 0\right)$ and $\left(\frac{7\pi}{9}, 0\right)$.

Determine the value of n and the value of φ. **(4)**
