IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper J

Difficulty Rating: 3.3200/1.4925

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

Solve the following trigonometric equation in the range given.

$$\tan(5y-35)^\circ = -2-\sqrt{3}, \quad 0 \le y < 90. \qquad \textbf{(5)}$$

Question 2

$$f(x) \equiv px^3 - 32x^2 - 10x + q,$$

where p and q are constants.

When $f(x)$ is divided by $(x-2)$ the remainder is exactly the same as when $f(x)$ is divided by $(2x+3)$.

Show clearly that $p = 8$. **(5)**

Question 3

A circle whose centre is at $(3,-5)$ has equation

$$x^2 + y^2 - 6x + ay = 15,$$

where a is a constant.

a) Find the value of a. **(2)**

b) Determine the radius of the circle. **(4)**

Question 4

a) Find the binomial expansion of $\left(1+\frac{1}{4}x\right)^{10}$ in ascending powers of x up and including the term in x^3, simplifying fully each coefficient. **(4)**

b) Use the expansion of part (a) to show that

$$\left(\frac{41}{40}\right)^{10} \approx 1.28 \,.$$ **(3)**

Question 5

In a certain quiz game contestants answer questions consecutively until they get a question wrong.

They win £10 for answering the first question correctly, £20 for answering the second question correctly, £40 for answering the third question correctly, and so on so that the amounts won for each successive question is a term of a geometric series.

When contestants answer a question wrong their game is over and they get to keep $\frac{1}{10}$ of their **total** winnings up to that point.

Connor answers 5 questions correctly.

a) Show that Connor won £31. **(2)**

The highest prize won in this game, by a contestant called Ray, was £2,097,151.

b) Use algebra to find the number of questions that Ray answered correctly.

Full workings, justifying every step in the calculations, must be shown in this part of the question. **(5)**

Question 6

Solve each of the following equations, giving the final answers correct to three significant figures, where appropriate.

a) $7^x = 10$. **(3)**

b) $\log_2 y = \dfrac{9}{\log_2 y}$. **(4)**

Question 7

The total cost C, in £, for a certain car journey, is modelled by

$$C = \frac{200}{V} + \frac{2V}{25},\ V > 30,$$

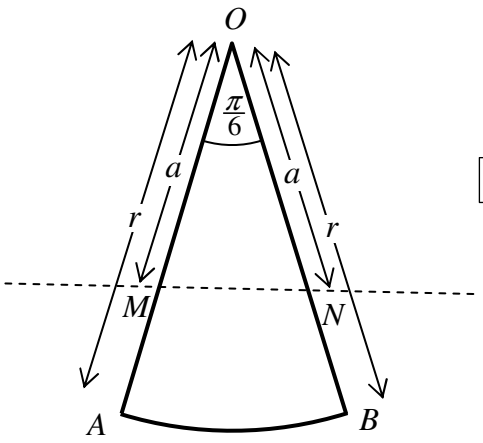
where V is the average speed in miles per hour.

a) Find the value of V for which C is stationary. **(5)**

b) Justify that this value of V minimizes C. **(2)**

c) Hence determine the minimum total cost of the journey. **(2)**

Question 8



not drawn accurately

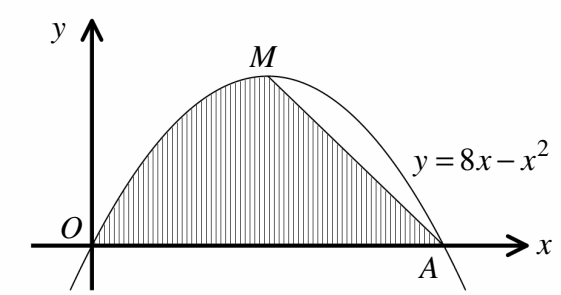
The figure above shows a circular sector OAB. The sector has radius r cm and subtends an angle of $\frac{\pi}{6}$ at O.

The straight line through M and N is such so that $OM = ON = a$ cm.

Given that the straight line through M and N divides the sector into two regions of equal area, show that

$$a = \sqrt{\frac{\pi}{6}}\, r . \qquad \textbf{(6)}$$

Question 9



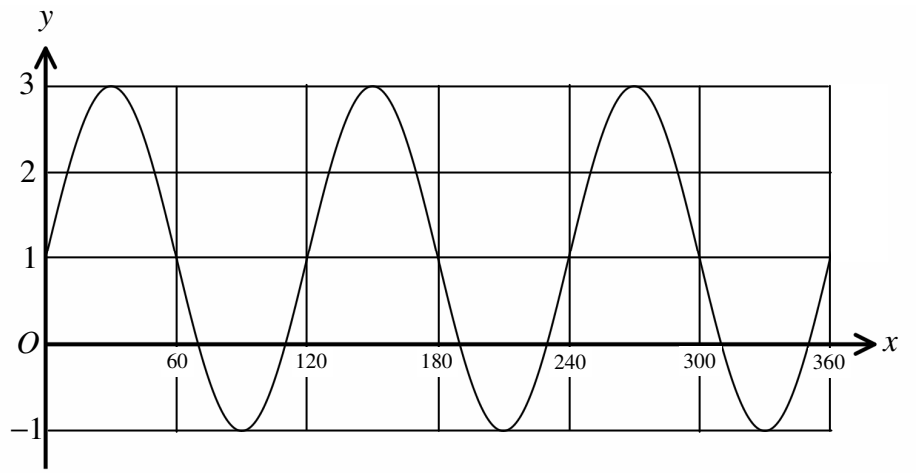
The figure above shows the quadratic curve with equation

$$y = 8x - x^2,\ x \in \mathbb{R}.$$

The point M is the maximum point of the curve and the point A is one of the curve's x intercepts.

Find the exact area of the shaded region, bounded by the curve, the x axis and the straight line segment from A to M. **(9)**

Question 10



The figure above shows an accurate graph of

$$y = A + B\sin Cx\,,$$

where x is measured in degrees and A, B and C are constants.

a) State the period of the graph. **(1)**

b) Find the value of A, B and C. **(3)**

Question 11

a) Use the trapezium rule with 4 equally spaced strips to find an estimate for

$$\int_0^2 2^{\sqrt{x}}\ dx. \qquad (\mathbf{6})$$

b) Use the answer of part **(a)** to find estimates for …

i. … $\int_0^2 2^{\sqrt{x}} + 3\ dx.$ $(\mathbf{2})$

ii. … $\int_0^2 2^{\sqrt{x}+3}\ dx.$ $(\mathbf{2})$