IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper T

Time: 2 hours 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

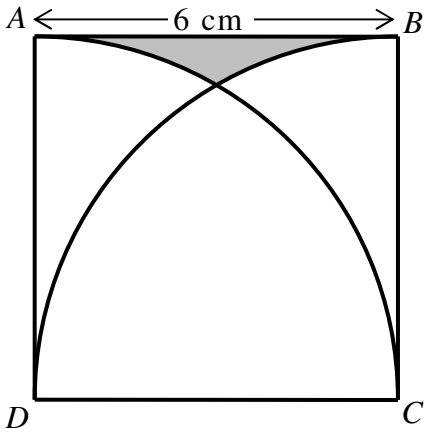
You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.
Non exact answers should be given to an appropriate degree of accuracy.
The examiner may refuse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

Question 1

The figure below was constructed as follows.

$ABCD$ is a square with side length 6 cm.

Two quarter circles with centres at the points C and D, each of radius 6 cm, are drawn inside the square.



Show that the area of the shaded region is

$$3\left(12-3\sqrt{3}-2\pi\right) \text{ cm}^2. \qquad (\mathbf{8})$$

Question 2

It is given that

$$f(x)=\sum_{r=0}^{n}\left[\binom{n}{r}x^r\left(1+x+x^2\right)^{n-r}\right],$$

where n is a positive integer constant.

a) Evaluate $f(-1)$. $(\mathbf{4})$

b) Find the value of n that satisfies the equation

$$f(3)f(2)=1728^{1728}. \qquad (\mathbf{3})$$

Question 3

$$ax^3 + ax^2 + ax + b = 0,$$

where a and b are non zero real constants.

Given that $x = -b$ is a root of the above cubic equation, determine the range of the possible values of a. **(7)**

Question 4

It is given that

$$4\sin x - \frac{\cos x}{2} = \frac{4}{\sin x} - \frac{1}{2\cos x}.$$

Show clearly that the above equation is equivalent to

$$\tan x = 2.$$ **(7)**

Question 5

The triangle ABC is such so that $\measuredangle ABC = 90°$ and $|AC| = 6$ cm.

The point P lies on AC and the point Q lies on AB in such a way so that

$$\measuredangle APQ = 90° \text{ and } |AP| = |QB| = 1 \text{ cm}.$$

Show that the straight line segment PB is exactly $\sqrt{7}$ cm. **(9)**

Question 6

The r^{th} term of a progression is given by

$$u_r = ak^{r-1},$$

where a and k are non zero constants with $k \neq \pm 1$.

Show that

$$\sum_{r=1}^{n} (u_r \times u_{r+1}) = \frac{a^2 k\left(1-k^{2n}\right)}{1-k^2}. \qquad (\mathbf{7})$$

Question 7

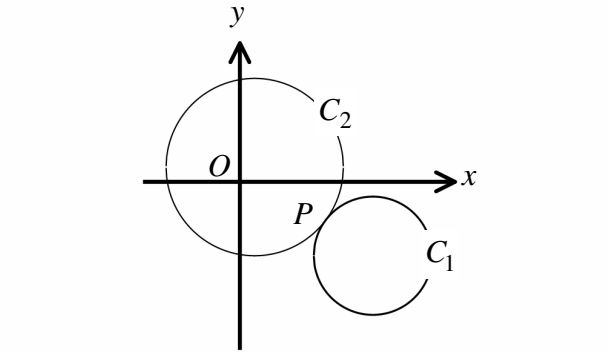
A mobile phone wholesaler buys a certain brand of phone for £35 a unit and sells it to shops for £100 a unit.

In a typical week the wholesaler expects to sell 500 of these phones.

Research however showed that on a typical week for every £1 reduced of the selling price of this phone, an extra 20 sales can be achieved.

Determine the **selling** price for this phone if the weekly profit is to be maximized, and find this maximum weekly profit. $(\mathbf{8})$

Question 8



The figure above shows a circle C_1 with equation

$$x^2 + y^2 - 18x + ky + 90 = 0,$$

where k is a positive constant.

a) Determine, in terms of k, the coordinates of the centre of C_1 and the size of its radius. **(2)**

Another circle C_2 has equation

$$x^2 + y^2 - 2x - 2y = 34.$$

b) Given that C_1 and C_2 are **touching externally** at the point P, find …

i. … the value of k.

ii. … the coordinates of P.

(10)

Question 9

$$\log_{\sin x \cos x}(\sin x) \times \log_{\sin x \cos x}(\cos x) = \frac{1}{4}.$$

Show that the solution of the above equation is given by

$$x = \frac{\pi}{4}(4n-3),\ n \in \mathbb{N}.$$ **(9)**
