IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper S

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.

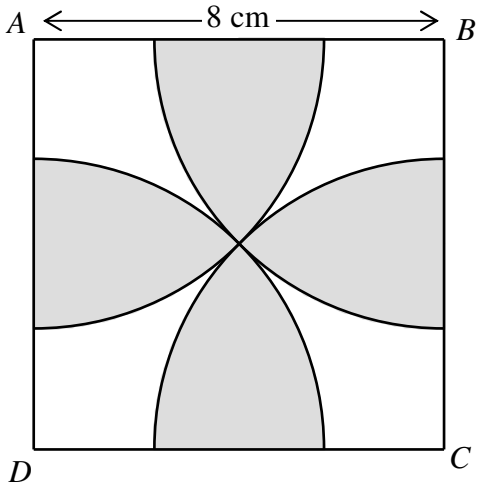
Question 1

The figure below was constructed as follows.

$ABCD$ is a square with side length 8 cm.

Four identical quarter circles, whose centres are located at each of the four corners of the square, are drawn inside the square.

The radii of the quarter circles are such so that the four quarter circles meet at the centre of the square.



Show that the area of the shaded region is

$$32(\pi-2)\text{ cm}^2. \qquad \textbf{(8)}$$

Question 2

The binomial coefficients are given by

$$\binom{n}{k}=\frac{n!}{k!(n-k)!},\ k\in\mathbb{N},\ n\in\mathbb{N}\cup\{0\}.$$

Show directly from the above definition that

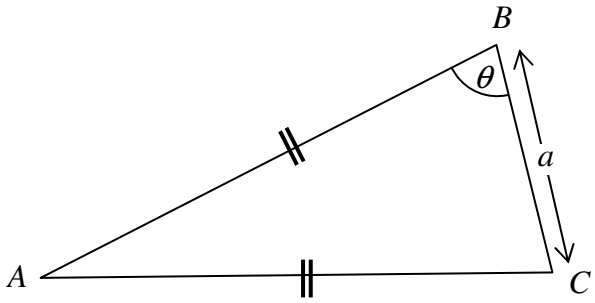
$$\binom{n}{k}=\binom{n-1}{k-1}+\binom{n-1}{k}. \qquad \textbf{(6)}$$

Question 3

Solve the following trigonometric equation for $0 \le x < 360°$

$$\frac{\tan x}{\cos x} + \frac{1}{1+\sin x} = \frac{4}{3}. \qquad (\mathbf{8})$$

Question 4



The figure above shows an isosceles triangle ABC, where $AB = AC$.

The side BC has length a and the angle ABC is θ.

Show that the area of the triangle is

$$\frac{1}{4}a^2 \tan\theta. \qquad (\mathbf{8})$$

Question 5

An elastic ball is dropped from a height of h metres.

The ball bounces off the ground to a height which is r times the height from which it was dropped, where $0 < r < 1$.

The ball keeps bouncing off the ground in this fashion until it comes to rest.

Given the ball covers a total distance d show that

$$r = \frac{d-h}{d+h}. \qquad (\mathbf{8})$$

Question 6

The curve C has equation

$$y = x^2 - 4x + 7.$$

The points $P(-1,12)$ and $Q(4,7)$ lie on C.

The point R also lies on C so that $\measuredangle PRQ = 90°$.

Determine, as exact surds, the possible coordinates of R. $(\mathbf{9})$

Question 7

A solid right circular cylinder is to be cut out of a solid right circular cone, whose radius is 1.5 m and its height is 3 m.

The axis of symmetry of the cone coincides with the axis of symmetry of the cylinder which passes though its circular ends. The circumference of one end of the cylinder is in contact with the curved surface of the cone and the other end of the cylinder lies on the base of the cone.

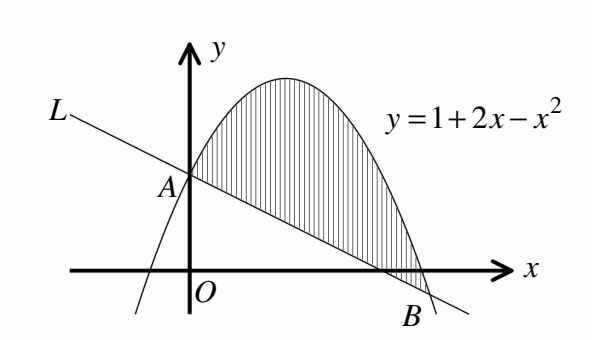
Show that the maximum volume of the cylinder to be cut out is π m^3. $(\mathbf{8})$

Question 8

Solve the following logarithmic equation

$$\frac{2-\log_4 x^7}{7-\log_4 x^2}+\left(\log_4 x\right)^2=0 \qquad \textbf{(10)}$$

Question 9



The diagram above shows part of the curve C, with equation

$$y=1+2x-x^2.$$

The curve crosses the y axis at the point A.

The straight line L is the normal to C at A.

The point B is a point of intersection between C and A.

Find the exact area of the finite region, bounded by C and L. **(10)**
