Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1807045491

ADDITIONAL MATHEMATICS **0606/13**

Paper 1 **October/November 2015**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

This document consists of **16** printed pages.

DC (AC/CGW) 98537/3

CAMBRIDGE International Examinations

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Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1}a^{n-1} b + \binom{n}{2}a^{n-2} b^2 + \ldots + \binom{n}{r}a^{n-r} b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

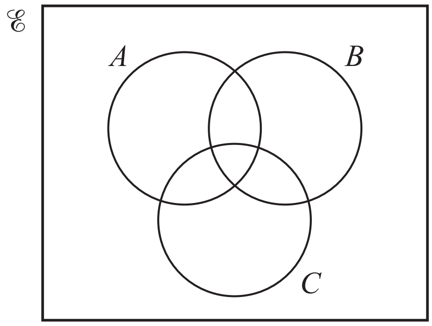
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

1 On the Venn diagrams below, shade the regions indicated.

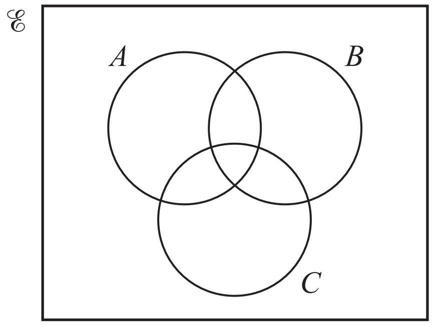
(i)



$A \cap (B \cup C)$

[1]

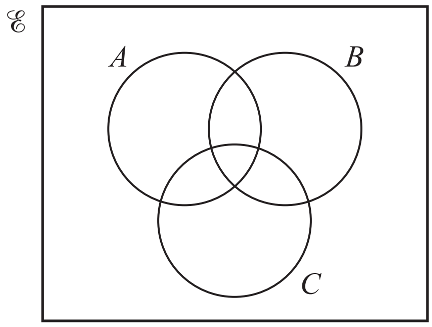
(ii)



$A \cup (B \cap C)$

[1]

(iii)



$(A \cup B)' \cap C$

[1]

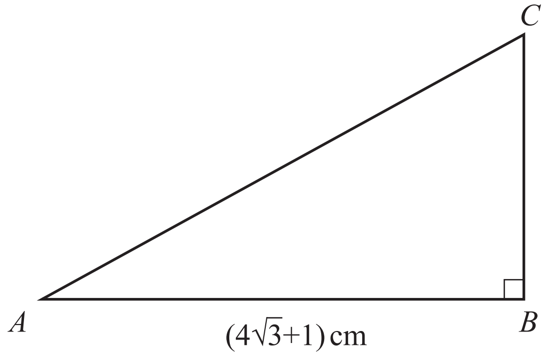
2 Solve $2\cos^2\left(3x - \frac{\pi}{4}\right) = 1$ for $0 \leqslant x \leqslant \frac{\pi}{3}$. [4]

3 **(a)** Matrices **A** and **B** are such that $\mathbf{A}=\begin{pmatrix}2 & 1\\4 & 3\end{pmatrix}$ and $\mathbf{B}=\begin{pmatrix}3 & 8 & 1\\6 & 0 & 2\end{pmatrix}$. Find **AB**. [2]

(b) Given that matrix $\mathbf{X}=\begin{pmatrix}4 & 6\\2 & -8\end{pmatrix}$, find the integer value of m and of n such that $\mathbf{X}^2 = m\mathbf{X} + n\mathbf{I}$, where **I** is the identity matrix. [5]

(c) Given that matrix $\mathbf{Y}=\begin{pmatrix}a & 2\\3 & a\end{pmatrix}$, find the values of a for which det $\mathbf{Y} = 0$. [2]

4 **You are not allowed to use a calculator in this question**.



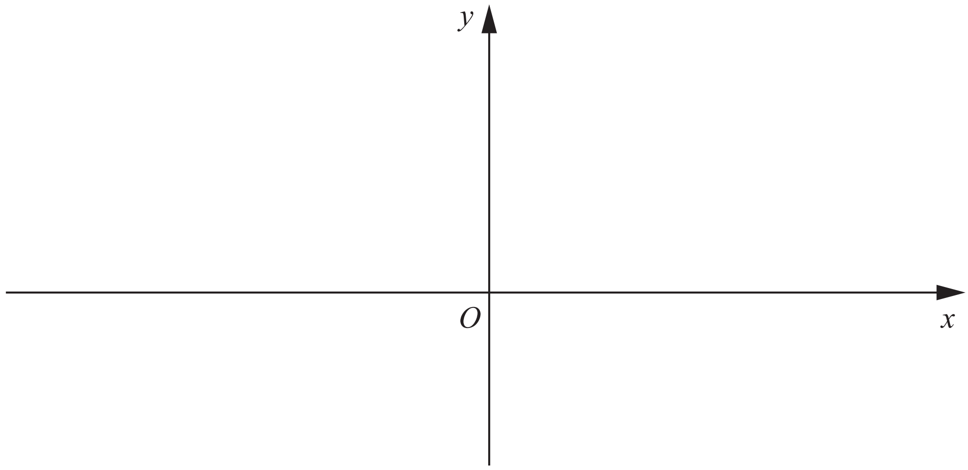
The diagram shows triangle ABC with side $AB = (4\sqrt{3} + 1)$ cm. Angle B is a right angle. It is given that the area of this triangle is $\frac{47}{2}$ cm^2.

(i) Find the length of the side BC in the form $(a\sqrt{3} + b)$ cm, where a and b are integers. [3]

(ii) Hence find the length of the side AC in the form $p\sqrt{2}$ cm, where p is an integer. [2]

5 Find the equation of the normal to the curve $y = 5\tan x - 3$ at the point where $x = \frac{\pi}{4}$. [5]

6 **(i)** On the axes below, sketch the graph of $y = |x^2 - 4x - 12|$ showing the coordinates of the points where the graph meets the axes. [3]



(ii) Find the coordinates of the stationary point on the curve $y = |x^2 - 4x - 12|$. [2]

(iii) Find the values of k such that the equation $|x^2 - 4x - 12| = k$ has only 2 solutions. [2]

7 A curve, showing the relationship between two variables x and y, is such that $\frac{d^2y}{dx^2} = 6\cos 3x$. Given that the curve has a gradient of $4\sqrt{3}$ at the point $\left(\frac{\pi}{9}, -\frac{1}{3}\right)$, find the equation of the curve. [6]

8 **(a)** Given that the first 4 terms in the expansion of $(2 + kx)^8$ are $256 + 256x + px^2 + qx^3$, find the value of k, of p and of q. [3]

(b) Find the term that is independent of x in the expansion of $\left(x - \frac{2}{x^2}\right)^9$. [3]

9 **(a)** Five different books are to be arranged on a shelf. There are 2 Mathematics books and 3 History books. Find the number of different arrangements of books if

(i) the Mathematics books are next to each other, [2]

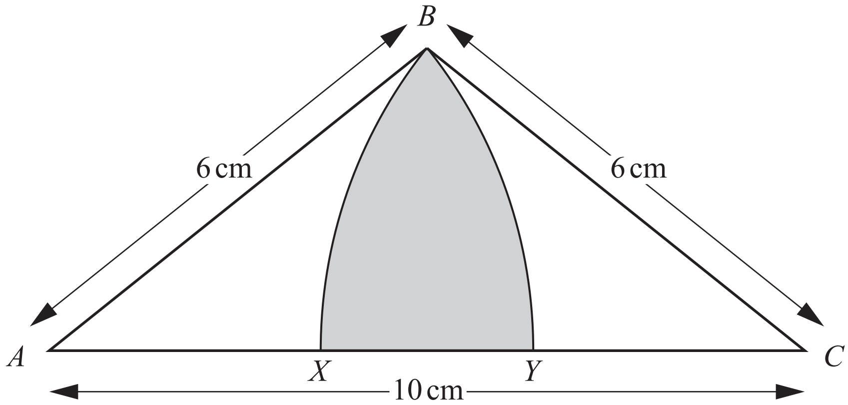
(ii) the Mathematics books are not next to each other. [2]

(b) To compete in a quiz, a team of 5 is to be chosen from a group of 9 men and 6 women. Find the number of different teams that can be chosen if

(i) there are no restrictions, [1]

(ii) at least two men must be on the team. [3]

10



The diagram shows an isosceles triangle ABC such that $AC = 10$ cm and $AB = BC = 6$ cm.
BX is an arc of a circle, centre C, and BY is an arc of a circle, centre A.

(i) Show that angle $ABC = 1.970$ radians, correct to 3 decimal places. [2]

(ii) Find the perimeter of the shaded region. [4]

(iii) Find the area of the shaded region. [3]

11 The line $x - y + 2 = 0$ intersects the curve $2x^2 - y^2 + 2x + 1 = 0$ at the points A and B. The perpendicular bisector of the line AB intersects the curve at the points C and D. Find the length of the line CD in the form $a\sqrt{5}$, where a is an integer. [10]

Question 12 is printed on the next page.

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12 **(a)** Given that $2^{2x-1} \times 4^{x+y} = 128$ and $\dfrac{9^{2y-x}}{27^{y-4}} = 1$, find the value of each of the integers x and y. [4]

(b) Solve $2(5)^{2z} + 5^{z} - 1 = 0.$ [4]