Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4296345267

ADDITIONAL MATHEMATICS **4037/13**

Paper 1 **October/November 2014**

2 hours

Candidates answer on the Question Paper.

No additional materials are required.

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 **15** printed pages and **1** blank page.

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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

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

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

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

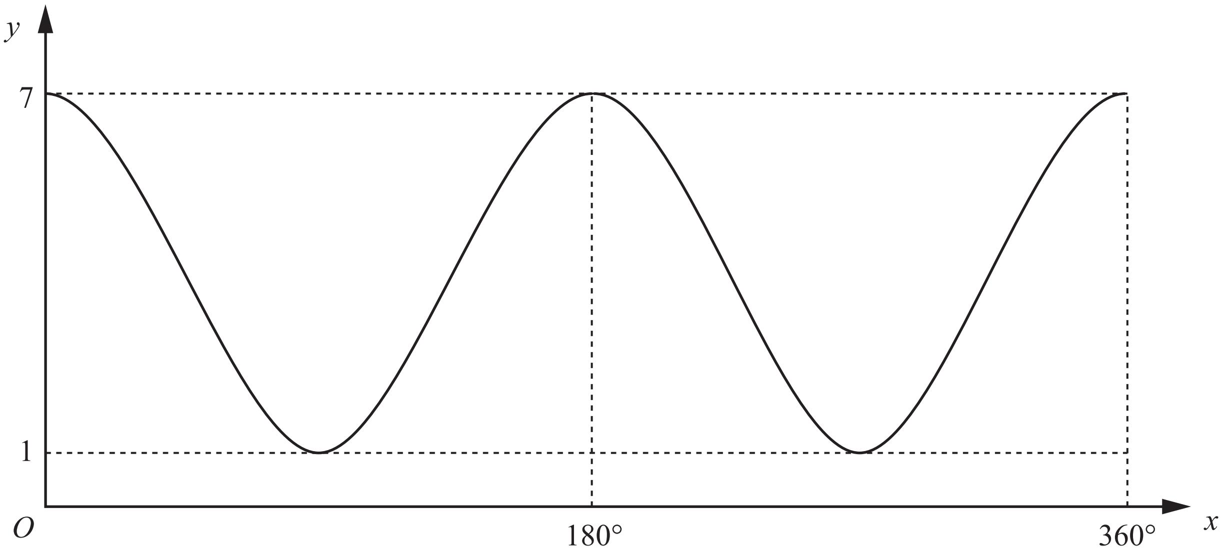
Formulae for ΔABC

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

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

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

1 The diagram shows the graph of $y = a\cos bx + c$ for $0° \leqslant x \leqslant 360°$, where a, b and c are positive integers.



State the value of each of a, b and c. [3]

$a =$

$b =$

$c =$

2 The line $4y = x + 8$ cuts the curve $xy = 4 + 2x$ at the points A and B. Find the exact length of AB. [5]

3 The universal set $\mathscr{E}$ is the set of real numbers. Sets A, B and C are such that

$$A = \{x : x^2 + 5x + 6 = 0\},$$

$$B = \{x : (x-3)(x+2)(x+1) = 0\},$$

$$C = \{x : x^2 + x + 3 = 0\}.$$

(i) State the value of each of n(A), n(B) and n(C). [3]

$\mathrm{n}(A) =$

$\mathrm{n}(B) =$

$\mathrm{n}(C) =$

(ii) List the elements in the set $A \cup B$. [1]

(iii) List the elements in the set $A \cap B$. [1]

(iv) Describe the set C'. [1]

4 **(a)** Solve $3\sin x + 5\cos x = 0$ for $0° \leqslant x \leqslant 360°$. [3]

(b) Solve $\operatorname{cosec}\left(3y + \dfrac{\pi}{4}\right) = 2$ for $0 \leqslant y \leqslant \pi$ radians. [5]

5 **(a)** A drinks machine sells coffee, tea and cola. Coffee costs \$0.50, tea costs \$0.40 and cola costs \$0.45. The table below shows the numbers of drinks sold over a 4-day period.

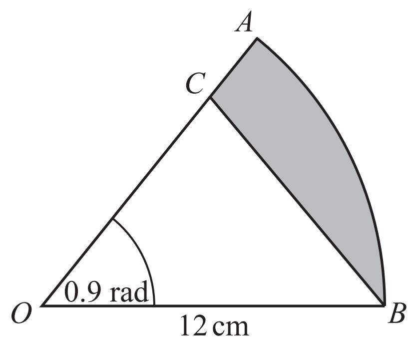
	Coffee	Tea	Cola
Tuesday	12	2	1
Wednesday	9	3	0
Thursday	8	5	1
Friday	11	2	0

(i) Write down 2 matrices whose product will give the amount of money the drinks machine took each day and evaluate this product. [4]

(ii) Hence write down the total amount of money taken by the machine for this 4-day period. [1]

(b) Matrices **X** and **Y** are such that $\mathbf{X} = \begin{pmatrix} 2 & 4 \\ -5 & 1 \end{pmatrix}$ and $\mathbf{XY} = \mathbf{I}$, where **I** is the identity matrix. Find the matrix **Y**. [3]

6 The diagram shows a sector, AOB, of a circle centre O, radius 12 cm. Angle $AOB = 0.9$ radians. The point C lies on OA such that $OC = CB$.



(i) Show that $OC = 9.65$ cm correct to 3 significant figures. [2]

(ii) Find the perimeter of the shaded region. [3]

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

7 Solve the equation $1 + 2\log_5 x = \log_5(18x - 9)$. [5]

8 **(i)** Given that $f(x) = x\ln x^3$, show that $f'(x) = 3(1 + \ln x)$. [3]

(ii) Hence find $\int (1 + \ln x)\,dx$. [2]

(iii) Hence find $\int_1^2 \ln x\,dx$ in the form $p + \ln q$, where p and q are integers. [3]

9 **(a)** Given that the first 3 terms in the expansion of $(5 - qx)^p$ are $625 - 1500x + rx^2$, find the value of each of the integers p, q and r. [5]

(b) Find the value of the term that is independent of x in the expansion of $\left(2x + \dfrac{1}{4x^3}\right)^{12}$. [3]

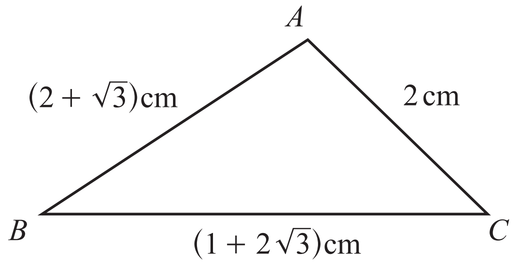
10 (a) Solve the following simultaneous equations.

$$\frac{5^x}{25^{3y-2}} = 1$$

$$\frac{3^x}{27^{y-1}} = 81$$

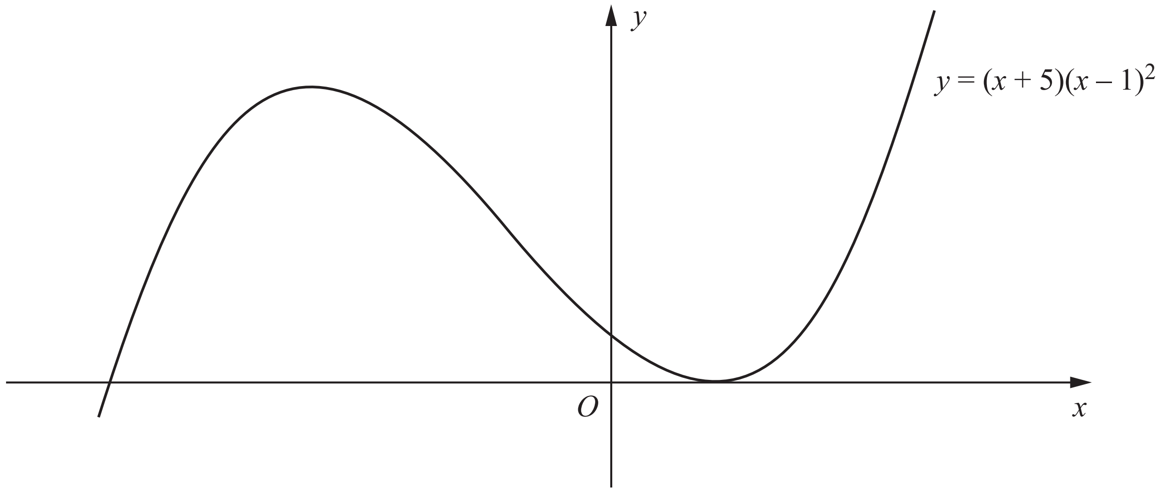
[5]

(b) The diagram shows a triangle ABC such that $AB = (2+\sqrt{3})$ cm, $BC = (1+2\sqrt{3})$ cm and $AC = 2$ cm.



Without using a calculator, find the value of $\cos A$ in the form $a + b\sqrt{3}$, where a and b are constants to be found. [4]

11 The diagram shows part of the curve $y = (x+5)(x-1)^2$.



(i) Find the x-coordinates of the stationary points of the curve. [5]

(ii) Find $\int (x+5)(x-1)^2 \, dx$. [3]

(iii) Hence find the area enclosed by the curve and the x-axis. [2]

(iv) Find the set of positive values of k for which the equation $(x+5)(x-1)^2 = k$ has only one real solution. [2]

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