UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5544652315

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **May/June 2013**

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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.

© UCLES 2013

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

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

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

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

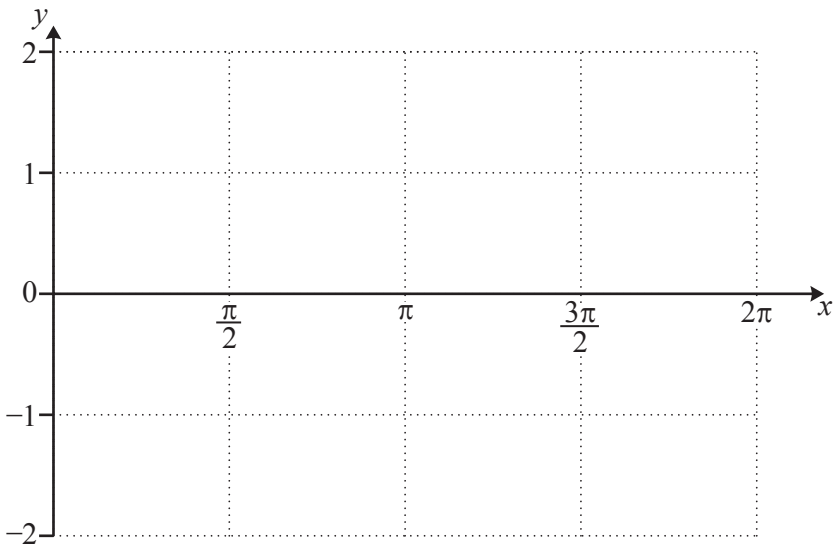
© UCLES 2013

1 On the axes below sketch, for $0 \leqslant x \leqslant 2\pi$, the graph of

For Examiner's Use

(i) $y = \cos x - 1$, [2]

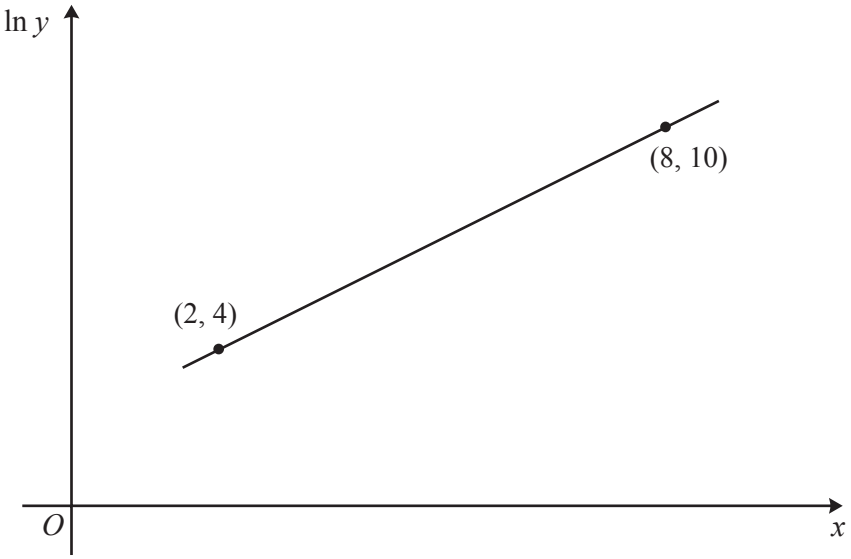
(ii) $y = \sin 2x$. [2]



(iii) State the number of solutions of the equation $\cos x - \sin 2x = 1$, for $0 \leqslant x \leqslant 2\pi$. [1]

2 Variables x and y are such that $y = Ab^x$, where A and b are constants. The diagram shows the graph of $\ln y$ against x, passing through the points (2, 4) and (8, 10).

For Examiner's Use



Find the value of A and of b. [5]

© UCLES 2013

3 A committee of 6 members is to be selected from 5 men and 9 women. Find the number of different committees that could be selected if

For Examiner's Use

(i) there are no restrictions, [1]

(ii) there are exactly 3 men and 3 women on the committee, [2]

(iii) there is at least 1 man on the committee. [3]

© UCLES 2013

4 **(i)** Given that $\log_4 x = \frac{1}{2}$, find the value of x. [1]

For Examiner's Use

(ii) Solve $2\log_4 y - \log_4 (5y - 12) = \frac{1}{2}$. [4]

© UCLES 2013

5 **(i)** Find $\int\left(1-\frac{6}{x^2}\right)\mathrm{d}x$. [2]

For Examiner's Use

(ii) Hence find the value of the positive constant k for which $\int_k^{3k}\left(1-\frac{6}{x^2}\right)\mathrm{d}x = 2$. [4]

6 **(i)** Given that $\mathbf{A} = \begin{pmatrix} 2 & -1 \\ 3 & 5 \end{pmatrix}$, find $\mathbf{A}^{-1}$. [2]

For Examiner's Use

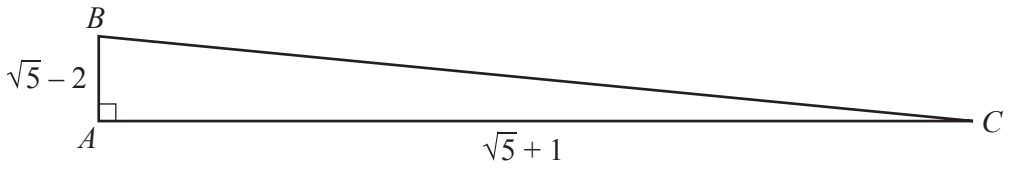
(ii) Using your answer from part **(i)**, or otherwise, find the values of a, b, c and d such that

$$\mathbf{A}\begin{pmatrix} a & b \\ c & -1 \end{pmatrix} = \begin{pmatrix} 7 & 5 \\ 17 & d \end{pmatrix}.$$ [5]

© UCLES 2013

7 Calculators must not be used in this question.

For Examiner's Use



The diagram shows a triangle ABC in which angle $A = 90°$. Sides AB and AC are $\sqrt{5} - 2$ and $\sqrt{5} + 1$ respectively. Find

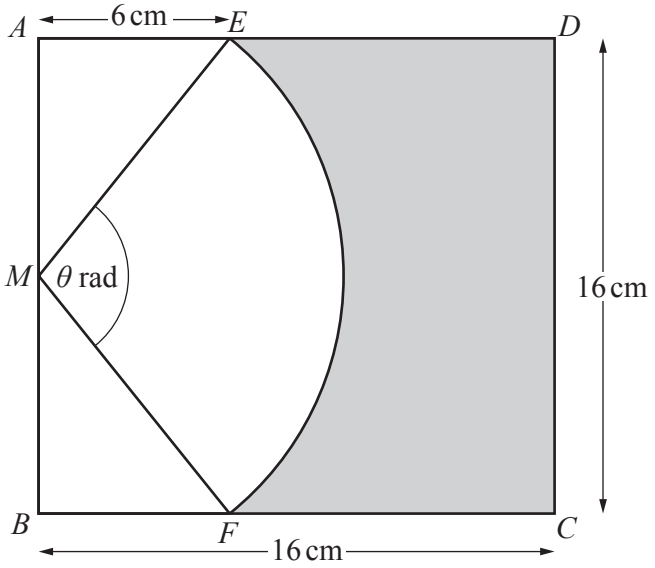
(i) $\tan B$ in the form $a + b\sqrt{5}$, where a and b are integers, [3]

(ii) $\sec^2 B$ in the form $c + d\sqrt{5}$, where c and d are integers. [4]

© UCLES 2013

[Turn over

8



The diagram shows a square $ABCD$ of side 16 cm. M is the mid-point of AB. The points E and F are on AD and BC respectively such that $AE = BF = 6$ cm. EF is an arc of the circle centre M, such that angle EMF is θ radians.

(i) Show that $\theta = 1.855$ radians, correct to 3 decimal places. [2]

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

For Examiner's Use

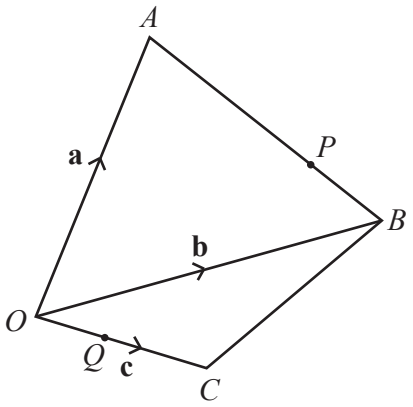
© UCLES 2013

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

For Examiner's Use

9

For Examiner's Use



The figure shows points A, B and C with position vectors **a**, **b** and **c** respectively, relative to an origin O. The point P lies on AB such that $AP{:}AB = 3{:}4$. The point Q lies on OC such that $OQ{:}QC = 2{:}3$.

(i) Express $\overrightarrow{AP}$ in terms of **a** and **b** and hence show that $\overrightarrow{OP} = \frac{1}{4}(\mathbf{a} + 3\mathbf{b})$. [3]

(ii) Find $\overrightarrow{PQ}$ in terms of **a**, **b** and **c**. [3]

© UCLES 2013

(iii) Given that $5\overrightarrow{PQ} = 6\overrightarrow{BC}$, find **c** in terms of **a** and **b**. [2]

For Examiner's Use

10 The point A, whose x-coordinate is 2, lies on the curve with equation $y = x^3 - 4x^2 + x + 1$.

For Examiner's Use

(i) Find the equation of the tangent to the curve at A. [4]

This tangent meets the curve again at the point B.

(ii) Find the coordinates of B. [4]

© UCLES 2013

(iii) Find the equation of the perpendicular bisector of the line AB. [4]

For Examiner's Use

Question 11 is printed on the next page.

11 **(a)** Solve $2\sin\left(x+\frac{\pi}{3}\right)=-1$ for $0 \leqslant x \leqslant 2\pi$ radians. [4]

For Examiner's Use

(b) Solve $\tan y - 2 = \cot y$ for $0^\circ \leqslant y \leqslant 180^\circ$. [6]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2013