

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME						
CENTRE NUMBER				CANDIDATE NUMBER		

8006817548

ADDITIONAL MATHEMATICS

0606/12

Paper 1

October/November 2012

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.

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.

For Exam	iner's Use
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

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

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

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

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$
$$\csc^2 A = 1 + \cot^2 A$$

Formulae for $\triangle ABC$

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

$$a^{2} = b^{2} + c^{2} - 2bc \cos A$$
$$\Delta = \frac{1}{2} bc \sin A$$

1 It is given that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 21 \\ 2 \end{pmatrix}$.

For Examiner's Use

(i) Find $|\mathbf{a} + \mathbf{b} + \mathbf{c}|$.

[2]

(ii) Find λ and μ such that $\lambda \mathbf{a} + \mu \mathbf{b} = \mathbf{c}$.

[3]

2 (i) Find the inverse of the matrix
$$\begin{pmatrix} 2 & -1 \\ -1 & 1.5 \end{pmatrix}$$
.

(ii) Hence find the matrix **A** such that
$$\begin{pmatrix} 2 & -1 \\ -1 & 1.5 \end{pmatrix}$$
 A = $\begin{pmatrix} 1 & 6 \\ -0.5 & 4 \end{pmatrix}$.

3 (i) Show that
$$\cot \theta + \frac{\sin \theta}{1 + \cos \theta} = \csc \theta$$
.

(ii) Explain why the equation
$$\cot \theta + \frac{\sin \theta}{1 + \cos \theta} = \frac{1}{2}$$
 has no solution. [1]

- 4 Given that $\log_a pq = 9$ and $\log_a p^2 q = 15$, find the value of
 - (i) $\log_a p$ and of $\log_a q$,



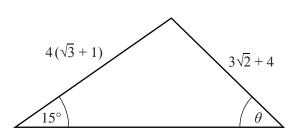
[4]

(ii) $\log_p a + \log_q a$.

[2]

5 The line x - 2y = 6 intersects the curve $x^2 + xy + 10y + 4y^2 = 156$ at the points A and B. Find the length of AB. [7] $\begin{bmatrix} For \\ Examiner's \\ Use \end{bmatrix}$

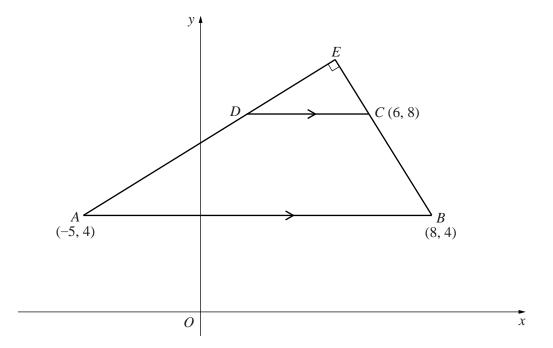




Using $\sin 15^\circ = \frac{\sqrt{2}}{4}(\sqrt{3} - 1)$ and without using a calculator, find the value of $\sin \theta$ in the form $a + b\sqrt{2}$, where a and b are integers. [5]

7 Solutions to this question by accurate drawing will not be accepted.





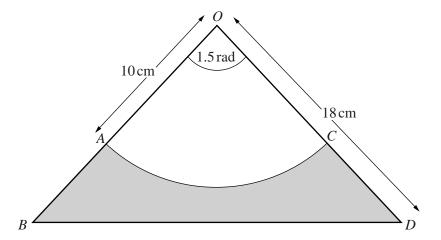
The vertices of the trapezium ABCD are the points A(-5, 4), B(8, 4), C(6, 8) and D. The line AB is parallel to the line DC. The lines AD and BC are extended to meet at E and angle $AEB = 90^{\circ}$.

(i) Find the coordinates of D and of E. [6]

(ii)	Find the area of the trapezium <i>ABCD</i> .	[2]	For Examiner's Use

8

For Examiner's Use



The diagram shows an isosceles triangle OBD in which OB = OD = 18 cm and angle BOD = 1.5 radians. An arc of the circle, centre O and radius 10 cm, meets OB at A and OD at C.

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

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

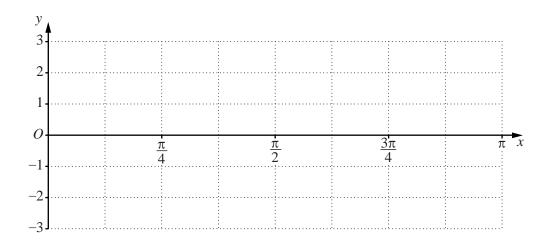
9 (a) (i) Using the axes below, sketch for $0 \le x \le \pi$, the graphs of

$$y = \sin 2x$$
 and $y = 1 + \cos 2x$.



[4]

[1]



(ii) Write down the solutions of the equation $\sin 2x - \cos 2x = 1$, for $0 \le x \le \pi$. [2]

(b) (i) Write down the amplitude and period of $5\cos 4x - 3$. [2]

(ii) Write down the period of $4\tan 3x$.

10	A function f is such that	$f(x) = 4x^3 + 4x^2 + ax + b$. It is given that $2x - 1$ is a factor of both $f(x)$
	and $f'(x)$.	

For Examiner's Use

(i) Show that b = 2 and find the value of a.

[5]

Using the values of a and b from part (i),

(ii) find the remainder when f(x) is divided by x + 3,

[2]

(iii)		$f(x) = (2x - 1)(px^2 + qx + r)$, where p, q and r are integers to be		For
	found,		[2]	Examiner's
				IIse

(iv) find the values of x for which f(x) = 0. [2]

11 Answer only **one** of the following two alternatives.

For Examiner's Use

[3]

EITHER

A curve is such that $y = \frac{5x^2}{1+x^2}$.

- (i) Show that $\frac{dy}{dx} = \frac{kx}{(1+x^2)^2}$, where k is an integer to be found. [4]
- (ii) Find the coordinates of the stationary point on the curve and determine the nature of this stationary point. [3]
- (iii) By using your result from part (i), find $\int \frac{x}{(1+x^2)^2} dx$ and hence evaluate $\int_{-1}^{2} \frac{x}{(1+x^2)^2} dx$.

OR

A curve is such that $y = \frac{Ax^2 + B}{x^2 - 2}$, where A and B are constants.

(i) Show that
$$\frac{dy}{dx} = -\frac{2x(2A+B)}{(x^2-2)^2}$$
. [4]

It is given that y = -3 and $\frac{dy}{dx} = -10$ when x = 1.

- (ii) Find the value of A and of B.
- (iii) Using your values of A and B, find the coordinates of the stationary point on the curve, and determine the nature of this stationary point. [4]

Start your answer to Question 11 here.							
To Provide the Language of the Control of the Contr	EITHER						
Indicate which question you are answering.	OR						

Continue your answer here.	Fe
	Exam U.

Continue your answer here if necessary.	For
	Examine Use
	Ose

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.