

--

--	--	--	--	--

--	--	--	--

0606/23

May/June 2012

2 hours

Additional Materials: Electronic calculator

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.

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.

You are reminded of the need for clear presentation in your answers.

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 Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

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

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*

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

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

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

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 (i) Given that $\mathbf{A} = \begin{pmatrix} 4 & -3 \\ 2 & 5 \end{pmatrix}$, find the inverse matrix $\mathbf{A}^{-1}$.

[2]

*For
Examiner's
Use*

- (ii) Use your answer to part (i) to solve the simultaneous equations

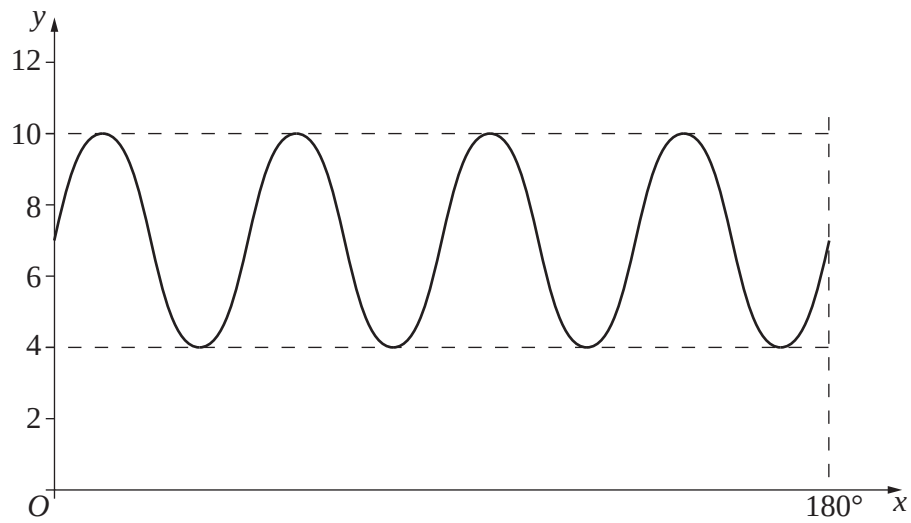
$$\begin{aligned} 4x - 3y &= -10, \\ 2x + 5y &= 21. \end{aligned}$$

[2]

- 2 A cuboid has a square base of side $(2 + \sqrt{3})$ cm and a volume of $(16 + 9\sqrt{3})$ cm³. Without using a calculator, find the height of the cuboid in the form $(a + b\sqrt{3})$ cm, where a and b are integers. [4]

For
Examiner's
Use

3 (a)

For
Examiner's
Use

The diagram shows a sketch of the curve $y = a \sin(bx) + c$ for $0^\circ \leq x \leq 180^\circ$. Find the values of a , b and c . [3]

(b) Given that $f(x) = 5 \cos 3x + 1$, for all x , state

(i) the period of f , [1]

(ii) the amplitude of f . [1]

4 (i) Find $\frac{d}{dx}(x^2 \ln x)$.

[2]

For
Examiner's
Use

(ii) Hence, or otherwise, find $\int x \ln x \, dx$.

[3]

- 5 (a) Solve the equation $3^{2x} = 1000$, giving your answer to 2 decimal places.

[2]

For
Examiner's
Use

- (b) Solve the equation $\frac{36^{2y-5}}{6^{3y}} = \frac{6^{2y-1}}{216^{y+6}}$.

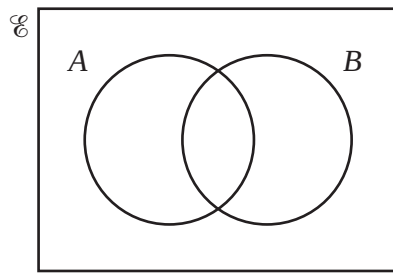
[4]

- 6 By shading the Venn diagrams below, investigate whether each of the following statements is true or false. State your conclusions clearly.

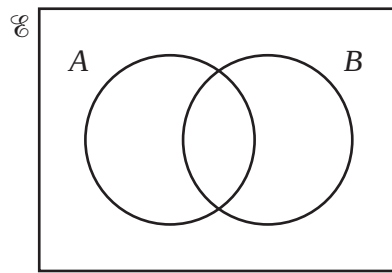
For
Examiner's
Use

(i) $A \cap B' = (A' \cap B)'$

[2]



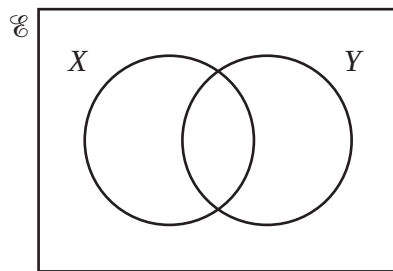
$A \cap B'$



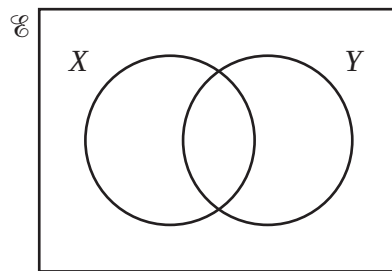
$(A' \cap B)'$

(ii) $X \cap Y = X' \cup Y'$

[2]



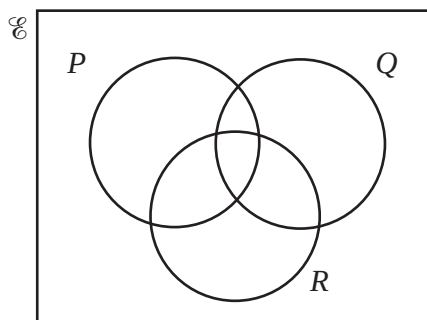
$X \cap Y$



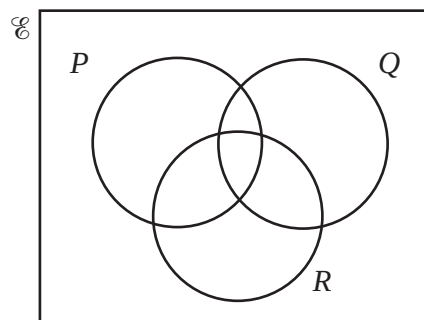
$X' \cup Y'$

(iii) $(P \cap Q) \cup (Q \cap R) = Q \cap (P \cup R)$

[2]



$(P \cap Q) \cup (Q \cap R)$



$Q \cap (P \cup R)$

7 Given that $f(x) = x^2 - \frac{648}{\sqrt{x}}$, find the value of x for which $f''(x) = 0$.

[6]

*For
Examiner's
Use*

- 8 Relative to an origin O , the position vectors of the points A and B are $2\mathbf{i} - 3\mathbf{j}$ and $11\mathbf{i} + 42\mathbf{j}$ respectively.

For
Examiner's
Use

- (i) Write down an expression for $\overrightarrow{AB}$. [2]

The point C lies on AB such that $\overrightarrow{AC} = \frac{1}{3}\overrightarrow{AB}$.

- (ii) Find the length of $\overrightarrow{OC}$. [4]

The point D lies on $\overrightarrow{OA}$ such that $\overrightarrow{DC}$ is parallel to $\overrightarrow{OB}$.

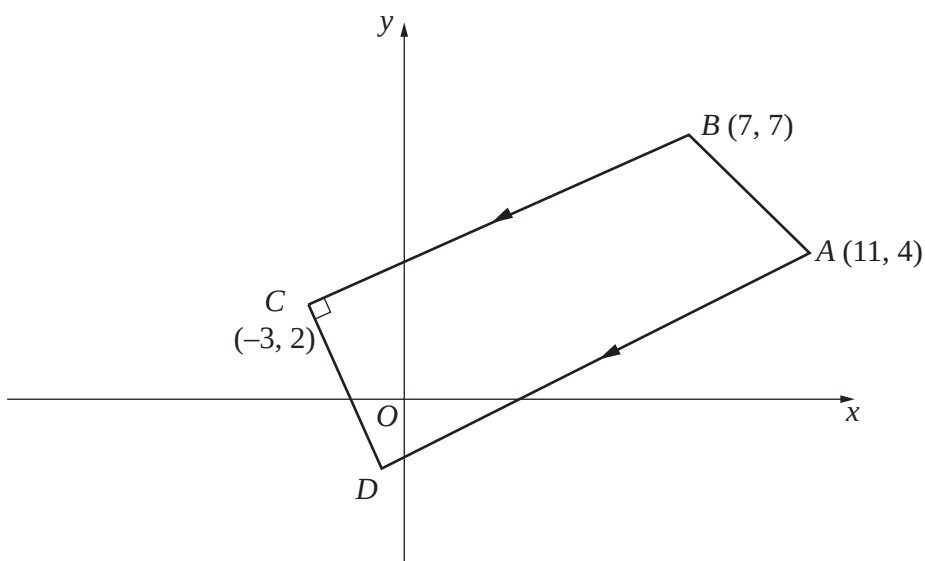
- (iii) Find the position vector of D . [2]

- 9 A particle moves in a straight line so that, t s after passing through a fixed point O , its velocity, $v \text{ ms}^{-1}$, is given by $v = 2t - 11 + \frac{6}{t+1}$. Find the acceleration of the particle when it is at instantaneous rest. [7]

For
Examiner's
Use

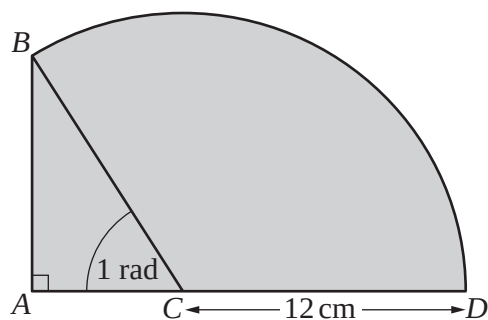
10 Solutions to this question by accurate drawing will not be accepted.

For
Examiner's
Use



The diagram shows a trapezium $ABCD$ with vertices $A(11, 4)$, $B(7, 7)$, $C(-3, 2)$ and D . The side AD is parallel to BC and the side CD is perpendicular to BC . Find the area of the trapezium $ABCD$. [9]

11

For
Examiner's
Use

The diagram shows a right-angled triangle ABC and a sector $CBDC$ of a circle with centre C and radius 12 cm. Angle $ACB = 1$ radian and ACD is a straight line.

(i) Show that the length of AB is approximately 10.1 cm. [1]

(ii) Find the perimeter of the shaded region. [5]

(iii) Find the area of the shaded region. [4]

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

For
Examiner's
Use

EITHER

The equation of a curve is $y = 2x^2 - 20x + 37$.

(i) Express y in the form $a(x + b)^2 + c$, where a , b and c are integers. [3]

(ii) Write down the coordinates of the stationary point on the curve. [1]

A function f is defined by $f : x \mapsto 2x^2 - 20x + 37$ for $x > k$. Given that the function $f^{-1}(x)$ exists,

(iii) write down the least possible value of k , [1]

(iv) sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the axes provided, [2]

(v) obtain an expression for f^{-1} . [3]

OR

A function g is defined by $g : x \mapsto 5x^2 + px + 72$, where p is a constant. The function can also be written as $g : x \mapsto 5(x - 4)^2 + q$.

(i) Find the value of p and of q . [3]

(ii) Find the range of the function g . [1]

(iii) Sketch the graph of the function on the axes provided. [2]

(iv) Given that the function h is defined by $h : x \mapsto \ln x$, where $x > 0$, solve the equation $gh(x) = 12$. [4]

Start your answer to Question 12 here.

Indicate which question you are answering.

EITHER	
OR	

.....

.....

.....

.....

.....

.....

.....

.....

Continue your answer here.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

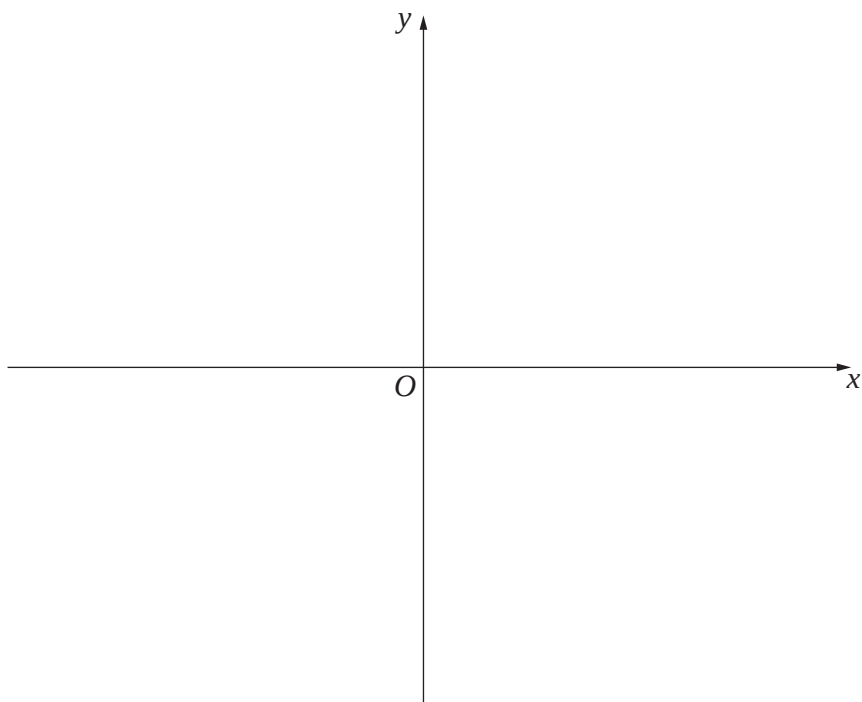
.....

.....

.....

.....

.....



Continue your answer here if necessary.

This image shows a full page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, typical of notebook or legal stationery. There are no margins, text, or other markings on the page.

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.