



--

--	--	--	--	--

--	--	--	--

0606/12

October/November 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.

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 Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
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 It is given that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 21 \\ 2 \end{pmatrix}$.

(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 $\begin{pmatrix} 2 & -1 \\ -1 & 1.5 \end{pmatrix}$.

[2]

*For
Examiner's
Use*

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

[3]

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

[5]

- (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 $\log_a p^2q = 15$, find the value of

(i) $\log_a p$ and of $\log_a q$,

[4]

For
Examiner's
Use

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

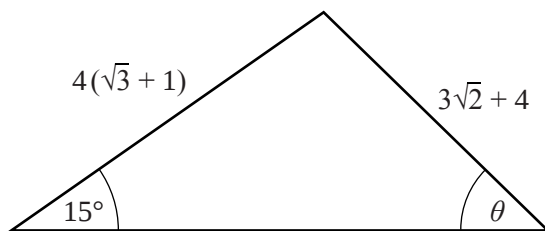
[2]

- 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]

*For
Examiner's
Use*

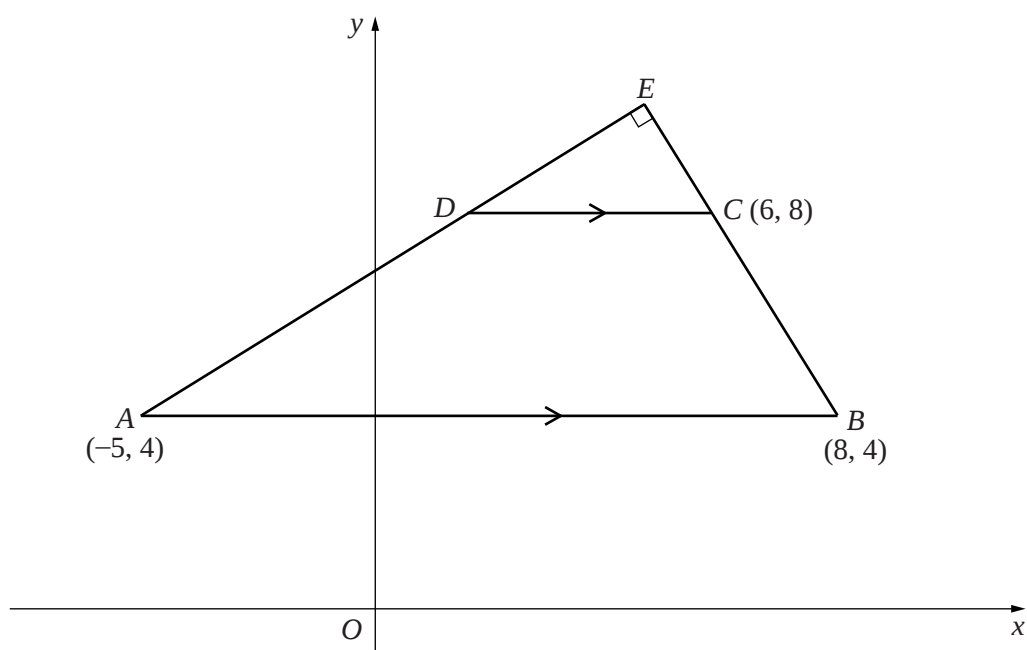
6

For
Examiner's
Use

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.

For
Examiner's
Use



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 $AEB = 90^\circ$.

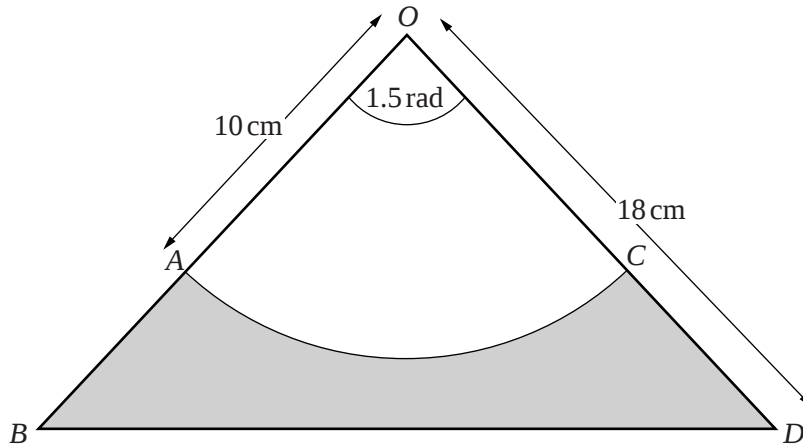
(i) Find the coordinates of D and of E .

[6]

- (ii) Find the area of the trapezium $ABCD$.

[2]

*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]

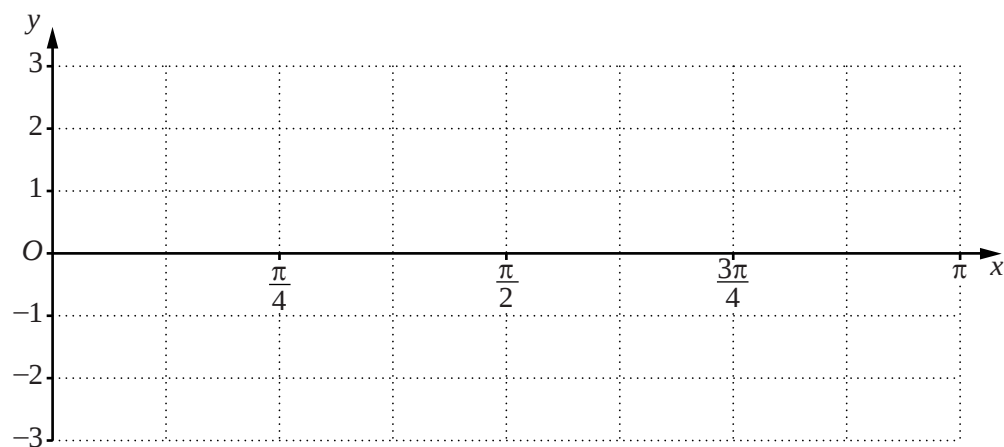
(ii) Find the perimeter of the shaded region. [4]

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

$$y = \sin 2x \quad \text{and} \quad y = 1 + \cos 2x.$$

[4]

For
Examiner's
Use



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

[2]

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

[2]

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

[1]

- 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) express $f(x)$ in the form $f(x) = (2x - 1)(px^2 + qx + r)$, where p , q and r are integers to be found, [2]

*For
Examiner's
Use*

- (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

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 $\int_{-1}^2 \frac{x}{(1+x^2)^2} dx$. [4]

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 . [3]
- (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.

Indicate which question you are answering.

EITHER	
OR	

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[illegible]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

0606/12/O/N/12