



--

--	--	--	--	--

--	--	--	--

4037/12

May/June 2015

2 hours

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

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

The total number of marks for this paper is 80.

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 Given that the graph of $y = (2k + 5)x^2 + kx + 1$ does not meet the x -axis, find the possible values of k . [4]

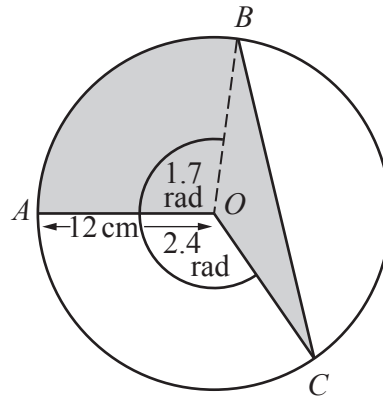
-
- 2 Show that $\frac{\tan \theta + \cot \theta}{\operatorname{cosec} \theta} = \sec \theta$. [4]

- 3 Find the inverse of the matrix $\begin{pmatrix} 4 & 2 \\ 5 & 3 \end{pmatrix}$ and hence solve the simultaneous equations

$$4x + 2y - 8 = 0,$$

$$5x + 3y - 9 = 0.$$

[5]



The diagram shows a circle, centre O , radius 12 cm . The points A , B and C lie on the circumference of this circle such that angle AOB is 1.7 radians and angle AOC is 2.4 radians.

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

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

5 (a) A security code is to be chosen using 6 of the following:

- the letters A, B and C
- the numbers 2, 3 and 5
- the symbols * and \$.

None of the above may be used more than once. Find the number of different security codes that may be chosen if

(i) there are no restrictions, [1]

(ii) the security code starts with a letter and finishes with a symbol, [2]

(iii) the two symbols are next to each other in the security code. [3]

(b) Two teams, each of 4 students, are to be selected from a class of 8 boys and 6 girls. Find the number of different ways the two teams may be selected if

(i) there are no restrictions, [2]

(ii) one team is to contain boys only and the other team is to contain girls only. [2]

- 6 A particle moves in a straight line such that its displacement, x m, from a fixed point O after t s, is given by $x = 10 \ln(t^2 + 4) - 4t$.

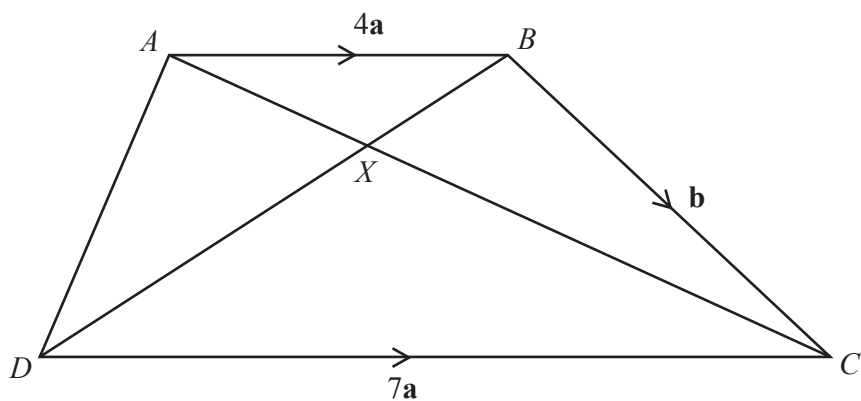
(i) Find the initial displacement of the particle from O . [1]

(ii) Find the values of t when the particle is instantaneously at rest. [4]

(iii) Find the value of t when the acceleration of the particle is zero.

[5]

7



In the diagram $\overrightarrow{AB} = 4\mathbf{a}$, $\overrightarrow{BC} = \mathbf{b}$ and $\overrightarrow{DC} = 7\mathbf{a}$. The lines AC and DB intersect at the point X . Find, in terms of $\mathbf{a}$ and $\mathbf{b}$,

(i) $\overrightarrow{DA}$, [1]

(ii) $\overrightarrow{DB}$. [1]

Given that $\overrightarrow{AX} = \lambda \overrightarrow{AC}$, find, in terms of $\mathbf{a}$, $\mathbf{b}$ and λ ,

(iii) $\overrightarrow{AX}$, [1]

(iv) $\overrightarrow{DX}$. [2]

Given that $\overrightarrow{DX} = \mu \overrightarrow{DB}$,

(v) find the value of λ and of μ .

[4]

8 (i) Find $\int (10e^{2x} + e^{-2x}) dx$. [2]

(ii) Hence find $\int_{-k}^k (10e^{2x} + e^{-2x}) dx$ in terms of the constant k . [2]

(iii) Given that $\int_{-k}^k (10e^{2x} + e^{-2x}) dx = -60$, show that $11e^{2k} - 11e^{-2k} + 120 = 0$. [2]

- (iv) Using a substitution of $y = e^{2k}$ or otherwise, find the value of k in the form $a \ln b$, where a and b are constants.

[3]

- 9 A curve has equation $y = 4x + 3 \cos 2x$. The normal to the curve at the point where $x = \frac{\pi}{4}$ meets the x - and y -axes at the points A and B respectively. Find the exact area of the triangle AOB , where O is the origin. [8]

10 (a) Solve $2 \cos 3x = \sec 3x$ for $0^\circ \leq x \leq 120^\circ$. [3]

(b) Solve $3 \operatorname{cosec}^2 y + 5 \cot y - 5 = 0$ for $0^\circ \leq y \leq 360^\circ$. [5]

Question 10(c) is printed on the next page.

(c) Solve $2 \sin\left(z + \frac{\pi}{3}\right) = 1$ for $0 \leq z \leq 2\pi$ radians. [4]

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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.