Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3911186838

ADDITIONAL MATHEMATICS **4037/12**

Paper 1 **May/June 2019**

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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 2019

Cambridge Assessment International Education

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

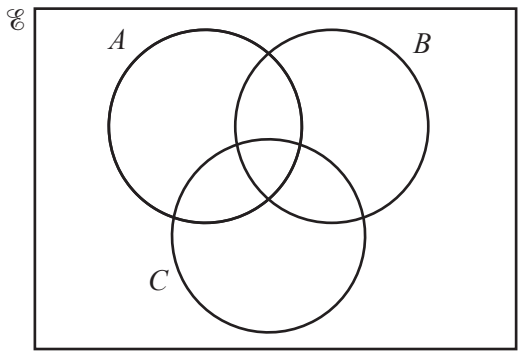
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

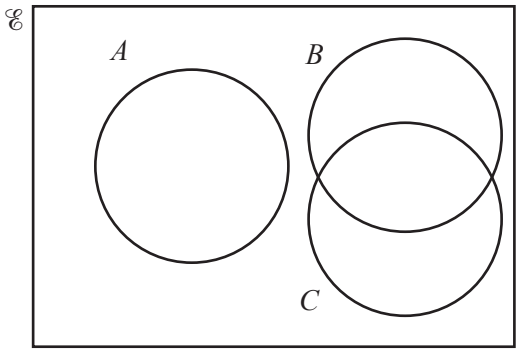
$$\Delta = \frac{1}{2} bc \sin A$$

© UCLES 2019

1 **(a)** On the Venn diagrams below, shade the region indicated.



$A' \cap B' \cap C'$



$A \cup (B \cap C)$

[2]

(b) $\mathscr{E} = \{x : 0° \leqslant x \leqslant 360°\}$

$P = \{x : \cos 2x = 0.5\}$

$Q = \{x : \sin x = 0.5\}$

Find $P \cap Q$. [3]

2 Do not use a calculator in this question.

Find the coordinates of the points of intersection of the curve $y = (2x+3)^2(x-1)$ and the line $y = 3(2x+3)$. [5]

3 The number, B, of a certain type of bacteria at time t days can be described by $B = 200e^{2t} + 800e^{-2t}$.

(i) Find the value of B when $t = 0$. [1]

(ii) At the instant when $\frac{dB}{dt} = 1200$, show that $e^{4t} - 3e^{2t} - 4 = 0$. [3]

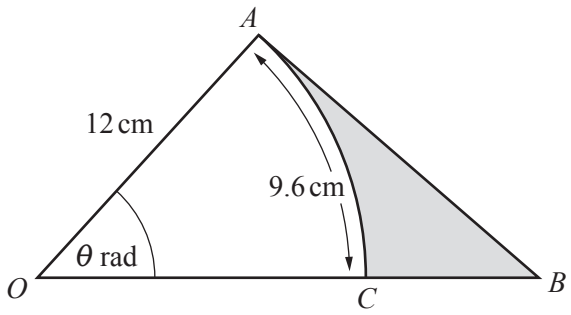
(iii) Using the substitution $u = e^{2t}$, or otherwise, solve $e^{4t} - 3e^{2t} - 4 = 0$. [2]

4 **(a)** Given that $\dfrac{\left(pr^2\right)^{\frac{3}{2}}\sqrt{qr}}{q^2\left(pr^2\right)^{-1}}$ can be written in the form $p^a q^b r^c$, find the value of each of the constants a, b and c. [3]

(b) Solve
$$3x^{\frac{1}{2}} - y^{-\frac{1}{2}} = 4,$$
$$4x^{\frac{1}{2}} + 3y^{-\frac{1}{2}} = 14.$$
[3]

© UCLES 2019

5



The diagram shows the right-angled triangle OAB. The point C lies on the line OB. Angle $OAB = \frac{\pi}{2}$ radians and angle $AOB = \theta$ radians. AC is an arc of the circle, centre O, radius 12 cm and AC has length 9.6 cm.

(i) Find the value of θ. [2]

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

6 **(a)** Eight books are to be arranged on a shelf. There are 4 mathematics books, 3 geography books and 1 French book.

(i) Find the number of different arrangements of the books if there are no restrictions. [1]

(ii) Find the number of different arrangements if the mathematics books have to be kept together. [3]

(iii) Find the number of different arrangements if the mathematics books have to be kept together and the geography books have to be kept together. [3]

© UCLES 2019

(b) A team of 6 players is to be chosen from 8 men and 4 women. Find the number of different ways this can be done if

(i) there are no restrictions, [1]

(ii) there is at least one woman in the team. [2]

© UCLES 2019

7 A pilot wishes to fly his plane from a point A to a point B on a bearing of 055°. There is a wind blowing at $120\,\text{km}\,\text{h}^{-1}$ from the west. The plane can fly at $650\,\text{km}\,\text{h}^{-1}$ in still air.

(i) Find the direction in which the pilot must fly his plane in order to reach B. [4]

(ii) Given that the distance between A and B is 1250 km, find the time it will take the pilot to fly from A to B. [4]

© UCLES 2019

8 When e^y is plotted against $\frac{1}{x}$, a straight line graph passing through the points $(2, 20)$ and $(4, 8)$ is obtained.

(i) Find y in terms of x. [5]

(ii) Hence find the positive values of x for which y is defined. [1]

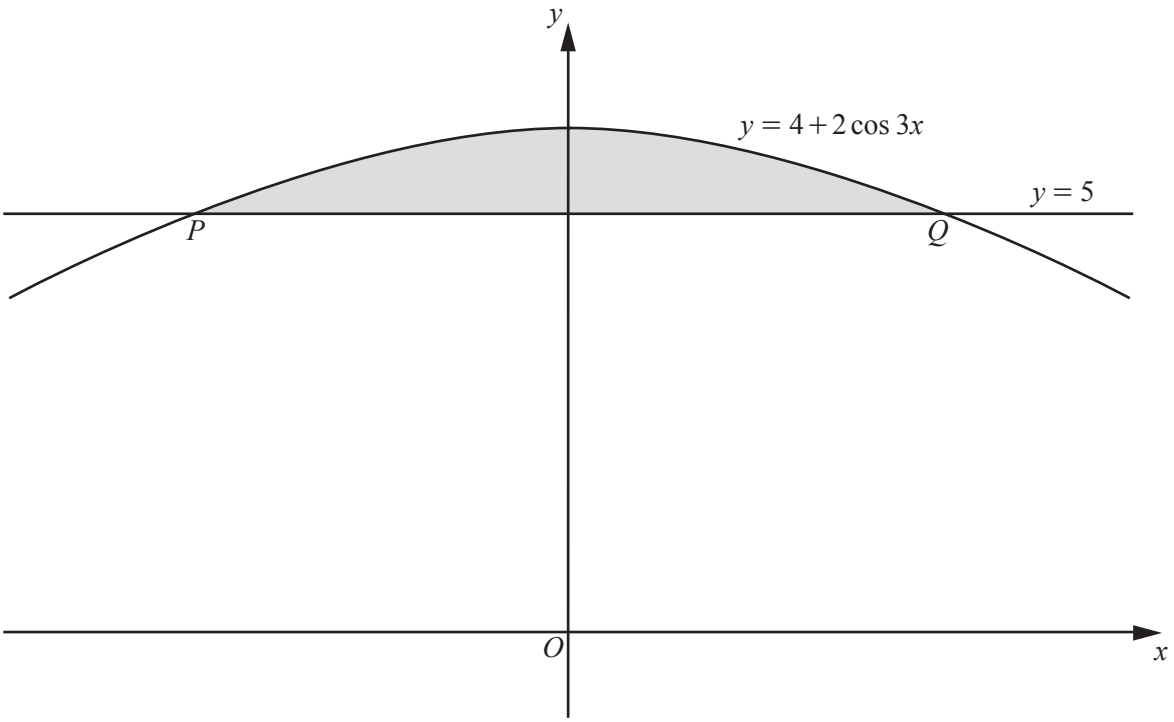
(iii) Find the exact value of y when $x = 3$. [1]

(iv) Find the exact value of x when $y = 2$. [2]

© UCLES 2019

[Turn over

9



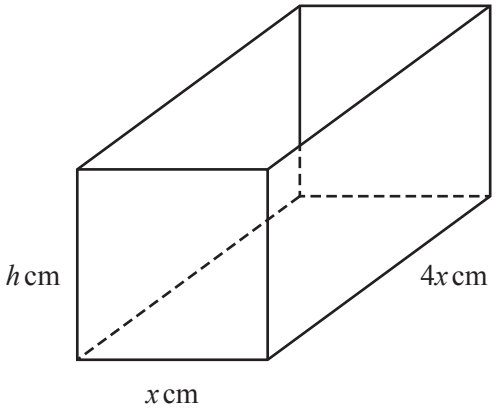
The diagram shows the curve $y = 4 + 2\cos 3x$ intersecting the line $y = 5$ at the points P and Q.

(i) Find, in terms of π, the x-coordinate of P and of Q. [3]

© UCLES 2019

(ii) Find the exact area of the shaded region. You must show all your working. [6]

10



The diagram shows an open container in the shape of a cuboid of width x cm, length $4x$ cm and height h cm. The volume of the container is $800\,\text{cm}^3$.

(i) Show that the external surface area, $S\,\text{cm}^2$, of the open container is such that $S = 4x^2 + \frac{2000}{x}$. [4]

(ii) Given that x can vary, find the stationary value of S and determine its nature. [5]

Question 11 is printed on the next page.

11 The normal to the curve $y = (x-2)(3x+1)^{\frac{2}{3}}$ at the point where $x = \frac{7}{3}$, meets the y-axis at the point P. Find the exact coordinates of the point P. [7]

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 Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

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

© UCLES 2019