Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3060253848

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **October/November 2019**

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 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.

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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

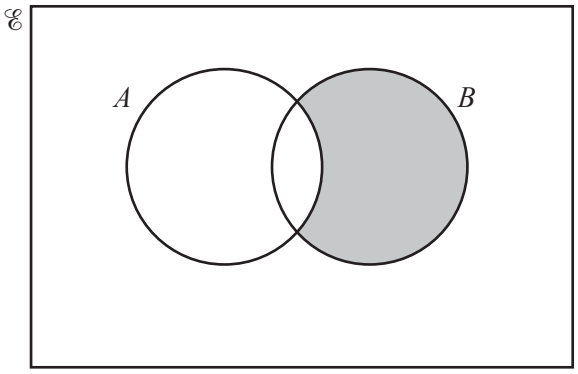
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

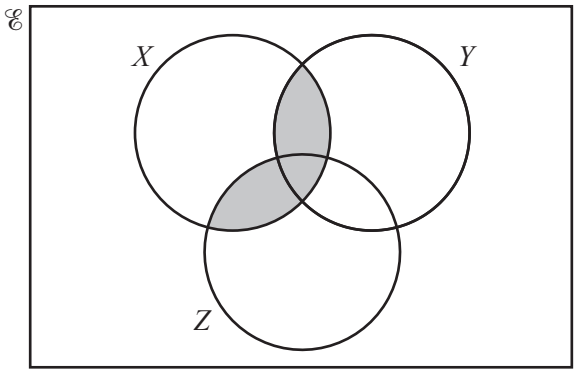
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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

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1 Using set notation, describe the regions shaded on the Venn diagrams below.





.... [2]

2 Find the values of k for which the line $y = kx - 3$ and the curve $y = 2x^2 + 3x + k$ do not intersect. [5]

3 Given that $7^x \times 49^y = 1$ and $5^{5x} \times 125^{\frac{2y}{3}} = \frac{1}{25}$, calculate the value of x and of y. [5]

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4 It is given that $y = \dfrac{\ln(4x^2 + 1)}{2x - 3}$.

(i) Find $\dfrac{dy}{dx}$. [3]

(ii) Find the approximate change in y as x increases from 2 to $2 + h$, where h is small. [2]

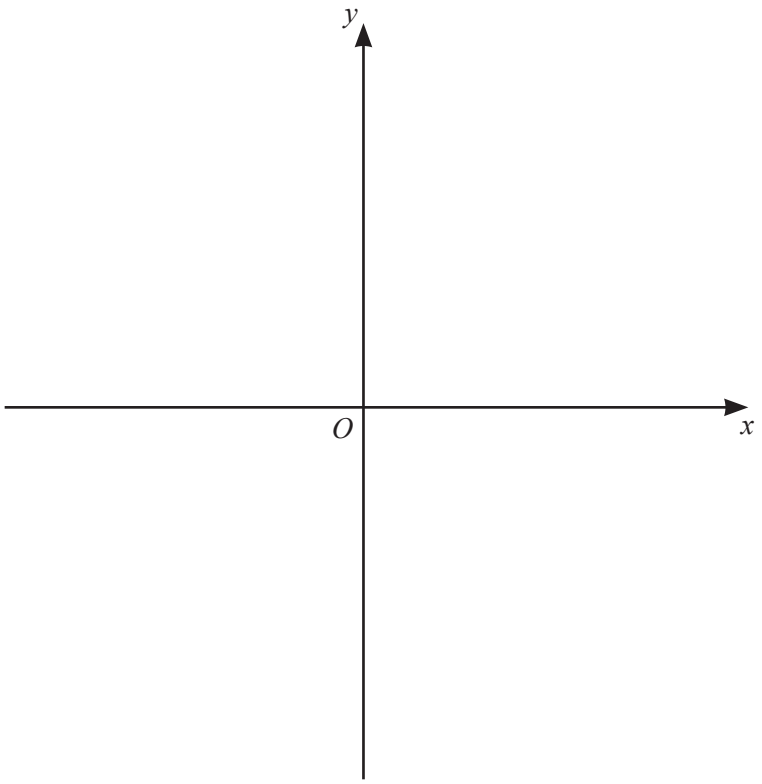
5 $\mathrm{f}(x) = 3\mathrm{e}^{2x} + 1 \quad$ for $x \in \mathbb{R}$

$\mathrm{g}(x) = x + 1 \quad$ for $x \in \mathbb{R}$

(i) Write down the range of f and of g. [2]

(ii) Evaluate $\mathrm{fg}^2(0)$. [2]

(iii) On the axes below, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, stating the coordinates of the points where the graphs meet the coordinate axes. [3]



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6 Find the equation of the normal to the curve $y = \sqrt{8x+5}$ at the point where $x = \frac{1}{2}$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [5]

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[Turn over

7 When lg y is plotted against x, a straight line graph passing through the points (2.2, 3.6) and (3.4, 6) is obtained.

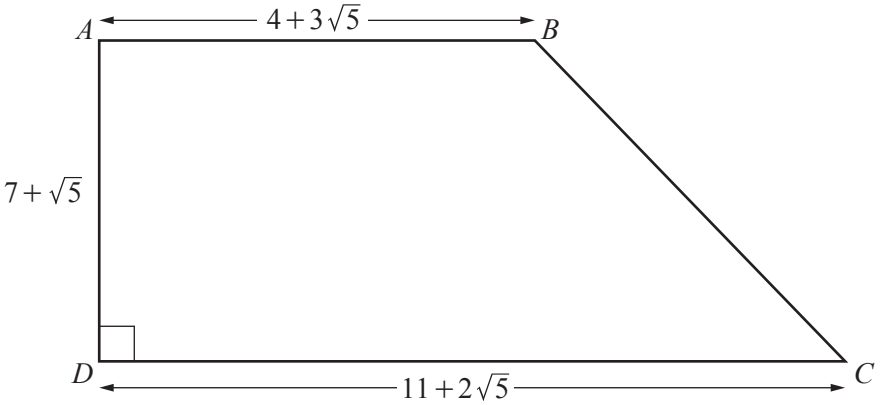
(i) Given that $y = Ab^x$, find the value of each of the constants A and b. [5]

(ii) Find x when $y = 900$. [2]

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8 Do not use a calculator in this question.

In this question, all lengths are in centimetres.



The diagram shows the trapezium $ABCD$ in which angle ADC is 90° and AB is parallel to DC. It is given that $AB = 4 + 3\sqrt{5}$, $DC = 11 + 2\sqrt{5}$ and $AD = 7 + \sqrt{5}$.

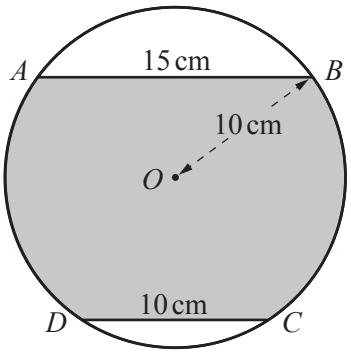
(i) Find the perimeter of the trapezium, giving your answer in simplest surd form. [3]

(ii) Find the area of the trapezium, giving your answer in simplest surd form. [3]

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[Turn over

9



The diagram shows a circle with centre O and radius 10 cm. The points A, B, C and D lie on the circle such that the chord $AB = 15$ cm and the chord $CD = 10$ cm. The chord AB is parallel to the chord DC.

(i) Show that the angle AOB is 1.70 radians correct to 2 decimal places. [2]

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

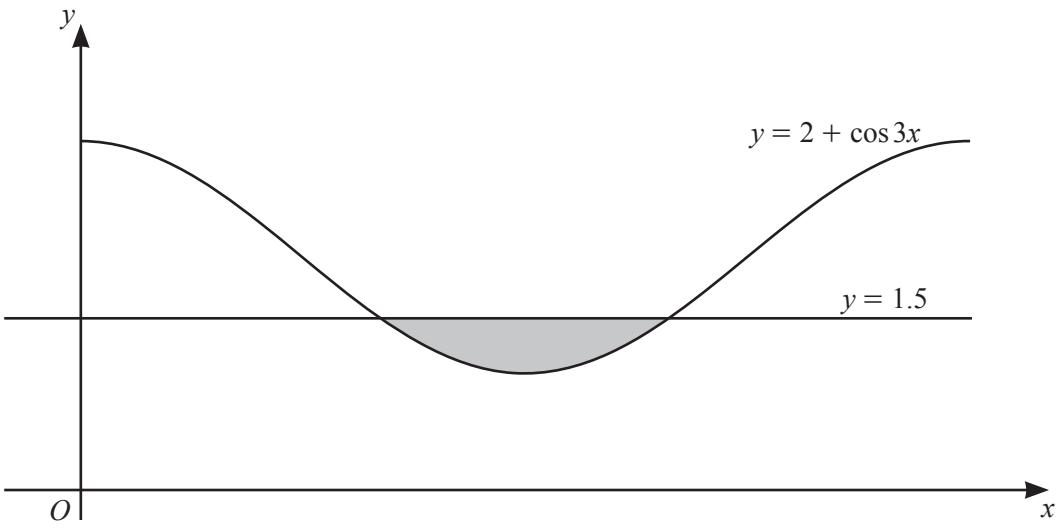
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(iii) Find the area of the shaded region. [4]

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[Turn over

10



The diagram shows part of the graph of $y = 2 + \cos 3x$ and the straight line $y = 1.5$. Find the exact area of the shaded region bounded by the curve and the straight line. You must show all your working. [9]

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Continuation of working space for Question 10

11 **(a)** Jess wants to arrange 9 different books on a shelf. There are 4 mathematics books, 3 physics books and 2 chemistry books. Find the number of different possible arrangements of the books if

(i) there are no restrictions, [1]

(ii) a chemistry book is at each end of the shelf, [2]

(iii) all the mathematics books are kept together and all the physics books are kept together. [3]

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(b) A quiz team of 6 children is to be chosen from a class of 8 boys and 10 girls. Find the number of ways of choosing the team if

(i) there are no restrictions, [1]

(ii) there are more boys than girls in the team. [4]

Question 12 is printed on the next page.

12 A curve is such that $\frac{d^2y}{dx^2} = 2\sin\left(x + \frac{\pi}{3}\right)$. Given that the curve has a gradient of 5 at the point $\left(\frac{\pi}{3}, \frac{5\pi}{3}\right)$, find the equation of the curve. [8]

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