Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3936138431

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **May/June 2018**

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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CAMBRIDGE International Examinations

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

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

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

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

1 Solve the equations

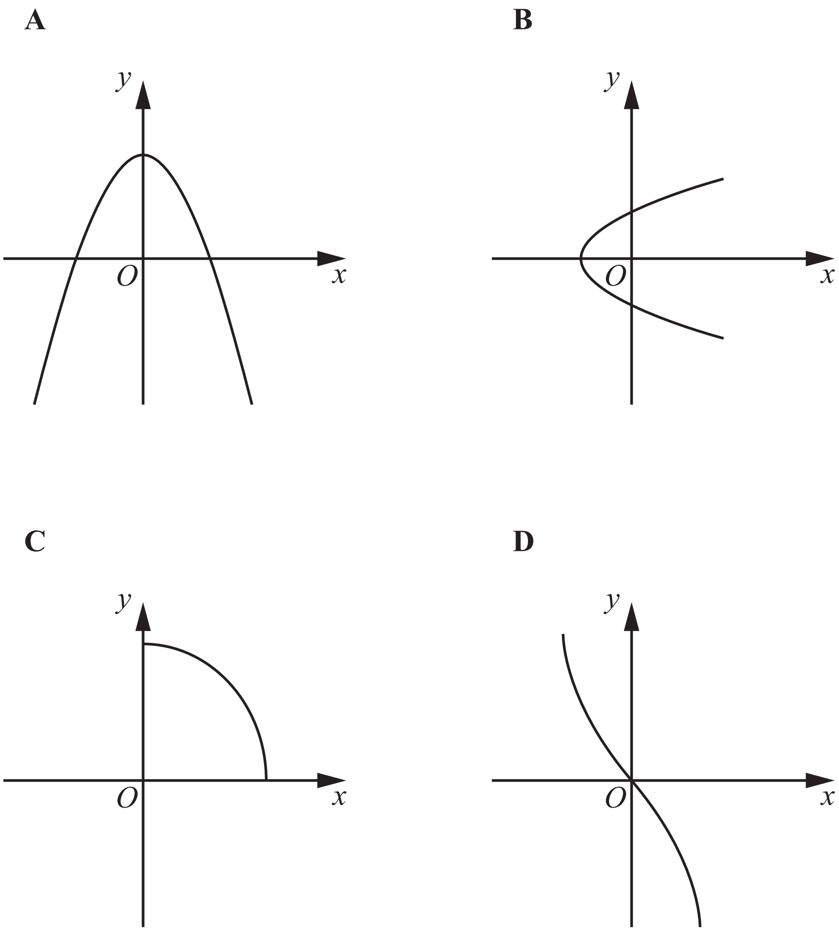
$$y - x = 4,$$

$$x^2 + y^2 - 8x - 4y - 16 = 0.$$

[5]

2 Find the equation of the perpendicular bisector of the line joining the points (1, 3) and (4, −5). Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. [5]

3 Diagrams **A** to **D** show four different graphs. In each case the whole graph is shown and the scales of the two axes are the same.

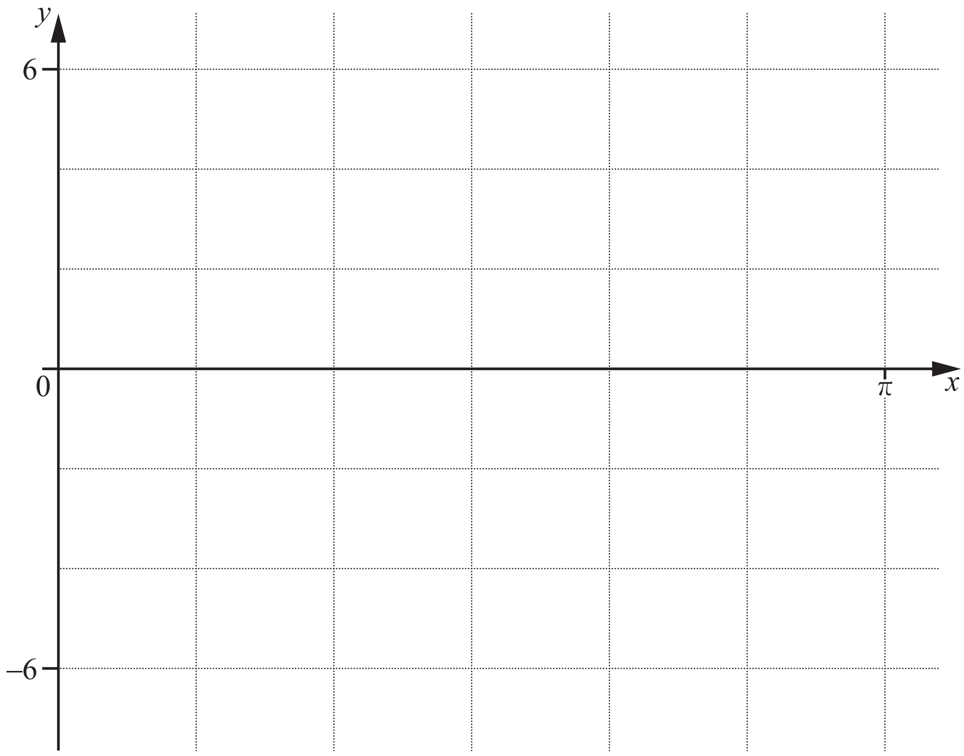


Place ticks in the boxes in the table to indicate which descriptions, if any, apply to each graph. There may be more than one tick in any row or column of the table. [4]

	A	B	C	D
Not a function				
One-one function				
A function that is its own inverse				
A function with no inverse				

4 **(i)** The curve $y = a + b\sin cx$ has an amplitude of 4 and a period of $\frac{\pi}{3}$. Given that the curve passes through the point $\left(\frac{\pi}{12}, 2\right)$, find the value of each of the constants a, b and c. [4]

(ii) Using your values of a, b and c, sketch the graph of $y = a + b\sin cx$ for $0 \leqslant x \leqslant \pi$ radians. [3]



5 The population, P, of a certain bacterium t days after the start of an experiment is modelled by $P = 800e^{kt}$, where k is a constant.

(i) State what the figure 800 represents in this experiment. [1]

(ii) Given that the population is 20 000 two days after the start of the experiment, calculate the value of k. [3]

(iii) Calculate the population three days after the start of the experiment. [2]

6 **(a)** Write $(\log_2 p)(\log_3 2) + \log_3 q$ as a single logarithm to base 3. [3]

(b) Given that $(\log_a 5)^2 - 4\log_a 5 + 3 = 0$, find the possible values of a. [3]

7 **(i)** Find the inverse of the matrix $\begin{pmatrix} 4 & -2 \\ -5 & 3 \end{pmatrix}$. [2]

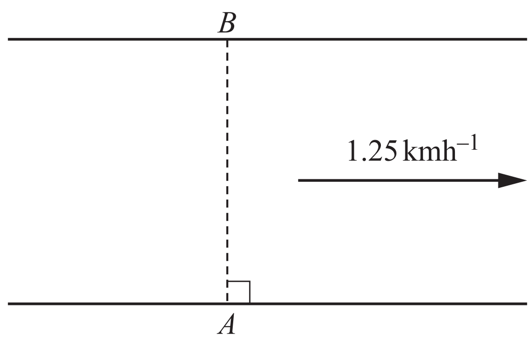
(ii) Hence solve the simultaneous equations

$$8x - 4y - 5 = 0,$$
$$-10x + 6y - 7 = 0.$$

[4]

8 **(a)** Given that $\mathbf{p} = 2\mathbf{i} - 5\mathbf{j}$ and $\mathbf{q} = \mathbf{i} - 3\mathbf{j}$, find the unit vector in the direction of $3\mathbf{p} - 4\mathbf{q}$. [4]

(b)



A river flows between parallel banks at a speed of 1.25 kmh^{-1}. A boy standing at point A on one bank sends a toy boat across the river to his father standing directly opposite at point B. The toy boat, which can travel at v kmh^{-1} in still water, crosses the river with resultant speed 2.73 kmh^{-1} along the line AB.

(i) Calculate the value of v. [2]

The direction in which the boy points the boat makes an angle θ with the line AB.

(ii) Find the value of θ. [2]

9 **(i)** Find the first 3 terms in the expansion of $\left(2x - \frac{1}{16x}\right)^8$ in descending powers of x. [3]

(ii) Hence find the coefficient of x^4 in the expansion of $\left(2x - \frac{1}{16x}\right)^8 \left(\frac{1}{x^2} + 1\right)^2$. [3]

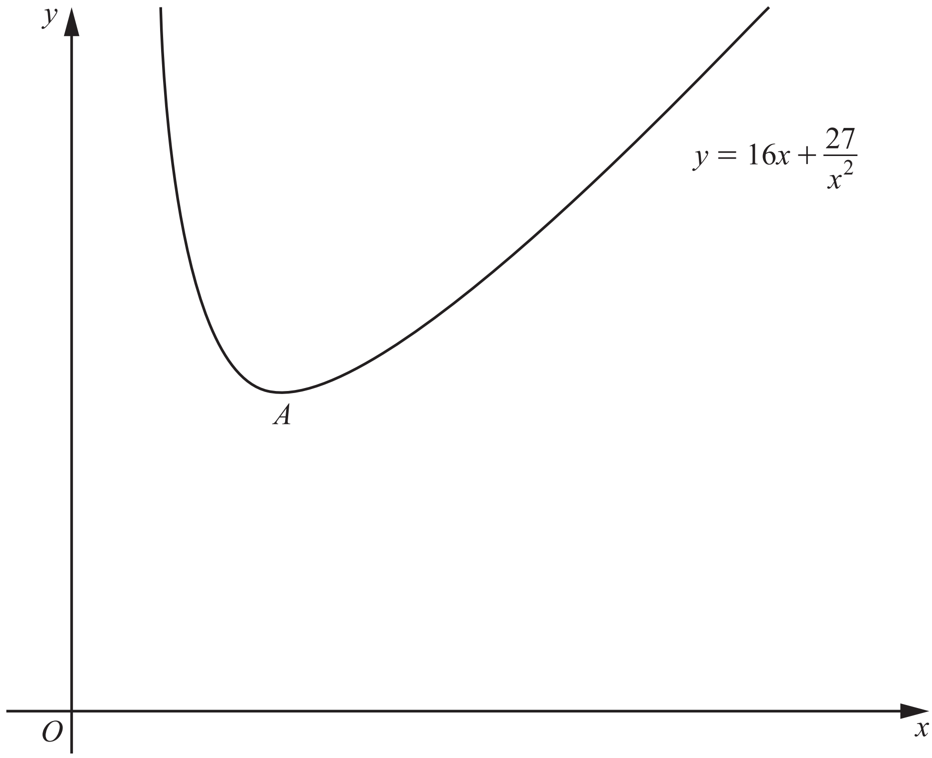
10 Do not use a calculator in this question.

(a) Simplify $\dfrac{5+6\sqrt{5}}{6+\sqrt{5}}$. [3]

(b) Show that $3^{0.5}\times(\sqrt{2})^7$ can be written in the form $a\sqrt{b}$, where a and b are integers and $a > b$. [2]

(c) Solve the equation $x+\sqrt{2}=\dfrac{4}{x}$, giving your answers in simplest surd form. [4]

11



The diagram shows part of the graph of $y = 16x + \dfrac{27}{x^2}$, which has a minimum at A.

(i) Find the coordinates of A. [4]

The points P and Q lie on the curve $y = 16x + \dfrac{27}{x^2}$ and have x-coordinates 1 and 3 respectively.

(ii) Find the area enclosed by the curve and the line PQ. You must show all your working. [6]

Question 12 is printed on the next page.

12 A curve is such that $\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = (2x-5)^{-\frac{1}{2}}$. Given that the curve has a gradient of 6 at the point $\left(\frac{9}{2}, \frac{2}{3}\right)$, find the equation of the curve. [8]