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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 4 2 1 4 7 6 7 2 5 9 *

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **February/March 2017**

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 **15** printed pages and **1** blank page.

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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 Solve the equation $|5-3x|=10$. [3]

2 The value, V dollars, of a car aged t years is given by $V = 12\,000\,\mathrm{e}^{-0.2t}$.

(i) Write down the value of the car when it was new. [1]

(ii) Find the time it takes for the value to decrease to $\frac{2}{3}$ of the value when it was new. [2]

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3 The polynomial $p(x)$ is $x^4 - 2x^3 - 3x^2 + 8x - 4$.

(i) Show that $p(x)$ can be written as $(x-1)(x^3 - x^2 - 4x + 4)$. [1]

(ii) Hence write $p(x)$ as a product of its linear factors, showing all your working. [4]

4 Find the set of values of k for which the line $y = 3x + k$ and the curve $y = 2x^2 - 3x + 4$ do not intersect. [4]

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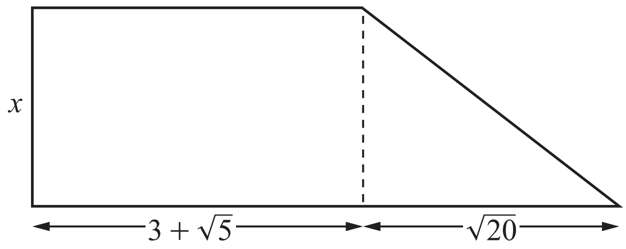
5



The diagram shows a trapezium made from a rectangle and a right-angled triangle. The dimensions, in centimetres, of the rectangle and triangle are shown. The area, in square centimetres, of the trapezium is $13 + 5\sqrt{5}$. **Without using a calculator**, find the value of x in the form $p + q\sqrt{5}$, where p and q are integers. [5]

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6 **(a)** **(i)** Express $\left(\sqrt[3]{-8x^9}\right)\left(\sqrt[6]{x^{-3}}\right)$ in the form ax^b, where a and b are constants to be found. [2]

(ii) Hence solve the equation $\left(\sqrt[3]{-8x^9}\right)\left(\sqrt[6]{x^{-3}}\right) = -6250$. [2]

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(b) It is given that $y = \log_a(ax) + 2\log_a(4x - 3) - 1$, where a is a positive integer.

(i) Explain why x must be greater than 0.75. [1]

(ii) Show that y can be written as $\log_a(16x^3 - 24x^2 + 9x)$. [3]

(iii) Find the value of x for which $y = \log_a(9x)$. [2]

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7 **(a)** Calculate the magnitude and bearing of the resultant velocity of $10\,\text{ms}^{-1}$ on a bearing of 240° and $5\,\text{ms}^{-1}$ due south. [5]

(b) A car travelling east along a road at a velocity of $38\,\text{kmh}^{-1}$ passes a lorry travelling west on the same road at a velocity of $56\,\text{kmh}^{-1}$. Write down the velocity of the lorry relative to the car. [2]

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8 The points $A(3, 7)$ and $B(8, 4)$ lie on the line L. The line through the point $C(6, -4)$ with gradient $\frac{1}{6}$ meets the line L at the point D. Calculate

(i) the coordinates of D, [6]

(ii) the equation of the line through D perpendicular to the line $3y - 2x = 10$. [2]

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9 **(a)** Find $\int e^{2x+1}\,dx$. [2]

(b) **(i)** Given that $y = \dfrac{x}{\ln x}$, find $\dfrac{dy}{dx}$. [3]

(ii) Hence find $\int \left(\dfrac{1}{\ln x} - \dfrac{1}{(\ln x)^2} + \dfrac{1}{x^2} \right) dx$. [3]

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10 Solve, for $0° \leqslant x \leqslant 360°$, the equation

(i) $\cot(2x - 10°) = \frac{3}{4}$, [4]

(ii) $\sin^2 x - \cos^2 x = \cos x$. [5]

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11 The functions f and g are defined by

$$\mathrm{f}(x) = \frac{x^2 - 2}{x} \quad \text{for } x \geqslant 2,$$

$$\mathrm{g}(x) = \frac{x^2 - 1}{2} \quad \text{for } x \geqslant 0.$$

(i) State the range of g. [1]

(ii) Explain why fg(1) does not exist. [2]

(iii) Show that $\mathrm{gf}(x) = ax^2 + b + \frac{c}{x^2}$, where a, b and c are constants to be found. [3]

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(iv) State the domain of gf. [1]

(v) Show that $f^{-1}(x) = \dfrac{x + \sqrt{x^2 + 8}}{2}$. [4]

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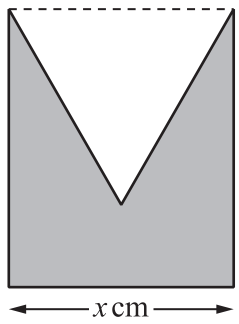
12 The diagram shows a shape made by cutting an equilateral triangle out of a rectangle of width x cm.



The perimeter of the shape is 20 cm.

(i) Show that the area, A cm^2, of the shape is given by

$$A = 10x - \left(\frac{6+\sqrt{3}}{4}\right)x^2.$$ [3]

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(ii) Given that x can vary, find the value of x which produces the maximum area and calculate this maximum area. Give your answers to 2 significant figures. [4]

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