

Cambridge IGCSE[™]

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

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ADDITIONAL MATHEMATICS

0606/12

Paper 1 October/November 2020

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do not write on any bar codes.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has 16 pages. Blank pages are indicated.

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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

$$(a+b)^{n} = a^{n} + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^{2} + \dots + \binom{n}{r}a^{n-r}b^{r} + \dots + b^{n}$$

where *n* is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series $u_n = a + (n-1)d$

$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n\left\{2a + (n-1)d\right\}$$

Geometric series

$$u_n = ar^{n-1}$$

 $S_n = \frac{a(1-r^n)}{1-r} \ (r \neq 1)$

$$S_{\infty} = \frac{a}{1-r} \ (|r| < 1)$$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$
$$\csc^2 A = 1 + \cot^2 A$$

Formulae for $\triangle ABC$

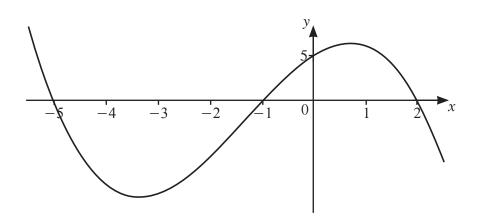
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$\Delta = \frac{1}{2}bc \sin A$$

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1 The curve $y = 2x^2 + k + 4$ intersects the straight line y = (k+4)x at two distinct points. Find the possible values of k. [4]

2



The diagram shows the graph of y = f(x), where f(x) is a cubic polynomial.

(a) Find f(x). [3]

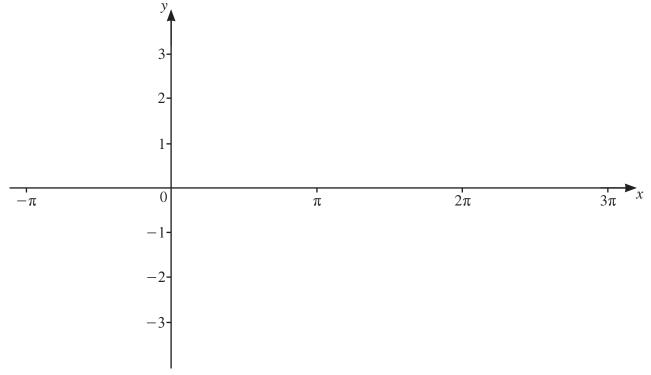
(b) Write down the values of x such that f(x) < 0. [2]

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- 3 (a) Write down the amplitude of $2\cos\frac{x}{3} 1$.
 - **(b)** Write down the period of $2\cos\frac{x}{3} 1$.

[1]

(c) On the axes below, sketch the graph of $y = 2\cos\frac{x}{3} - 1$ for $-\pi \le x \le 3\pi$ radians.



[3]

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[3) Om

- 4 The 7th and 10th terms of an arithmetic progression are 158 and 149 respectively.
 - (a) Find the common difference and the first term of the progression.

(b) Find the least number of terms of the progression for their sum to be negative.

[3]

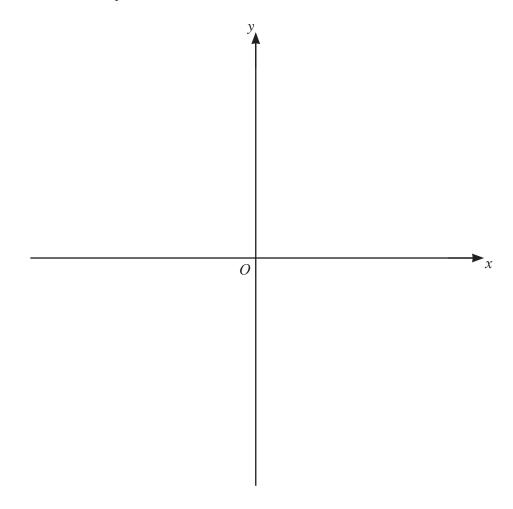
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5 Find the coefficient of x^2 in the expansion of $\left(x - \frac{3}{x}\right)\left(x + \frac{2}{x}\right)^5$.

6
$$f(x) = x^2 + 2x - 3$$
 for $x \ge -1$

(a) Given that the minimum value of $x^2 + 2x - 3$ occurs when x = -1, explain why f(x) has an inverse. [1]

(b) On the axes below, sketch the graph of y = f(x) and the graph of $y = f^{-1}(x)$. Label each graph and state the intercepts on the coordinate axes.



[4]

- A curve has equation $y = \frac{\ln(3x^2 5)}{2x + 1}$ for $3x^2 > 5$.
 - (a) Find the equation of the normal to the curve at the point where $x = \sqrt{2}$.

[6]

[1]

(b) Find the approximate change in y as x increases from $\sqrt{2}$ to $\sqrt{2} + h$, where h is small.

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8	(a)	Find the number of ways in which 12 people can be put into 3 groups containing 3, 4 and 5 peo	opi co
		respectively.	[3] SUY, CON
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(b)	4-digit numbers are to be formed using four of the digits 2, 3, 7, 8 and 9. Each digit may be used
	once only in any 4-digit number. Find how many 4-digit numbers can be formed if

(i) there are no restrictions, [1]

(ii) the number is even, [1]

(iii) the number is greater than 7000 and odd. [3]

- A curve has equation $y = (2x-1)\sqrt{4x+3}$. 9
 - (a) Show that $\frac{dy}{dx} = \frac{4(Ax+B)}{\sqrt{4x+3}}$, where A and B are constants.

[1]

- **(b)** Hence write down the *x*-coordinate of the stationary point of the curve.
- (c) Determine the nature of this stationary point. [2]

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	[4]	, cou

- The polynomial $p(x) = 6x^3 + ax^2 + bx + 2$, where a and b are integers, has a factor of x 2.
 - (a) Given that p(1) = -2p(0), find the value of a and of b.

- (b) Using your values of a and b,
 - (i) find the remainder when p(x) is divided by 2x-1,

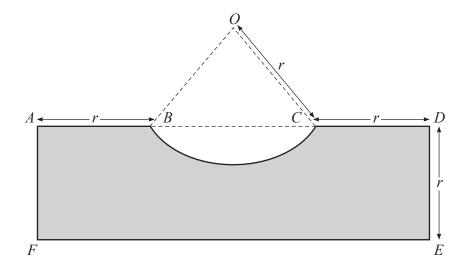
[2]

(ii) factorise p(x).

[2]

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11 In this question all lengths are in centimetres and all angles are in radians.



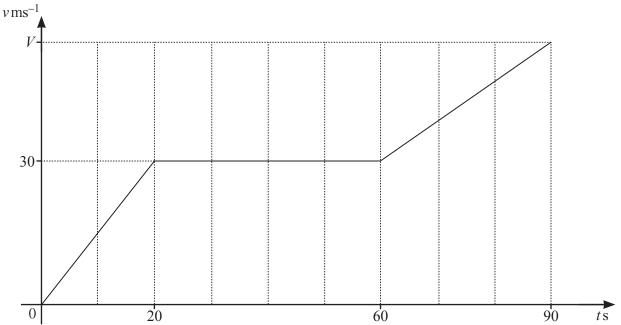
The diagram shows the rectangle ADEF, where AF = DE = r. The points B and C lie on AD such that AB = CD = r. The curve BC is an arc of the circle, centre O, radius r and has a length of 1.5r.

(a) Show that the perimeter of the shaded region is $(7.5 + 2\sin 0.75)r$. [5]

Constan. [4]

(b) Find the area of the shaded region, giving your answer in the form kr^2 , where k is a constant correct to 2 decimal places. [4]





The diagram shows the velocity–time graph of a particle P that travels 2775 m in 90 s, reaching a final velocity of $V \, \mathrm{ms}^{-1}$.

(i) Find the value of V. [3]

(ii) Write down the acceleration of P when t = 40. [1]

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(b)	The acceleration, $a \text{ ms}^{-2}$, of a particle Q travelling in a straight line, is given by $a = 6 \cos 2t$ time t s. When $t = 0$ the particle is at point O and is travelling with a velocity of 10 ms^{-1} .	a. Cloud. Co
	time ts. When $t = 0$ the particle is at point O and is travelling with a velocity of 10 ms ⁻¹ .	4.0

(i) Find the velocity of Q at time t.

[3]

(ii) Find the displacement of Q from O at time t.

[3]

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