



# Cambridge IGCSE®

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**ADDITIONAL MATHEMATICS**

**0606/01**

Paper 1

**For examination from 2020**

SPECIMEN PAPER

**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.

*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*

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

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

*Geometric series*

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

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

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

**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  $\triangle ABC$* 

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

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

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

**1 DO NOT USE A CALCULATOR IN THIS QUESTION.**

The polynomial  $p(x) = 2x^3 - 3x^2 + qx + 56$  has a factor  $x - 2$ .

(a) Show that  $q = -30$ . [1]

(b) Factorise  $p(x)$  completely and hence state all the solutions of  $p(x) = 0$ . [4]

**2** Variables  $x$  and  $y$  are related by the equation  $y = x\sqrt{x}$ .

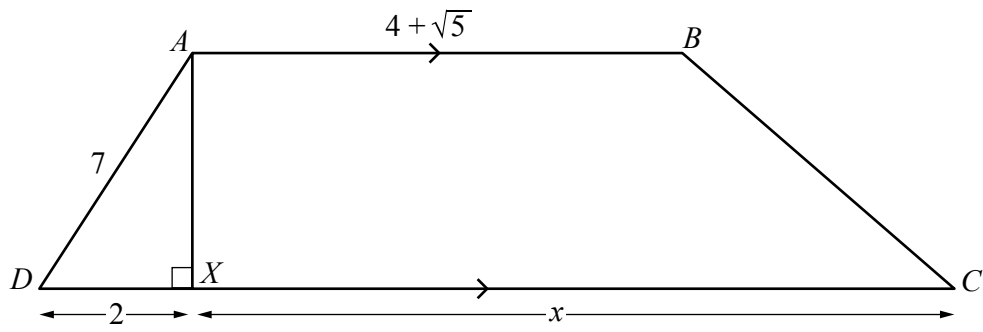
(a) Find  $\frac{dy}{dx}$ . [2]

(b) Hence find the approximate change in  $x$  when  $y$  increases from 8 by the small amount 0.015. [3]

3 (a) Express  $12x^2 - 6x + 5$  in the form  $p(x - q)^2 + r$ , where  $p$ ,  $q$  and  $r$  are constants to be found. [3]

(b) Hence find the greatest value of  $(12x^2 - 6x + 5)^{-1}$  and state the value of  $x$  at which this occurs. [2]

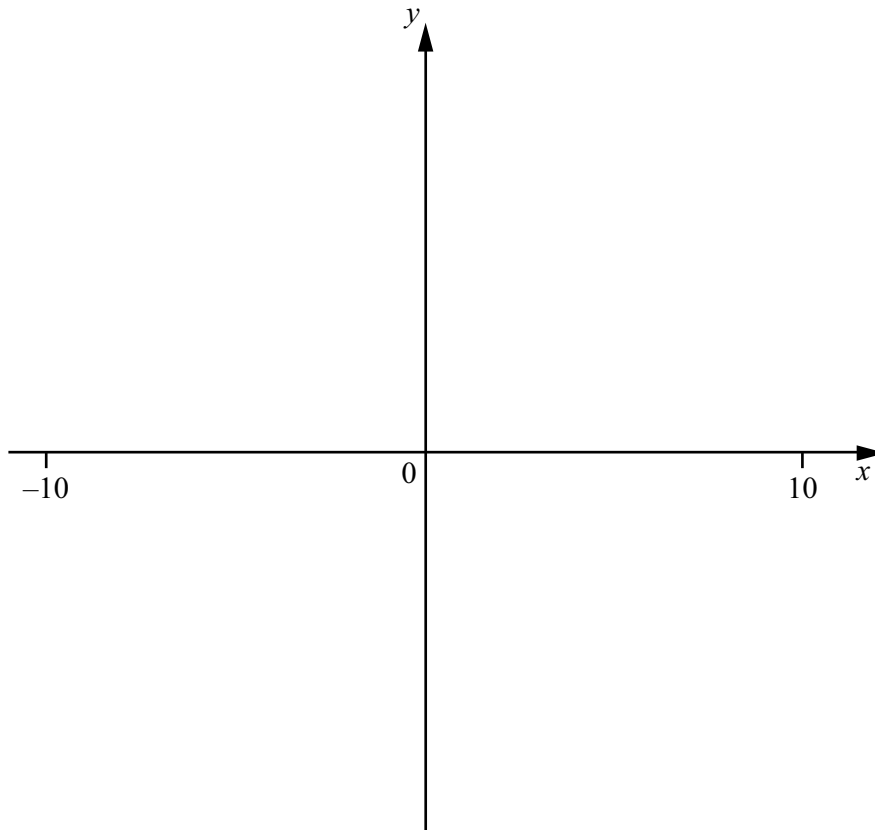
## 4 DO NOT USE A CALCULATOR IN THIS QUESTION.



The diagram shows a trapezium  $ABCD$  in which  $AD = 7$  cm and  $AB = (4 + \sqrt{5})$  cm.  $AX$  is perpendicular to  $DC$  with  $DX = 2$  cm and  $XC = x$  cm.

Given that the area of trapezium  $ABCD$  is  $15(\sqrt{5} + 2)$  cm<sup>2</sup>, obtain an expression for  $x$  in the form  $a + b\sqrt{5}$ , where  $a$  and  $b$  are integers. [6]

- 5 (a) On the axes below, sketch the graph of  $y = |2x + 5|$  and the graph of  $y = |2 - x|$ , stating the coordinates of the points where each graph meets the coordinate axes. [4]

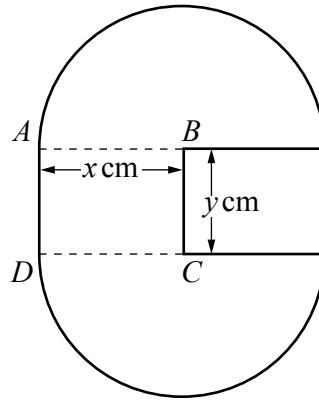


(b) Solve  $|2x + 5| \leq |2 - x|$ .

[3]

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

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The diagram shows a badge, made of thin sheet metal, consisting of two semi-circular pieces, centres  $B$  and  $C$ , each of radius  $x$  cm. They are attached to each other by a rectangular piece of thin sheet metal,  $ABCD$ , such that  $AB$  and  $CD$  are the radii of the semicircular pieces and  $AD = BC = y$  cm.

(a) Given that the area of the badge is  $20 \text{ cm}^2$ , show that the perimeter,  $P$  cm, of the badge is given by

$$P = 2x + \frac{40}{x}. \quad [4]$$



(b) Given that  $x$  can vary, find the minimum value of  $P$ , justifying that this value is a minimum. [5]

8 (a) Giving your answer in its simplest form, find the exact value of

(i)  $\int_{0.2}^1 e^{5x-1} dx,$  [4]

(ii)  $\int_1^2 \left(x + \frac{1}{x^2}\right)^2 dx.$  [5]

(b) Find  $\int \sin \frac{x}{6} dx.$  [2]

**9 DO NOT USE A CALCULATOR IN THIS QUESTION.**

In the expansion of  $(1 + 2x)^n$ , the coefficient of  $x^4$  is ten times the coefficient of  $x^2$ .

Find the value of the positive integer  $n$ .

[6]

10 (a) An arithmetic progression has a first term of 5 and a common difference of  $-3$ .

Find the number of terms such that the sum to  $n$  terms is first less than  $-200$ . [4]

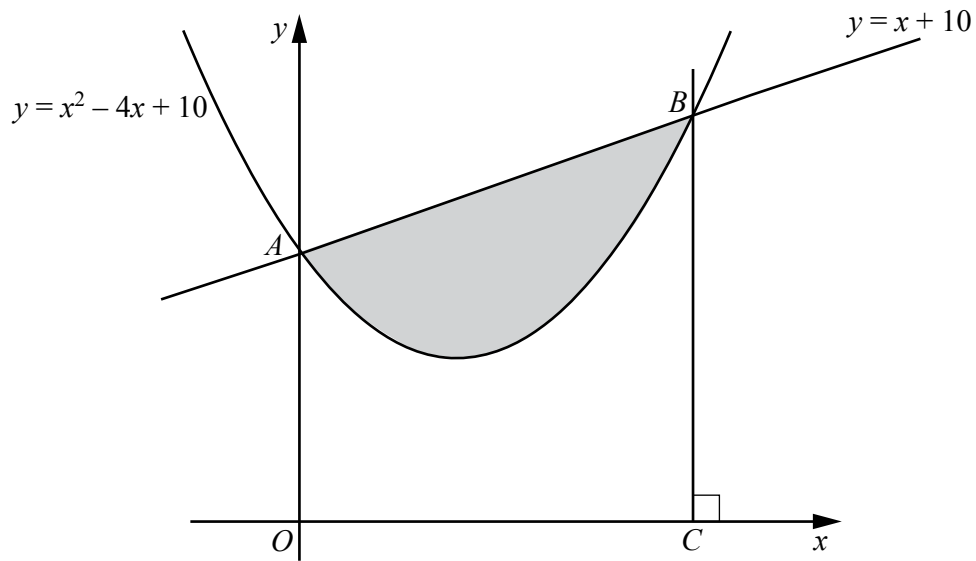
(b) A geometric progression is such that its 3rd term is equal to  $\frac{81}{64}$  and its 5th term is equal to  $\frac{729}{1024}$ .

(i) Find the first term of this progression and the positive common ratio of this progression. [5]

(ii) Hence find the sum to infinity of this progression.

[1]

11



The graph of  $y = x^2 - 4x + 10$  cuts the  $y$ -axis at point  $A$ . The graphs of  $y = x^2 - 4x + 10$  and  $y = x + 10$  intersect one another at the points  $A$  and  $B$ . The line  $BC$  is perpendicular to the  $x$ -axis. Calculate the area of the shaded region enclosed by the curve and the line  $AB$ . [8]

Continuation of working space for **question 11**.

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