



Cambridge O Level

CANDIDATE
NAME

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ADDITIONAL MATHEMATICS

4037/01

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 $y = x\sqrt{x}$.

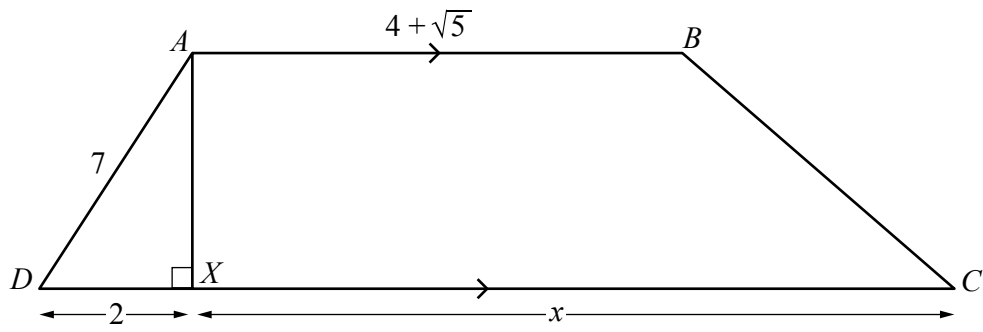
(a) Find $\frac{dy}{dx}$. [2]

(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]

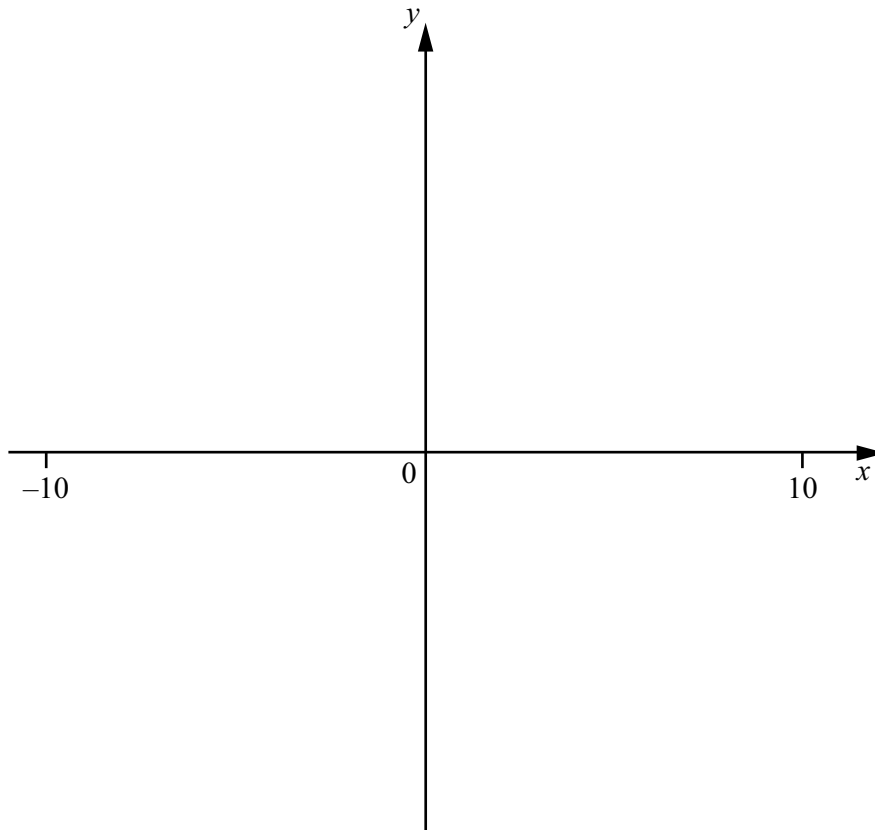
4 DO NOT USE A CALCULATOR IN THIS QUESTION.



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 $15(\sqrt{5} + 2)$ cm², 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]

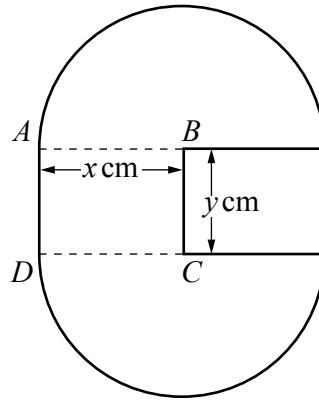


(b) Solve $|2x + 5| \leq |2 - x|$.

[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]

7



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 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]

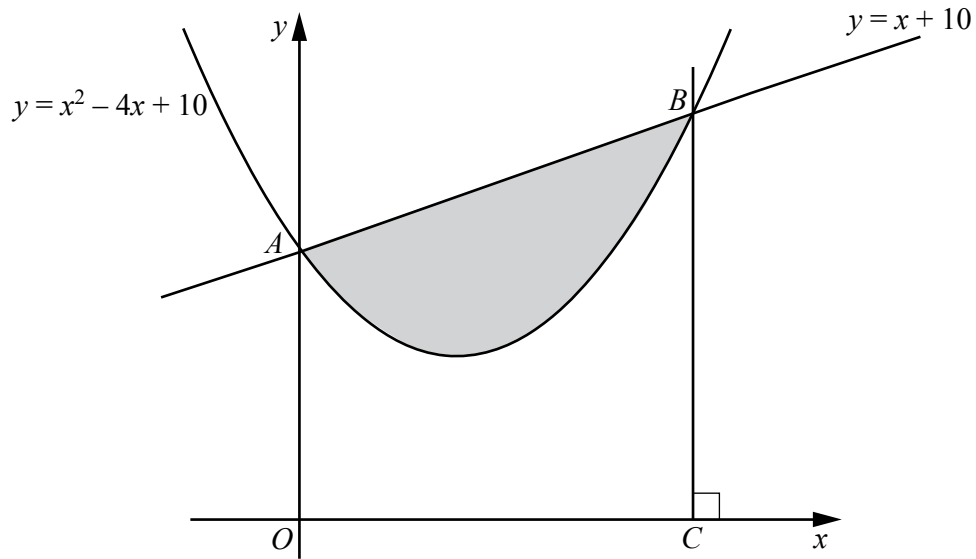
(b) A geometric progression is such that its 3rd term is equal to $\frac{81}{64}$ and its 5th term is equal to $\frac{729}{1024}$.

(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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