

Cambridge IGCSE™

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



ADDITIONAL MATHEMATICS

0606/21

Paper 2

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.

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*

$$\begin{aligned}\sin^2 A + \cos^2 A &= 1 \\ \sec^2 A &= 1 + \tan^2 A \\ \operatorname{cosec}^2 A &= 1 + \cot^2 A\end{aligned}$$

Formulae for $\triangle ABC$

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

1 Solve the inequality $|3x+2| > 8+x$. [3]

2 Find the coordinates of the points of intersection of the curve $x^2+xy=9$ and the line $y=\frac{2}{3}x-2$. [5]

3 Write $3 \lg x + 2 - \lg y$ as a single logarithm. [3]

4 It is given that $y = \ln(\sin x + 3 \cos x)$ for $0 < x < \frac{\pi}{2}$.

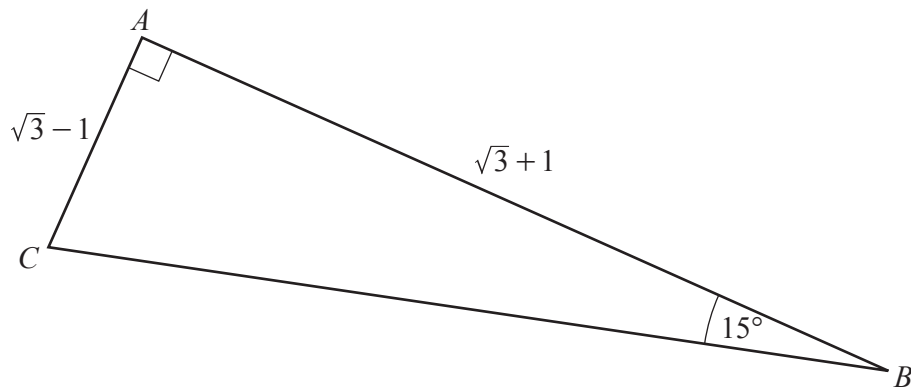
(a) Find $\frac{dy}{dx}$. [3]

(b) Find the value of x for which $\frac{dy}{dx} = -\frac{1}{2}$. [3]

- 5 The first three terms in the expansion of $(a+bx)^5(1+x)$ are $32-208x+cx^2$. Find the value of each of the integers a , b and c . [7]

6 DO NOT USE A CALCULATOR IN THIS QUESTION.

In this question all lengths are in centimetres.



In the diagram above $AC = \sqrt{3} - 1$, $AB = \sqrt{3} + 1$, angle $ABC = 15^\circ$ and angle $CAB = 90^\circ$.

(a) Show that $\tan 15^\circ = 2 - \sqrt{3}$. [3]

(b) Find the exact length of BC . [2]

7 DO NOT USE A CALCULATOR IN THIS QUESTION.

$$p(x) = 2x^3 - 3x^2 - 23x + 12$$

(a) Find the value of $p\left(\frac{1}{2}\right)$. [1]

(b) Write $p(x)$ as the product of three linear factors and hence solve $p(x) = 0$. [5]

- 8 The population P , in millions, of a country is given by $P = A \times b^t$, where t is the number of years after January 2000 and A and b are constants. In January 2010 the population was 40 million and had increased to 45 million by January 2013.

(a) Show that $b = 1.04$ to 2 decimal places and find A to the nearest integer. [4]

(b) Find the population in January 2020, giving your answer to the nearest million. [1]

(c) In January of which year will the population be over 100 million for the first time? [3]

- 9 A particle moves in a straight line such that, t seconds after passing a fixed point O , its displacement from O is s m, where $s = e^{2t} - 10e^t - 12t + 9$.

(a) Find expressions for the velocity and acceleration at time t . [3]

(b) Find the time when the particle is instantaneously at rest. [3]

(c) Find the acceleration at this time. [2]

10 The gradient of the normal to a curve at the point (x, y) is given by $\frac{x}{x+1}$.

(a) Given that the curve passes through the point $(1, 4)$, show that its equation is $y = 5 - \ln x - x$.
[5]

- (b) Find, in the form $y = mx + c$, the equation of the tangent to the curve at the point where $x = 3$. [3]

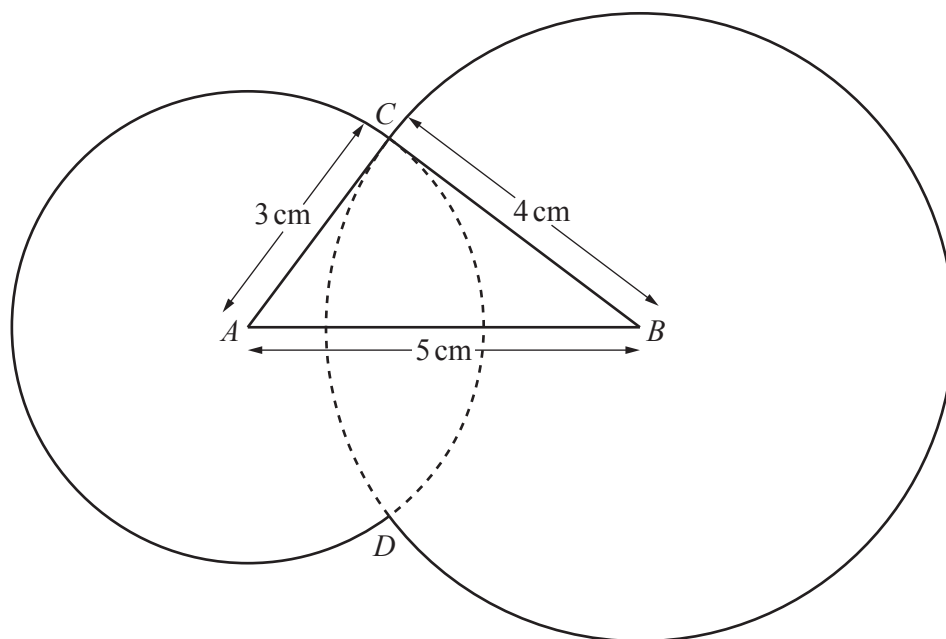
11 The equation of a curve is $y = x\sqrt{16-x^2}$ for $0 \leq x \leq 4$.

(a) Find the exact coordinates of the stationary point of the curve.

[6]

- (b) Find $\frac{d}{dx}(16-x^2)^{\frac{3}{2}}$ and hence evaluate the area enclosed by the curve $y = x\sqrt{16-x^2}$ and the lines $y = 0$, $x = 1$ and $x = 3$. [5]

12



The diagram shows a shape consisting of two circles of radius 3 cm and 4 cm with centres A and B which are 5 cm apart. The circles intersect at C and D as shown. The lines AC and BC are tangents to the circles, centres B and A respectively. Find

(a) the angle CAB in radians,

[2]

(b) the perimeter of the whole shape,

[4]

(c) the area of the whole shape.

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.