Cambridge Assessment International Education

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.

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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 $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

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 ΔABC

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

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

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

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 $0 < x < \frac{\pi}{2}$.

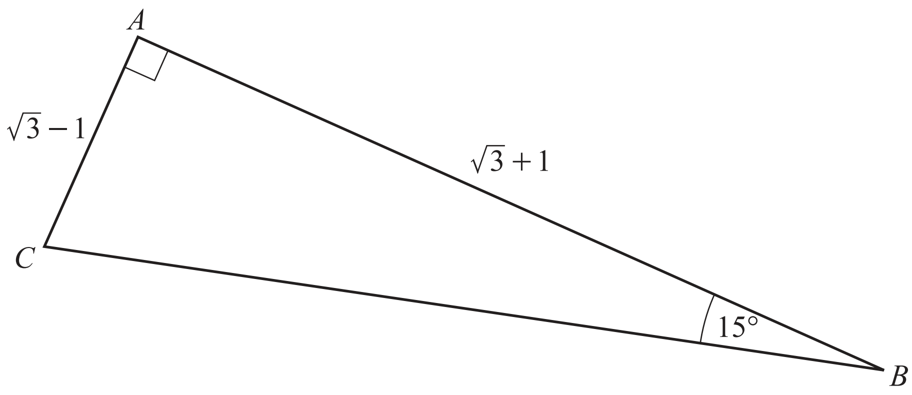
(a) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$. [3]

(b) Find the value of x for which $\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{1}{2}$. [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 $ABC = 15°$ and angle $CAB = 90°$.

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

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

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

$$\mathrm{p}(x) = 2x^3 - 3x^2 - 23x + 12$$

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

(b) Write $\mathrm{p}(x)$ as the product of three linear factors and hence solve $\mathrm{p}(x) = 0$. [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 $\dfrac{x}{x+1}$.

(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 $0 \leqslant x \leqslant 4$.

(a) Find the exact coordinates of the stationary point of the curve. [6]

(b) Find $\frac{\mathrm{d}}{\mathrm{d}x}\left(16-x^2\right)^{\frac{3}{2}}$ 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]

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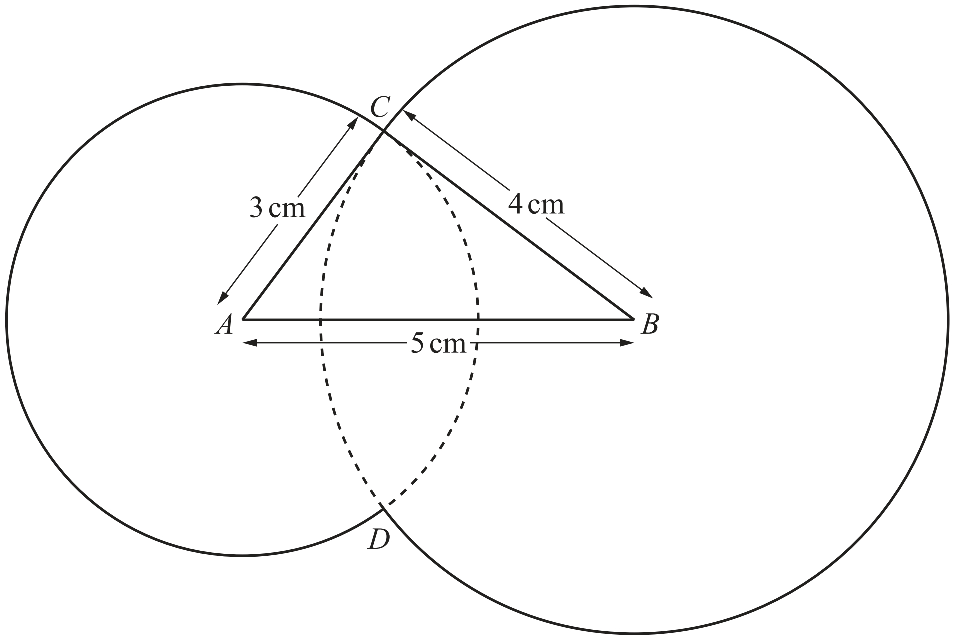

The diagram shows a shape consisting of two circles of radius 3 cm and 4 cm with centres A and B which are 5 cm apart. The circles intersect at C and D as shown. The lines AC and BC are tangents to the circles, centres B and A respectively. Find

(a) the angle CAB in radians, [2]

(b) the perimeter of the whole shape, [4]

(c) the area of the whole shape. [4]

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