Cambridge Assessment International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*6696758013*

**ADDITIONAL MATHEMATICS** **0606/22**

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* $\quad u_n = a + (n-1)d$

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

*Geometric series* $\quad u_n = ar^{n-1}$

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

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

## 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* $\Delta ABC$

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

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

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

**1** Solve the inequality $(x-8)(x-10) > 35$. [4]

**2** Find the value of $x$ such that $\frac{4^{x+1}}{2^{x-1}} = 32^{\frac{x}{3}} \times 8^{\frac{1}{3}}$. [4]

**3** **(a)** Find the equation of the perpendicular bisector of the line joining the points (12, 1) and (4, 3), giving your answer in the form $y = mx + c$. [5]

**(b)** The perpendicular bisector cuts the axes at points $A$ and $B$. Find the length of $AB$. [3]

**4** Solve the simultaneous equations.

$$\log_3(x+y) = 2$$
$$2\log_3(x+1) = \log_3(y+2)$$

[6]

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

**(a)** Find the equation of the tangent to the curve $y = x^3 - 6x^2 + 3x + 10$ at the point where $x = 1$. [4]

**(b)** Find the coordinates of the point where this tangent meets the curve again. [5]

**6** Find the exact value of $\int_2^4 \frac{(x+1)^2}{x^2}\,\mathrm{d}x$. [6]

**7** A geometric progression has a first term of 3 and a second term of 2.4. For this progression, find

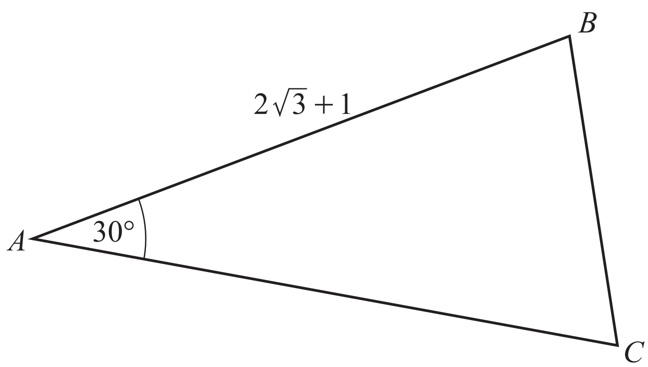
**(a)** the sum of the first 8 terms, [3]

**(b)** the sum to infinity, [1]

**(c)** the least number of terms for which the sum is greater than 95% of the sum to infinity. [4]

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

In this question lengths are in centimetres.




You may use the following trigonometric ratios.

$\sin 30° = \frac{1}{2}$

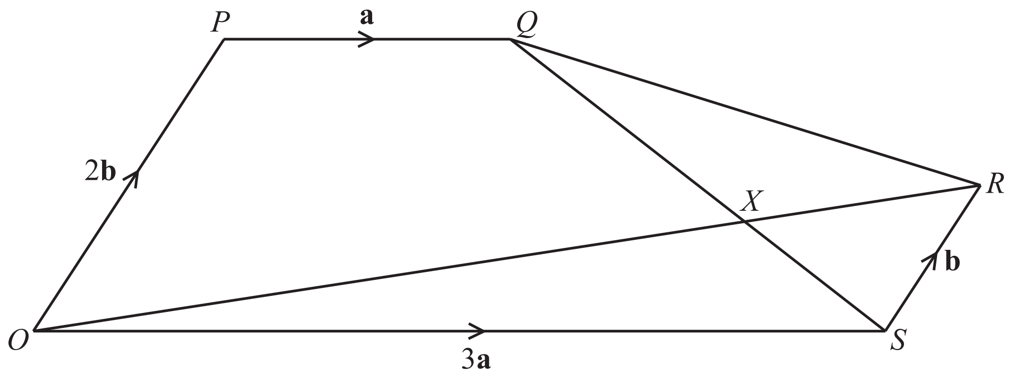
$\cos 30° = \frac{\sqrt{3}}{2}$

$\tan 30° = \frac{1}{\sqrt{3}}$

**(a)** Given that the area of the triangle $ABC$ is $5.5\,\text{cm}^2$, find the exact length of $AC$. Write your answer in the form $a+b\sqrt{3}$, where $a$ and $b$ are integers. [4]

**(b)** Show that $BC^2 = c+d\sqrt{3}$, where $c$ and $d$ are integers to be found. [4]

**9**




In the diagram $\overrightarrow{OP} = 2\mathbf{b}$, $\overrightarrow{OS} = 3\mathbf{a}$, $\overrightarrow{SR} = \mathbf{b}$ and $\overrightarrow{PQ} = \mathbf{a}$. The lines $OR$ and $QS$ intersect at $X$.

**(a)** Find $\overrightarrow{OQ}$ in terms of **a** and **b**. [1]

**(b)** Find $\overrightarrow{QS}$ in terms of **a** and **b**. [1]

**(c)** Given that $\overrightarrow{QX} = \mu\overrightarrow{QS}$, find $\overrightarrow{OX}$ in terms of **a**, **b** and $\mu$. [1]

**(d)** Given that $\overrightarrow{OX} = \lambda\overrightarrow{OR}$, find $\overrightarrow{OX}$ in terms of **a**, **b** and $\lambda$. [1]

**(e)** Find the value of $\lambda$ and of $\mu$. [3]

**(f)** Find the value of $\dfrac{QX}{XS}$ . [1]

**(g)** Find the value of $\dfrac{OR}{OX}$ . [1]

**10** The number, $b$, of bacteria in a sample is given by $b = P + Qe^{2t}$, where $P$ and $Q$ are constants and $t$ is time in weeks. Initially there are 500 bacteria which increase to 600 after 1 week.

**(a)** Find the value of $P$ and of $Q$. [4]

**(b)** Find the number of bacteria present after 2 weeks. [1]

**(c)** Find the first week in which the number of bacteria is greater than 1 000 000. [3]

**11** **(a)** Show that $\dfrac{\sin x \tan x}{1-\cos x} = 1 + \sec x$. [4]

**(b)** Solve the equation $5\tan x - 3\cot x = 2\sec x$ for $0° \leqslant x \leqslant 360°$. [6]

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