Cambridge Assessment International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*3772962579*

**ADDITIONAL MATHEMATICS** **0606/23**

Paper 2 **October/November 2021**

**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. Any blank pages are indicated.

DC (CE/CB) 212426/3

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

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

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

## 2. TRIGONOMETRY

*Identities*

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

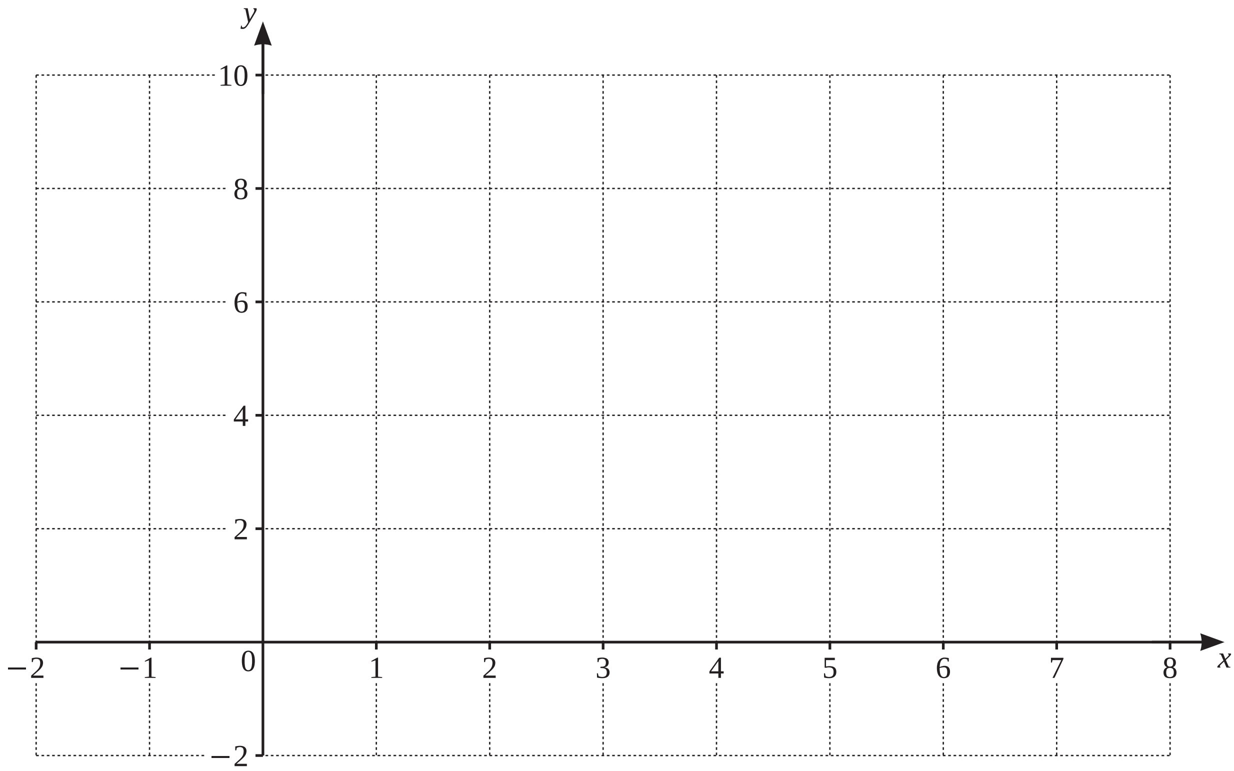
*Formulae for $\Delta ABC$*

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

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

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

1




**(a)** On the axes draw the graphs of $y = |x - 5|$ and $y = 6 - |2x - 7|$. [4]

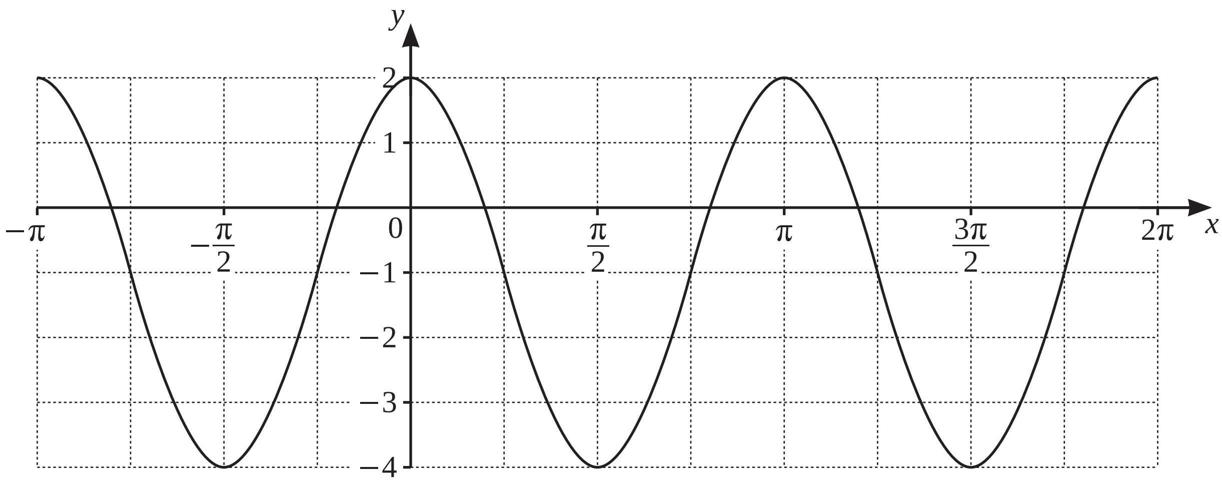
**(b)** Use your graphs to solve the inequality $|x - 5| > 6 - |2x - 7|$. [2]

**2** Solve the following simultaneous equations. Give your answers in the form $a+b\sqrt{3}$, where $a$ and $b$ are rational.

$$x+y=3$$
$$2x-\sqrt{3}y=5$$

[5]

**3**




**(a)** The curve has equation $y = a\cos bx + c$ where $a$, $b$ and $c$ are integers. Find the values of $a$, $b$ and $c$. [3]

**(b)** Another curve has equation $y = 2\sin 3x + 4$. Write down

**(i)** the amplitude, [1]

**(ii)** the period in radians. [1]

**4** **(a)** Solve the equation $\log_6(2x-3)=\frac{1}{2}$. Give your answer in exact form. [2]

**(b)** Solve the equation $\ln 2u-\ln(u-4)=1$. Give your answer in exact form. [3]

**(c)** Solve the equation $\frac{3^v}{27^{2v-5}}=9$. [3]

**5** **(a)** Show that $\dfrac{1}{\operatorname{cosec} x - 1} + \dfrac{1}{\operatorname{cosec} x + 1} = 2\tan x \sec x$. [4]

**(b)** Hence solve the equation $\dfrac{1}{\operatorname{cosec} x - 1} + \dfrac{1}{\operatorname{cosec} x + 1} = 5\operatorname{cosec} x$ for $0° < x < 360°$. [4]

**6** It is given that $x = 2 + \sec\theta$ and $y = 5 + \tan^2\theta$.

**(a)** Express $y$ in terms of $x$. [2]

**(b)** Find $\frac{dy}{dx}$ in terms of $x$. [1]

**(c)** A curve has the equation found in **part (a)**. Find the equation of the tangent to the curve when $\theta = \frac{\pi}{3}$. [4]

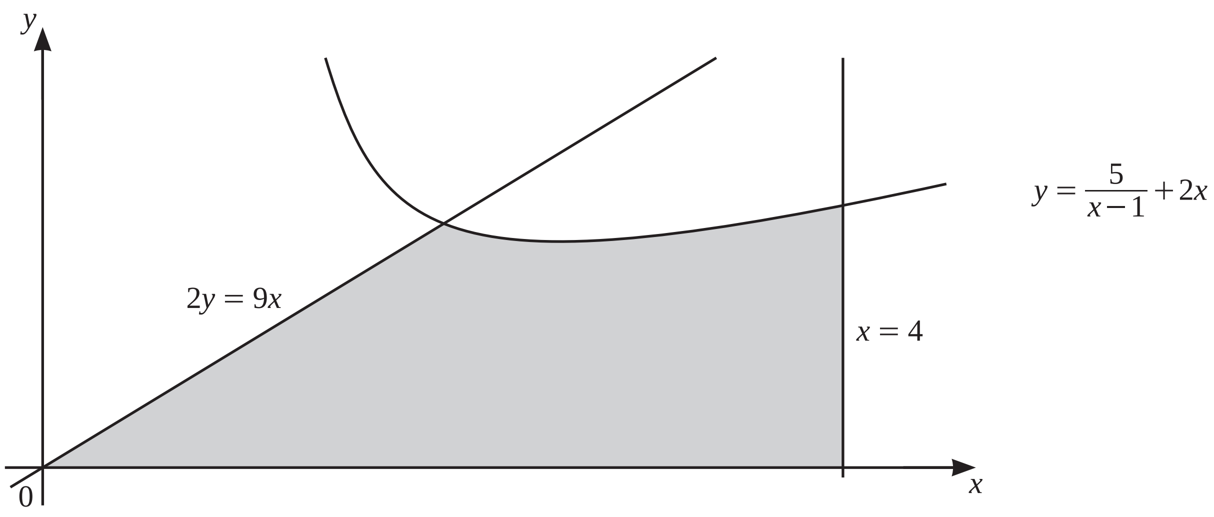
 

**7** The vector **p** has magnitude 39 and is in the direction $-5\mathbf{i}+12\mathbf{j}$. The vector **q** has magnitude 34 and is in the direction $15\mathbf{i}-8\mathbf{j}$.

**(a)** Write both **p** and **q** in terms of **i** and **j**. [4]

**(b)** Find the magnitude of $\mathbf{p}+\mathbf{q}$ and the angle this vector makes with the positive $x$-axis. [4]

**8**




The diagram shows part of the curve $y = \frac{5}{x-1} + 2x$, and the straight lines $x = 4$ and $2y = 9x$.

**(a)** Find the coordinates of the stationary point on the curve $y = \frac{5}{x-1} + 2x$. [5]

**(b)** Given that the curve and the line $2y = 9x$ intersect at the point (2, 9), find the area of the shaded region. [5]

**9** An arithmetic progression has first term $a$ and common difference $d$. The third term is 13 and the tenth term is 41.

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

**(b)** Find the number of terms required to give a sum of 2555. [4]

**(c)** Given that $S_n$ is the sum to $n$ terms, show that $S_{2k} - S_k = 3k(1+2k)$. [4]

**10** **(a)** It is given that $f(x) = 4x^3 - 4x^2 - 15x + 18$. Find the equation of the normal to the curve $y = f(x)$ at the point where $x = 1$. [5]

**(b) DO NOT USE A CALCULATOR IN THIS PART OF THE QUESTION.**

It is also given that $x+a$, where $a$ is an integer, is a factor of $f(x)$. Find $a$ and hence solve the equation $f(x)=0$. [6]

**BLANK PAGE**