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MATHEMATICS **0580/21**

Paper 2 Non-calculator (Extended) **May/June 2025**

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

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.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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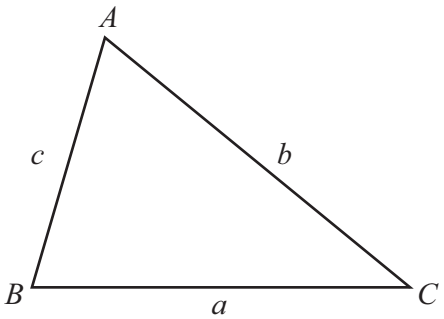
List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



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

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

$$\text{Area} = \frac{1}{2}ab\sin C$$

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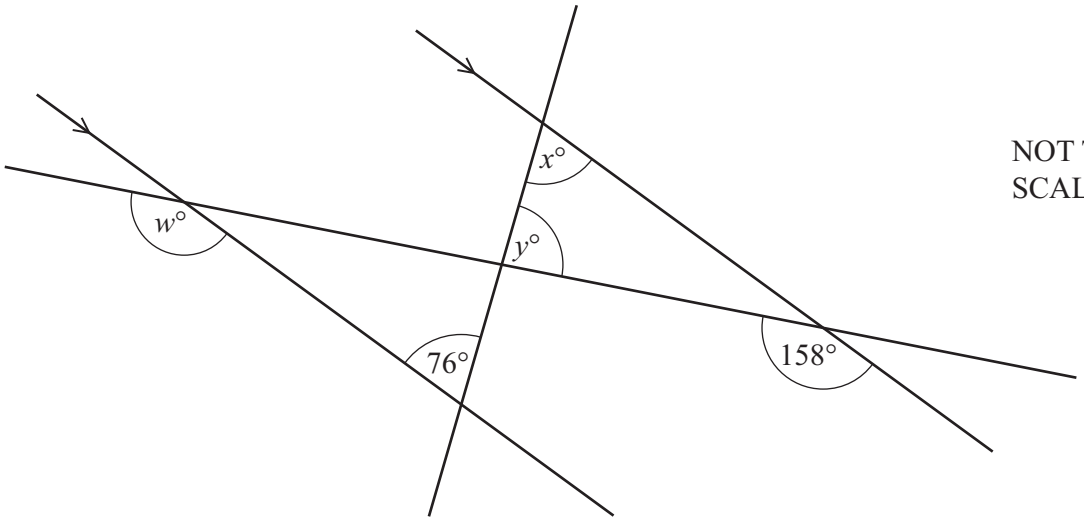
Calculators must **not** be used in this paper.

1 Simplify.

$7c - 5d + c + 3d$

..... [2]

2



NOT TO SCALE

The diagram shows two parallel lines intersecting two straight lines.

Find the values of w, x and y.

$w =$ .....

$x =$ .....

$y =$ .....

[4]

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3 Sally invests $1500 at 3% per year simple interest.

Work out the total value of her investment at the end of 6 years.

$ ..... [3]

4 Work out.

$$\frac{5}{6} - \frac{2}{3} \times \frac{3}{8}$$

..... [3]

5 The interior angle of a regular polygon is 150°.

Find the number of sides of this polygon.

..... [2]

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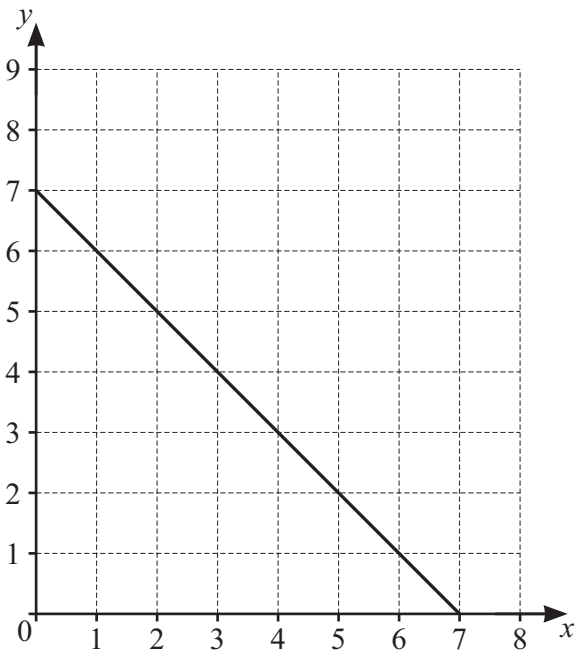

The line $x+y=7$ is drawn on the grid.

(a) On the grid, draw the line $y=2x+1$. [2]

(b) Use your graph to solve these simultaneous equations.

$$x+y=7$$
$$y=2x+1$$

$x =$ .....

$y =$ ..... [1]

7 Write the recurring decimal $0.2\dot{6}$ as a fraction.
Give your answer in its simplest form.

..... [3]

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8 $\mathbf{m} = \begin{pmatrix} 11 \\ 5 \end{pmatrix}$ $\mathbf{n} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$

(a) Find $2\mathbf{m} - \mathbf{n}$.

( ) [2]

(b) The vector $\begin{pmatrix} 5 \\ \sqrt{y} \end{pmatrix}$ has a magnitude of 7.

Find the value of y.

$y =$ ..... [2]

9 The table shows some information about the marks scored by a group of students in a test.

Test mark	4	5	8
Frequency	2	4	n

The mean mark is 6.

Work out the value of n.

$n =$ ..... [3]

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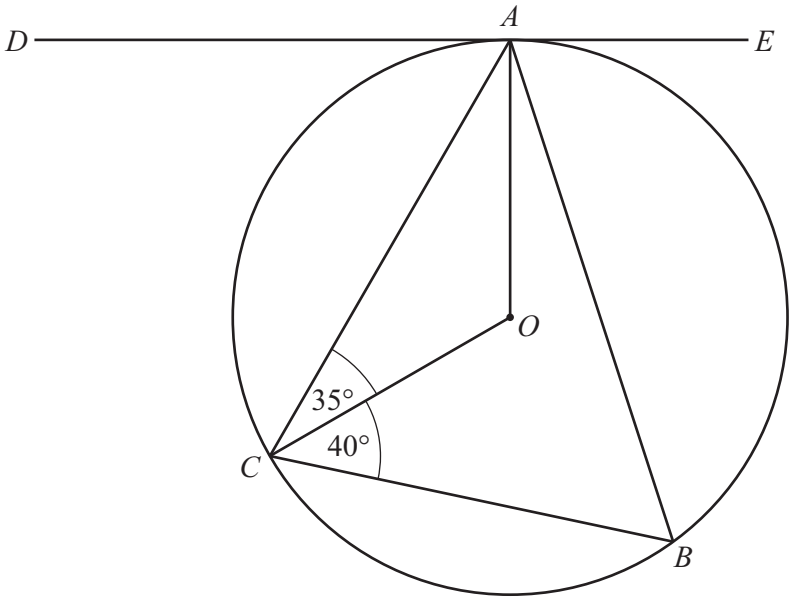

NOT TO SCALE

A, B and C are three points on a circle, centre O.
DE is a tangent to the circle at A.
Angle $ACO = 35°$ and angle $BCO = 40°$.

Find

(a) angle AOC

Angle AOC = ... [1]

(b) angle ABC

Angle ABC = ... [1]

(c) angle DAC

Angle DAC = ... [1]

(d) angle OAB.

Angle OAB = ... [1]

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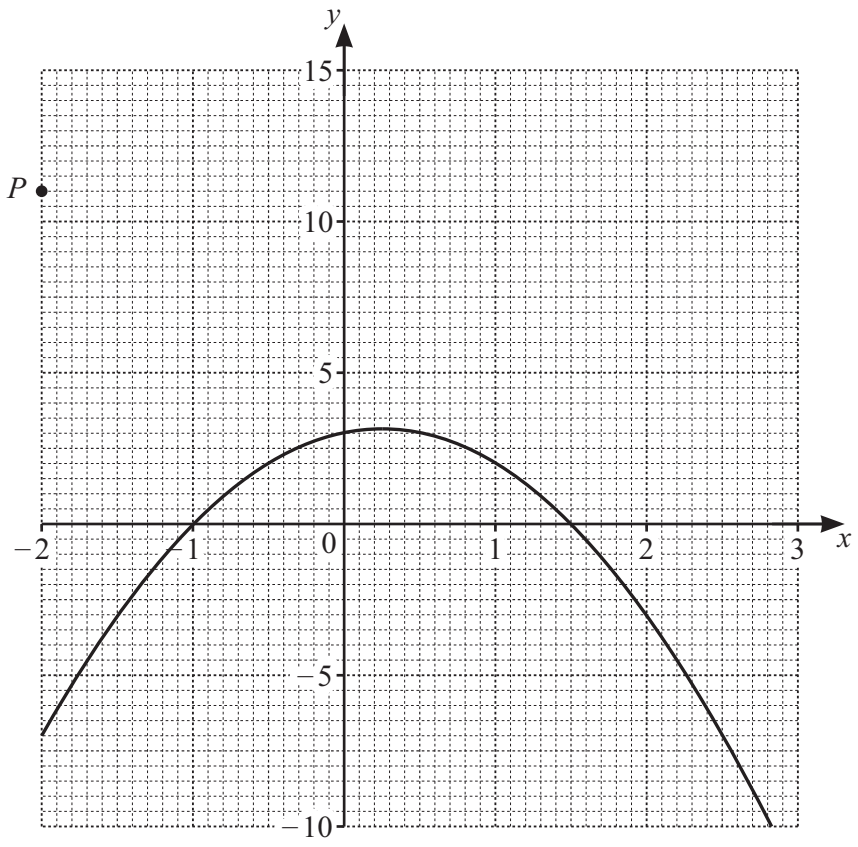
11 The diagram shows the graph of $y = f(x)$ and the point $P(-2, 11)$.



The tangent from P touches the graph of $y = f(x)$ at the point (a, b).
The values of a and b are integers.

(a) By drawing this tangent, find the value of a and the value of b.

$a =$ ....., $b =$ ..... [2]

(b) Find the equation of the tangent.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

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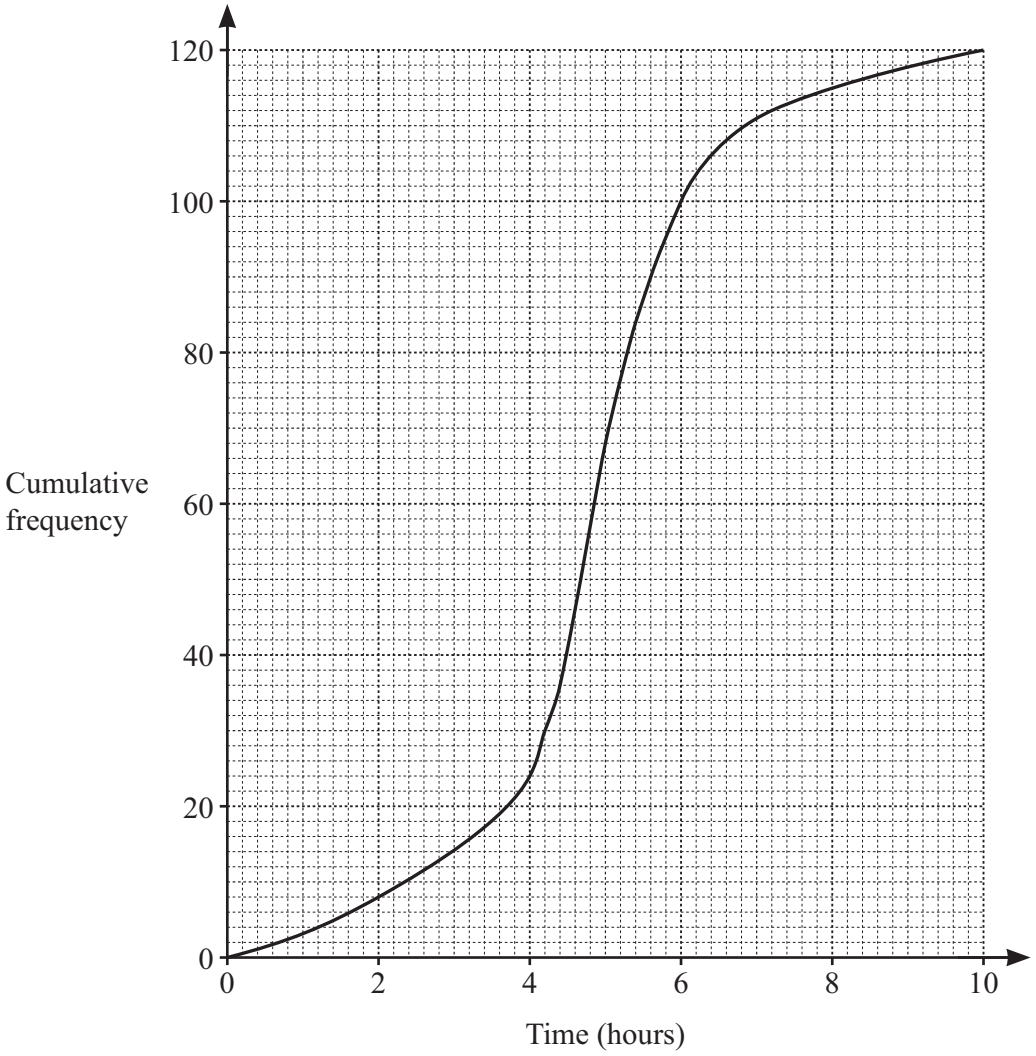
12 The time spent on the internet by each of 120 adults is recorded for one day.
The cumulative frequency diagram shows this information.



(a) Use the cumulative frequency diagram to find an estimate of the interquartile range.

..... h [2]

(b) 70% of the adults spent less than k hours on the internet.

Use the cumulative frequency diagram to find an estimate of the value of k.

$k =$ ..... [2]

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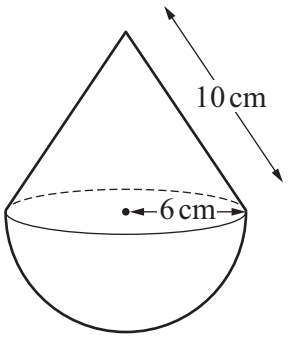
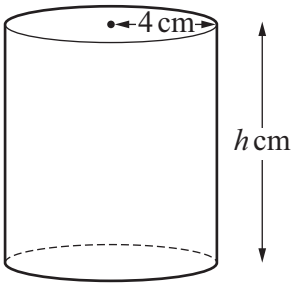
13



Solid *A*



Solid *B*

NOT TO SCALE

The diagram shows solid *A* and solid *B*.
Solid *A* is made from a hemisphere and a cone each with radius 6 cm.
The cone has sloping edge 10 cm.
Solid *B* is a cylinder with radius 4 cm and height *h* cm.

The **total** surface area of solid *A* is equal to the **total** surface area of solid *B*.

(a) Work out the value of *h*.

h = ... [5]

(b) Work out the height of solid *A*.

..... cm [3]

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14 $f(x) = 3x - 4$ $g(x) = 4x + 1$

(a) Find $f(-2)$.

..... [1]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) $fg(x) = ax + b$

Find the value of a, and the value of b.

$a =$ ..... $b =$ ..... [2]

(d) Simplify.

$$\frac{2}{f(x)} - \frac{5}{g(x)}$$

Give your answer as a single fraction in terms of x.

..... [3]

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15 **(a)** Expand and simplify.

$$(2-\sqrt{5})(1-3\sqrt{5})$$

..... [2]

(b) Rationalise the denominator.
Give your answer in its simplest form.

$$\frac{6}{\sqrt{10}}$$

..... [2]

16 Expand and simplify.

$$(x+4)(x-3)(3x+2)$$

..... [3]

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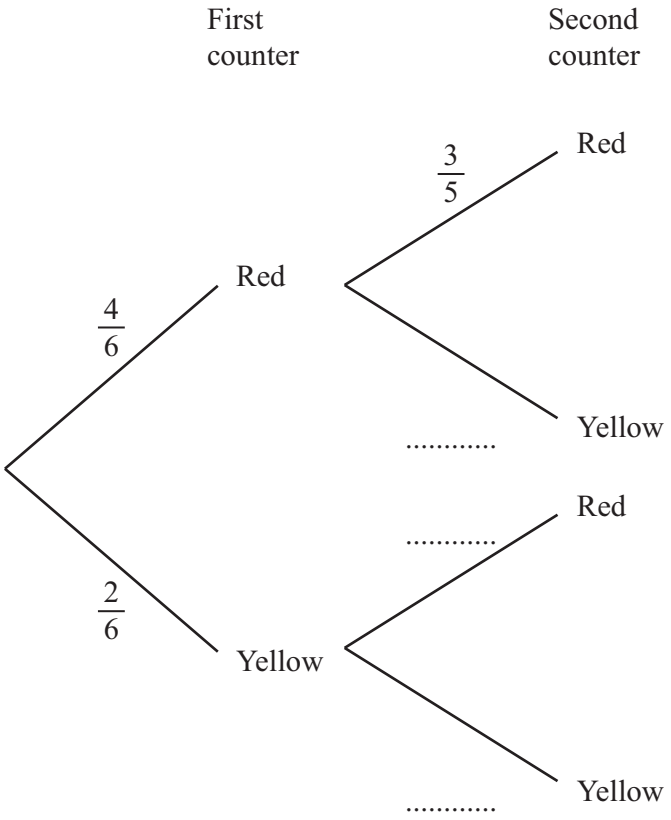
17 **(a)** A bag contains 6 red marbles, 3 green marbles and 1 blue marble.
Two marbles are picked at random from the bag **with replacement**.

Find the probability that both marbles are green.

..... [2]

(b) Another bag contains 4 red counters and 2 yellow counters.
Two counters are picked at random from this bag **without replacement**.

(i) Complete the tree diagram.



[2]

(ii) Find the probability that one of the two counters is yellow.

..... [3]

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18 One day, Anya runs 12 km at a speed of x km/h.
The next day she walks 10 km at a speed of $(x-4)$ km/h.

(a) Write down an expression, in terms of x, for the time she spends running.

..... h [1]

(b) Write down an expression, in terms of x, for the time she spends walking.

..... h [1]

(c) The time Anya spends walking is 1 hour more than the time she spends running.

Write an equation in terms of x and show that it simplifies to $x^2 - 2x - 48 = 0$.

[4]

(d) Use factorisation to solve the equation $x^2 - 2x - 48 = 0$.

$x =$ ..... or $x =$ ..... [3]

(e) Find the time Anya spends running.

..... h [1]

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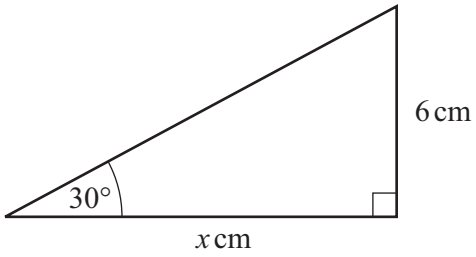
19 Find the value of $27^{-\frac{2}{3}}$.

..... [2]

20



NOT TO SCALE

Find the exact value of x.

$x =$ ..... [4]

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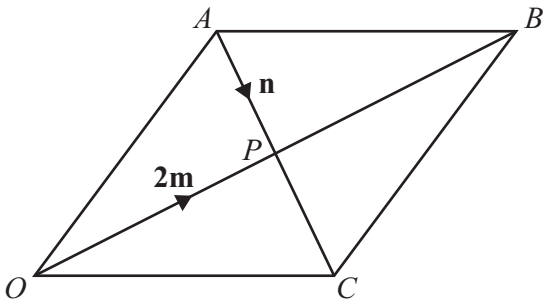

NOT TO SCALE

OABC is a rhombus and *O* is the origin.
The diagonals of the rhombus intersect at *P*.
$\overrightarrow{OP} = 2\,\mathbf{m}$ and $\overrightarrow{AP} = \mathbf{n}$.

(a) Find, in terms of **m** and **n**, in its simplest form

(i) $\overrightarrow{OA}$

$\overrightarrow{OA} =$ ..... [1]

(ii) $\overrightarrow{OC}$.

$\overrightarrow{OC} =$ ..... [1]

(b) *D* is the point such that $\overrightarrow{AD} = 10\mathbf{m} - 3\mathbf{n}$.

Show that *OADC* is a trapezium.

[3]

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22 A curve has equation $y = x^n + qx^2 + 9x$.

$$\frac{dy}{dx} = 3x^2 - 12x + 9$$

(a) Find the value of n, and the value of q.

$n =$ ..... $q =$ ..... [2]

(b) Work out the coordinates of the turning points of the curve.

(..... , ...) and (..... , ...) [4]

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23 Simplify.

$$\frac{2x^2 + 10x}{x^2 - 25}$$

..... [3]

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