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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.

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 .

$$V = \frac{1}{3}\pi r^2 h$$

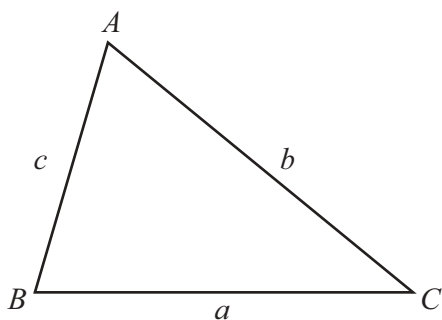
Volume, V , of sphere of radius r .

$$V = \frac{4}{3}\pi r^3$$

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,



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

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

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



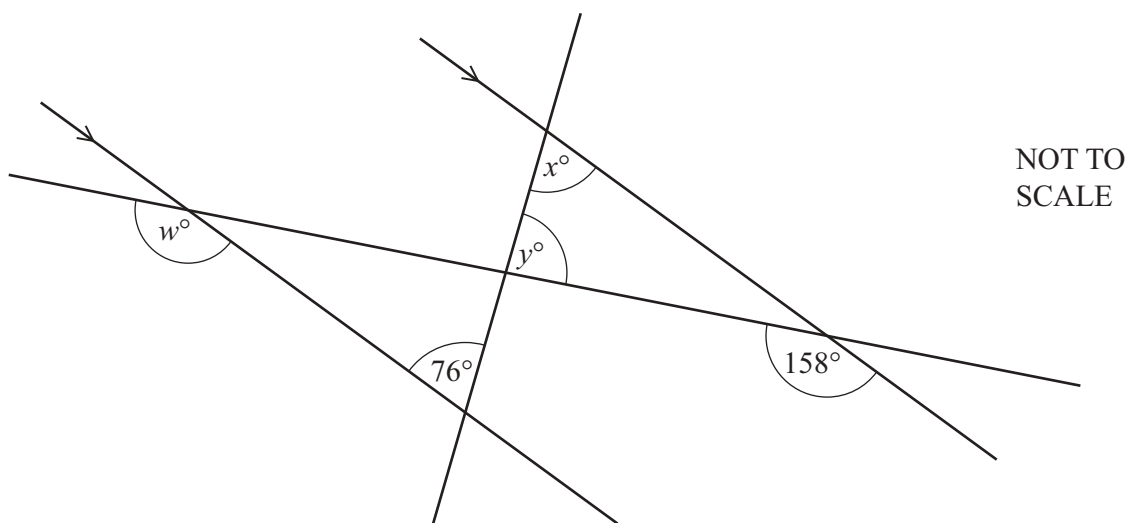
Calculators must **not** be used in this paper.

1 Simplify.

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

..... [2]

2



The diagram shows two parallel lines intersecting two straight lines.

Find the values of w , x and y .

$w =$

$x =$

$y =$

[4]



- 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.

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

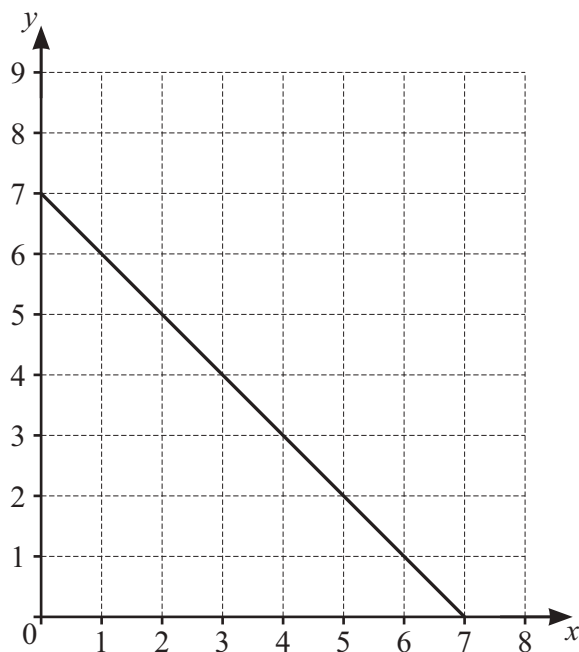
..... [3]

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

Find the number of sides of this polygon.

..... [2]





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.

$$\begin{aligned} x + y &= 7 \\ y &= 2x + 1 \end{aligned}$$

$x =$

$y =$

[1]

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

..... [3]



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

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

$\begin{pmatrix} \\ \end{pmatrix}$ [2]

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

Find the value of y .

$y = \dots\dots\dots$ [2]

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

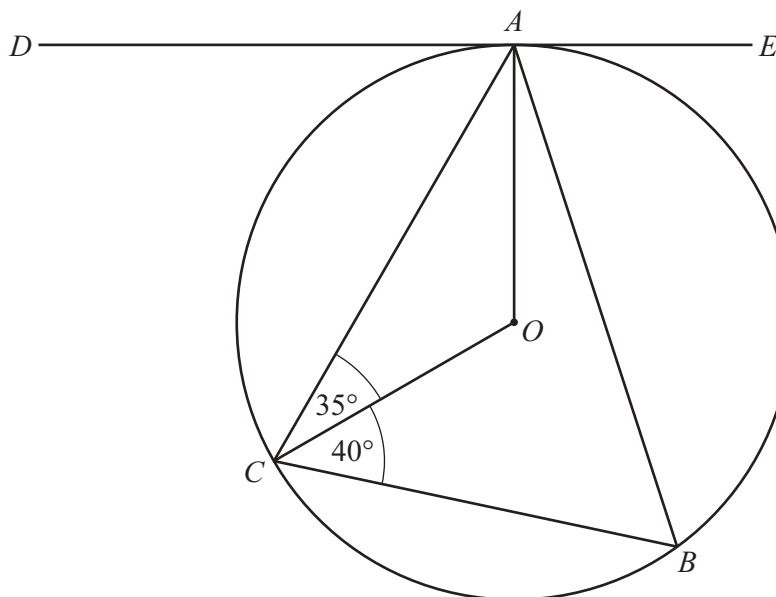
Test mark	4	5	8
Frequency	2	4	n

The mean mark is 6.

Work out the value of n .

$n = \dots\dots\dots$ [3]





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A , B and C are three points on a circle, centre O .

DE is a tangent to the circle at A .

Angle $ACO = 35^\circ$ and angle $BCO = 40^\circ$.

Find

(a) angle AOC

Angle $AOC = \dots\dots\dots$ [1]

(b) angle ABC

Angle $ABC = \dots\dots\dots$ [1]

(c) angle DAC

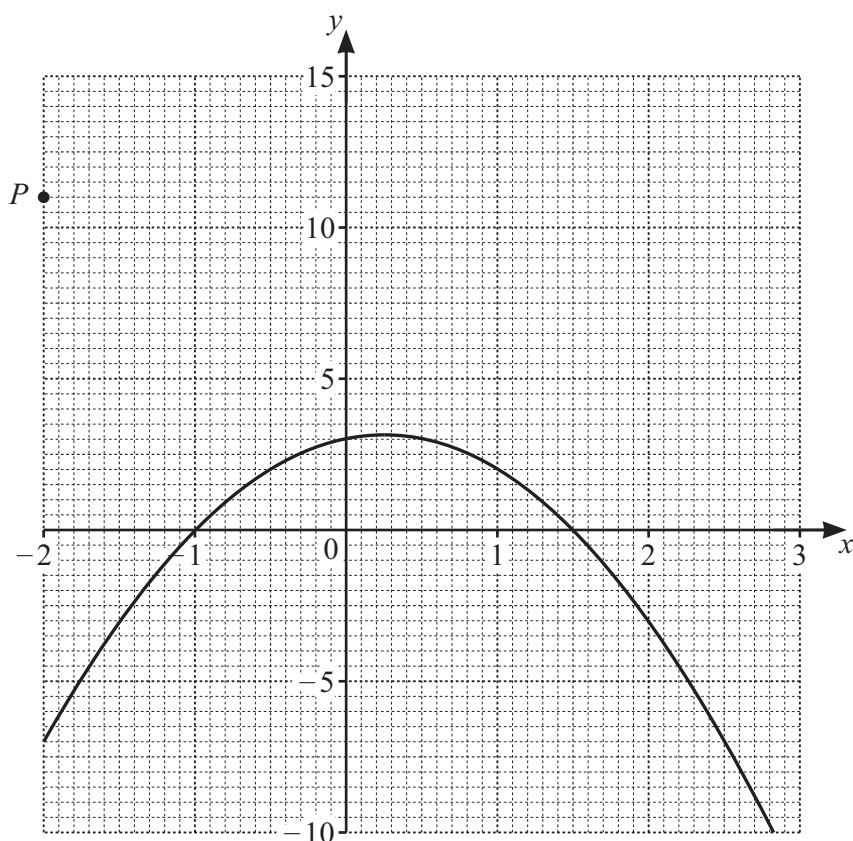
Angle $DAC = \dots\dots\dots$ [1]

(d) angle OAB .

Angle $OAB = \dots\dots\dots$ [1]



- 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 .

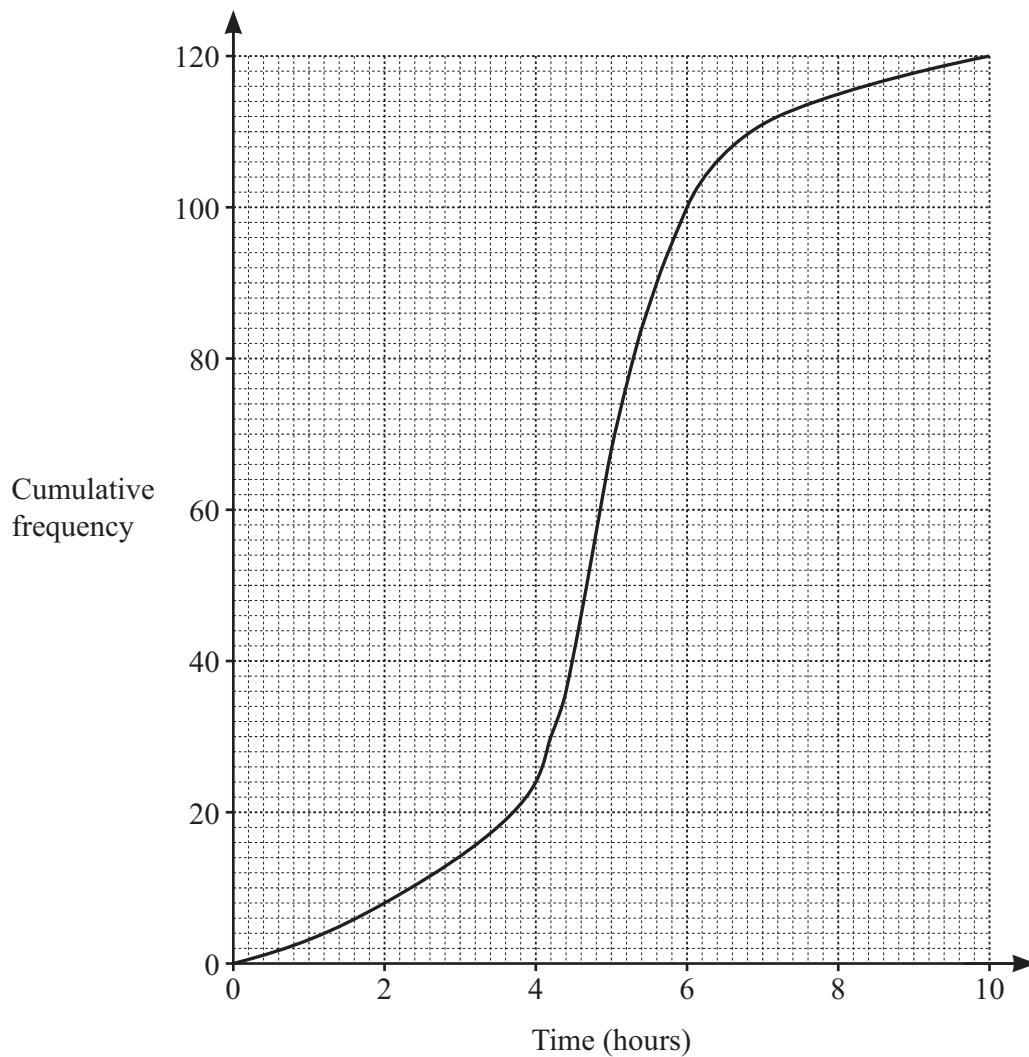
$a = \dots\dots\dots$, $b = \dots\dots\dots$ [2]

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

$y = \dots\dots\dots$ [3]



- 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]

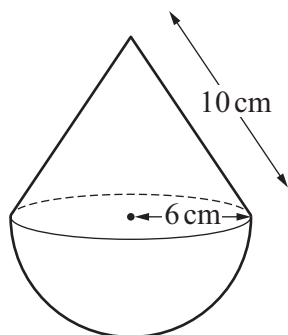




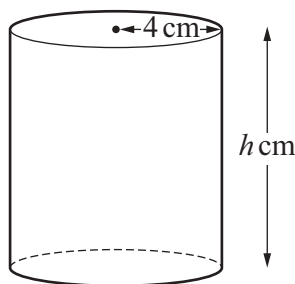
13



10



Solid *A*



Solid *B*

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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 .

$$h = \dots\dots\dots [5]$$

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

$$\dots\dots\dots \text{ cm } [3]$$



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]



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]



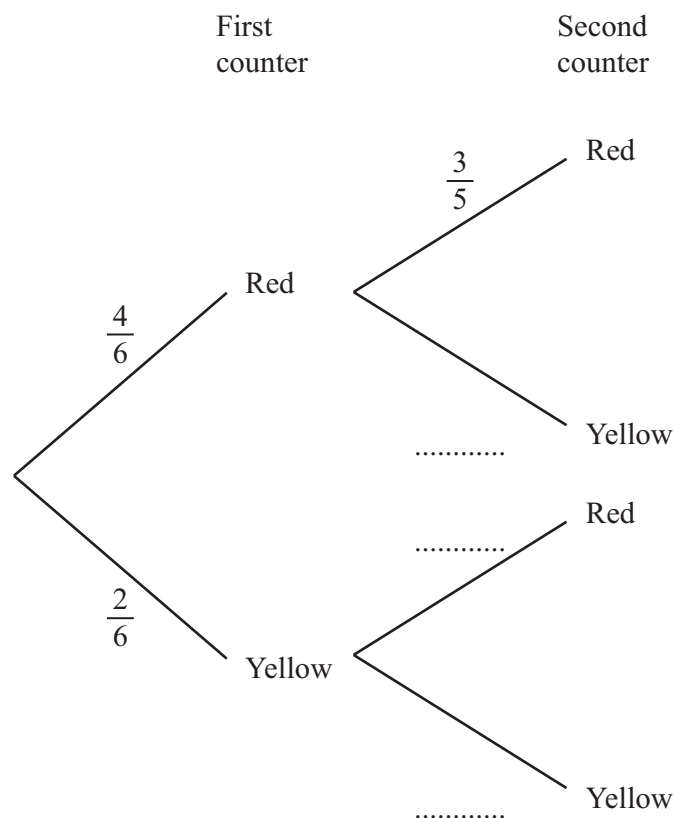
- 17 (a) A bag contains 6 red marbles, 3 green marbles and 1 blue marble.
Two marbles are picked at random from the bag **with replacement**.

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]



- 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]

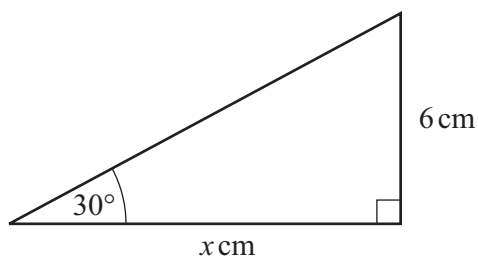
(e) Find the time Anya spends running.

..... h [1]



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

20



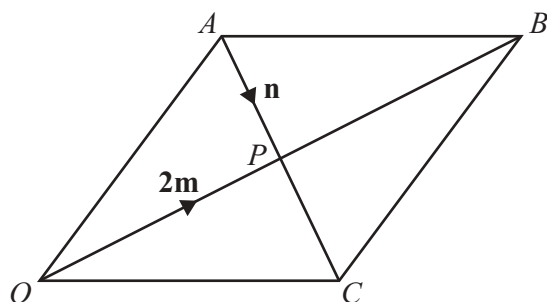
Find the exact value of x .

..... [2]

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$x =$ [4]





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$OABC$ 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 $\mathbf{m}$ and $\mathbf{n}$, in its simplest form

(i) $\overrightarrow{OA}$

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

(ii) $\overrightarrow{OC}$.

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

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

Show that $OADC$ is a trapezium.

[3]





- 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 .

$$n = \dots\dots\dots q = \dots\dots\dots [2]$$

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

$$(\dots\dots\dots, \dots\dots\dots) \text{ and } (\dots\dots\dots, \dots\dots\dots) [4]$$





23 Simplify.

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

..... [3]

