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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  $h$ .

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

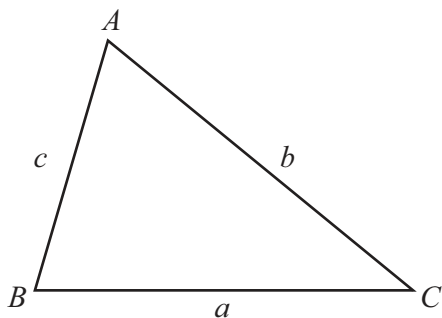
Volume,  $V$ , of sphere of radius  $r$ .

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

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,



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

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

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

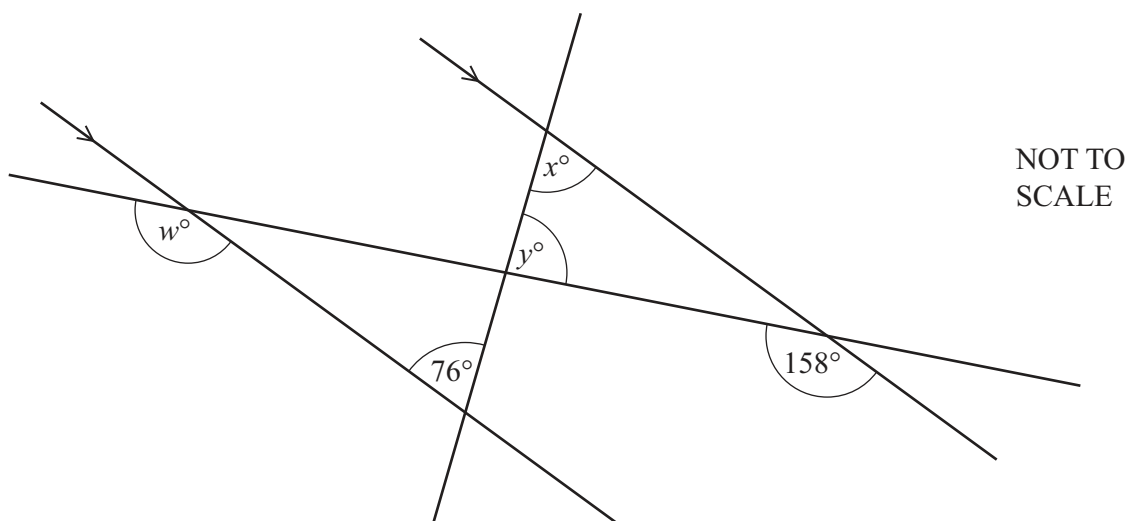
Calculators must **not** be used in this paper.

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  $y$ .

$$w = \dots\dots\dots$$

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

[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.

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

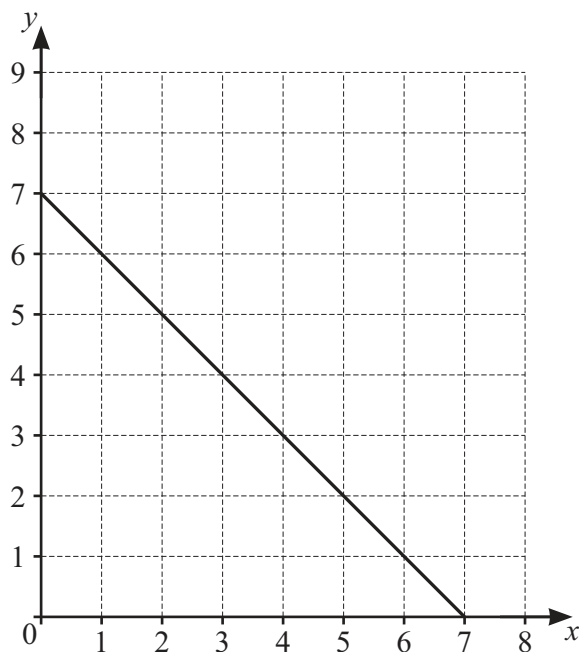
..... [3]

- 5 The interior angle of a regular polygon is  $150^\circ$ .

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  $2\mathbf{m} - \mathbf{n}$ .

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [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.

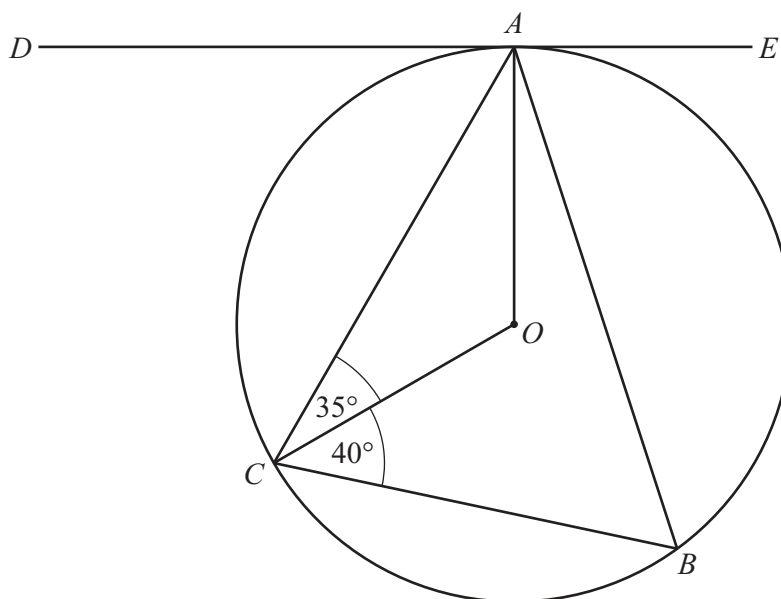
Test mark	4	5	8
Frequency	2	4	$n$

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]

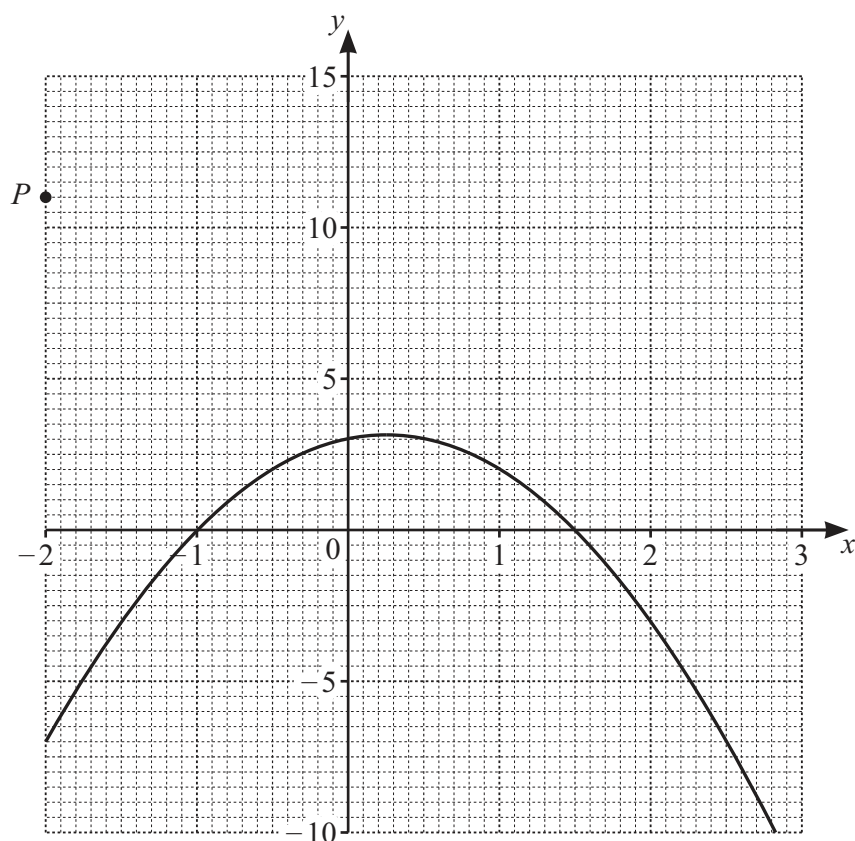
(c) angle  $DAC$

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]

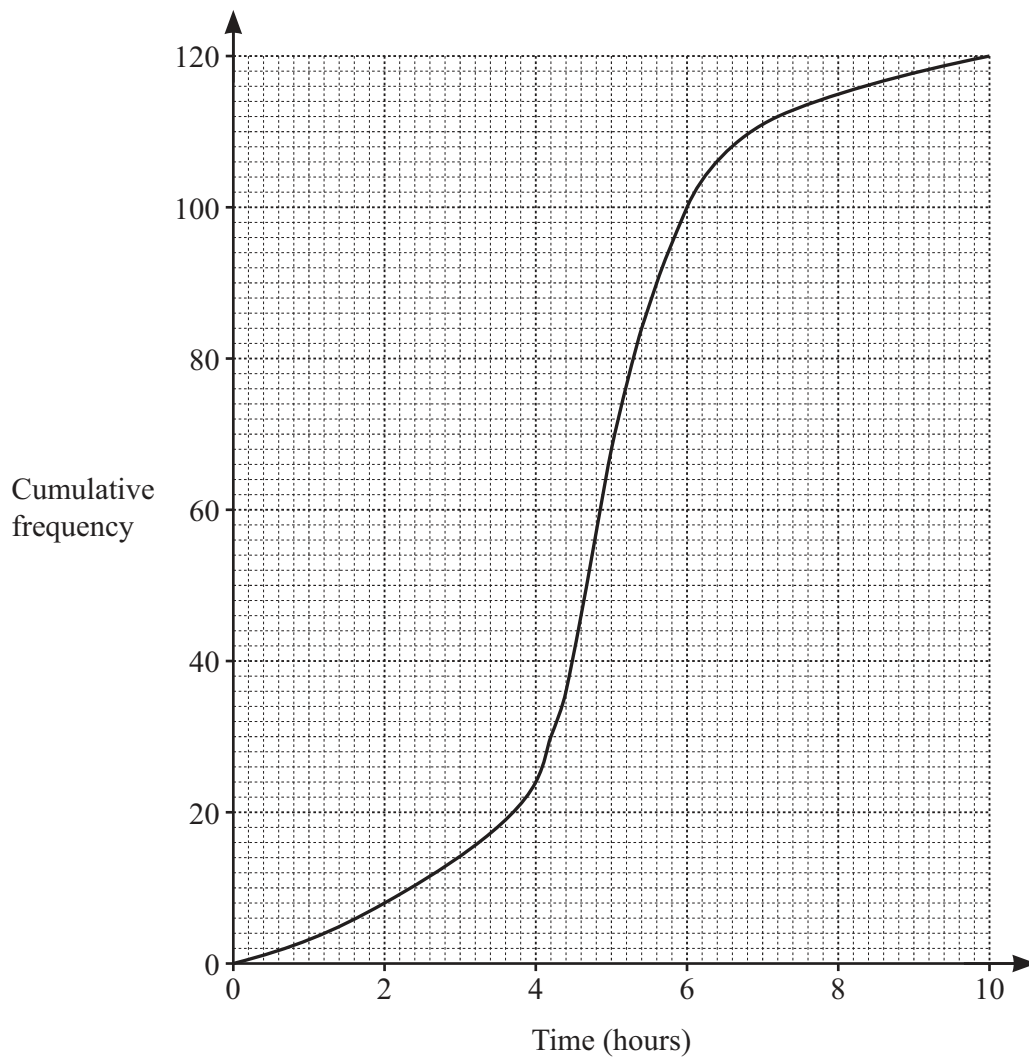
- (b) Find the equation of the tangent.  
Give your answer in the form  $y = mx + c$ .

$y = \dots\dots\dots$  [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  $k$ .

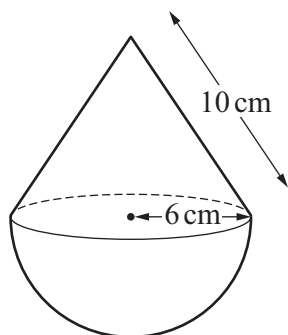
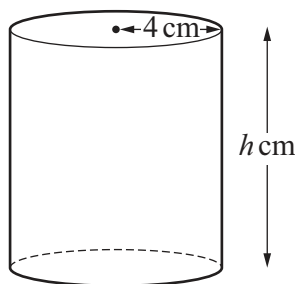
$k =$  ..... [2]





10

13

Solid *A*Solid *B*NOT TO  
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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]





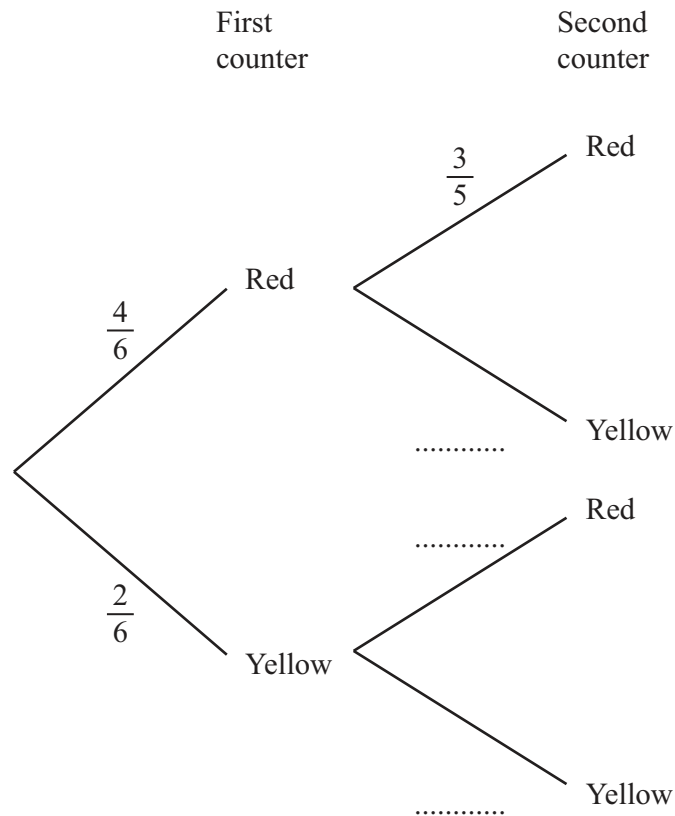
- 17 (a) A bag contains 6 red marbles, 3 green marbles and 1 blue marble.  
Two marbles are picked at random from the bag **with replacement**.

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]

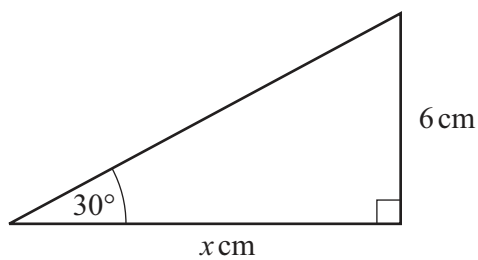
(e) Find the time Anya spends running.

..... h [1]



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

20



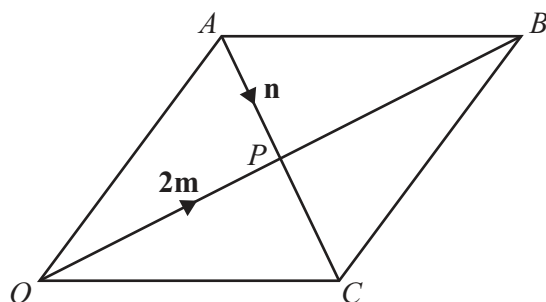
Find the exact value of  $x$ .

..... [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  $P$ .  
 $\vec{OP} = 2\mathbf{m}$  and  $\vec{AP} = \mathbf{n}$ .

(a) Find, in terms of  $\mathbf{m}$  and  $\mathbf{n}$ , in its simplest form

(i)  $\vec{OA}$

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

(ii)  $\vec{OC}$ .

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

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

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]







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