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## MATHEMATICS

0580/02

Paper 2 Non-calculator (Extended)

For examination from 2025

PRACTICE PAPER

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 **18** pages.

## 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  $h$ .  $V = \frac{1}{3}Ah$

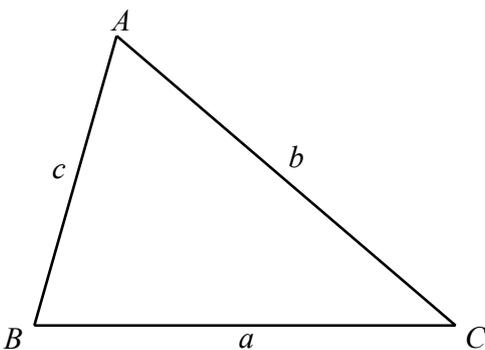
Volume,  $V$ , of cylinder of radius  $r$ , height  $h$ .  $V = \pi r^2 h$

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,



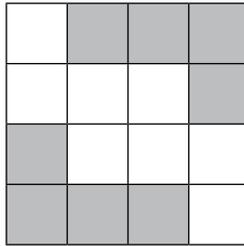
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

1



Write down the order of rotational symmetry of the diagram.

..... [1]

2 At noon the temperature in Maseru was 21 °C.  
At midnight the temperature had fallen by 26 °C.

Work out the temperature at midnight.

..... °C [1]

3 Work out.

(a)  $0.3 \times 0.07$

..... [1]

(b)  $8 \div 0.2$

..... [1]

4 Write down

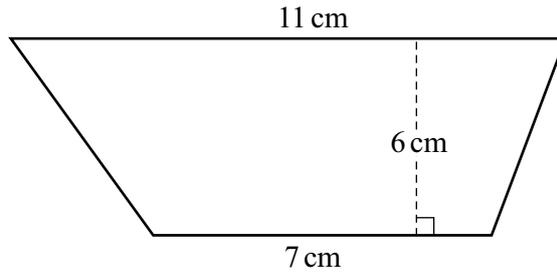
(a) a square number greater than 10

..... [1]

(b) the reciprocal of 20.

..... [1]

5

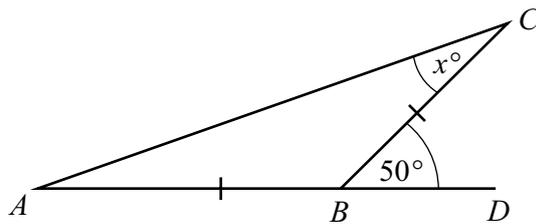


NOT TO SCALE

Work out the area of the trapezium.

.....cm<sup>2</sup> [2]

6



NOT TO SCALE

$AB = BC$  and  $ABD$  is a straight line.

Find the value of  $x$ .

$x =$  ..... [2]

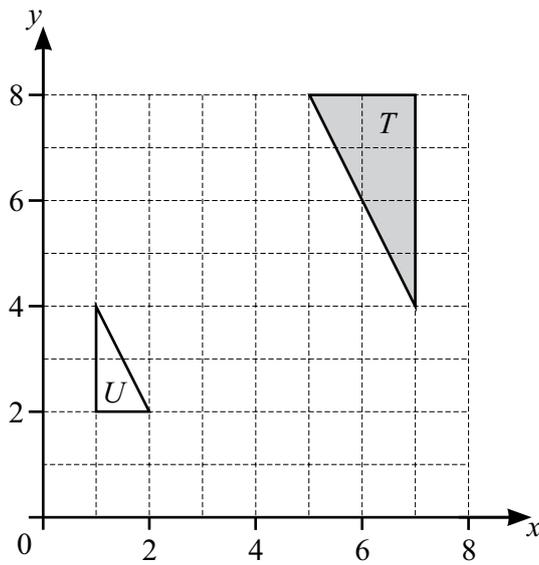
7 Write 0.00067 in standard form.

..... [1]

- 8 Work out  $1\frac{3}{4} - \frac{11}{12}$ .  
Give your answer as a fraction in its simplest form.

..... [3]

9



Describe fully the **single** transformation that maps triangle *T* onto triangle *U*.

.....  
..... [3]

- 10 Simplify.

$$8t^8 \div 4t^4$$

..... [2]

11 The line  $y = 3x - 2$  crosses the  $y$ -axis at  $G$ .

Write down the coordinates of  $G$ .

( ..... , ..... ) [1]

12 (a)  $\mathbf{p} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$     $\mathbf{q} = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$

(i) Find  $2\mathbf{p} + \mathbf{q}$ .

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [2]

(ii) Find the exact value of  $|\mathbf{p}|$ .

Give your answer as a surd in its simplest form.

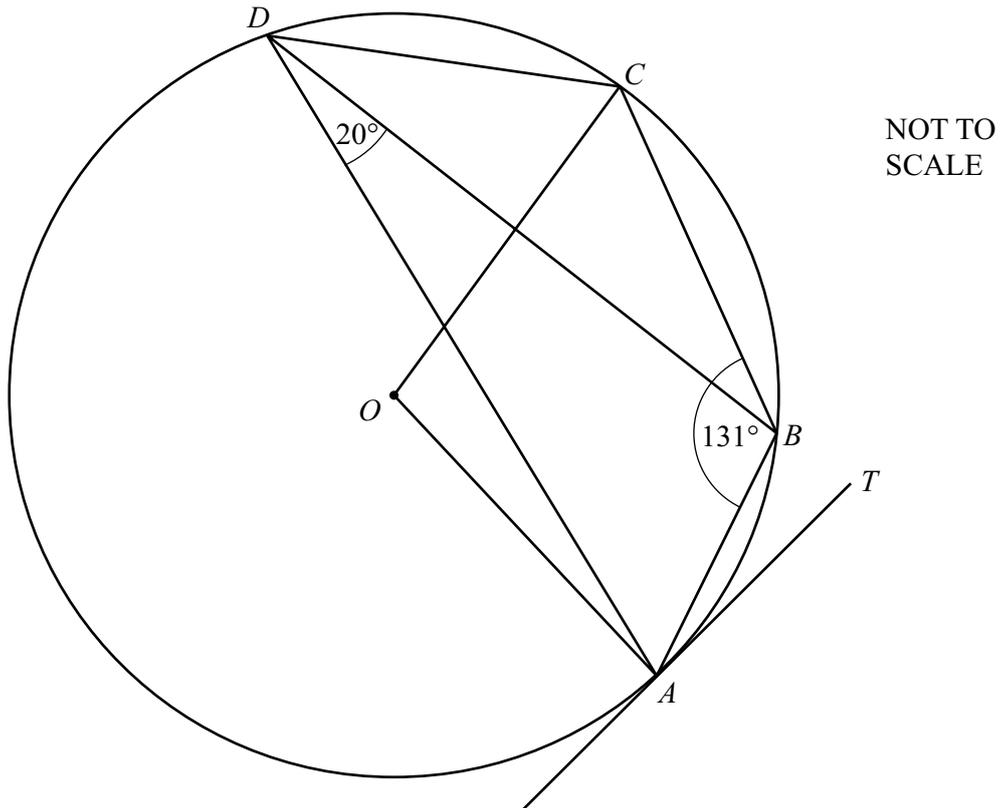
..... [2]

(b)  $A$  is the point  $(4, 1)$  and  $\overrightarrow{AB} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$ .

Find the coordinates of  $B$ .

( ..... , ..... ) [1]

13



$A, B, C$  and  $D$  lie on the circle, centre  $O$ .  
 $TA$  is a tangent to the circle at  $A$ .  
 Angle  $ABC = 131^\circ$  and angle  $ADB = 20^\circ$ .

Find

(a) angle  $ADC$

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

(b) angle  $AOC$

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

(c) angle  $BAT$

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

(d) angle  $OAB$ .

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

14  $h^2 = x^2 + 2y^2$

Rearrange the formula to make  $y$  the subject.

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

15 Ella's height is 175 cm, correct to the nearest 5 cm.

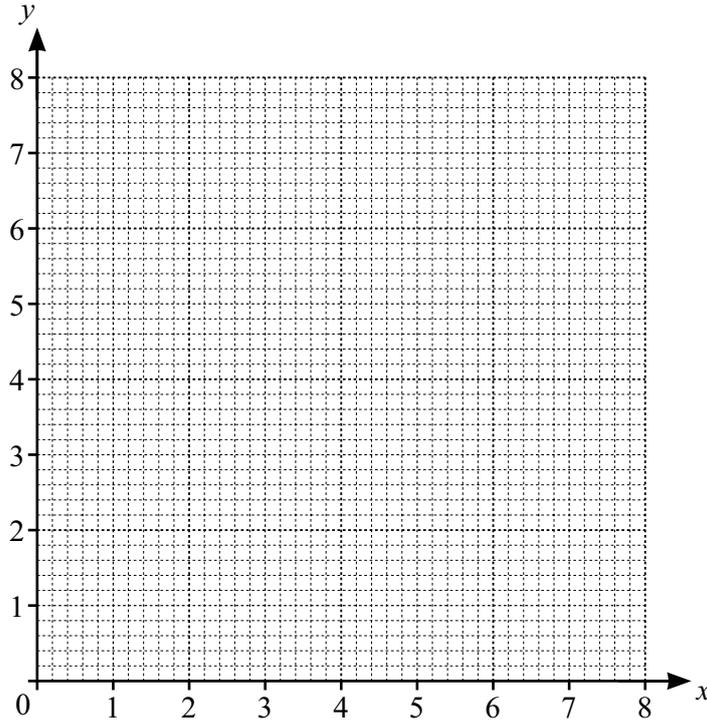
(a) Write down the upper bound of Ella's height.

$\dots\dots\dots$  cm [1]

(b) Rafael's height is 161 cm, correct to the nearest cm.

Work out the upper bound of the difference between Ella's height and Rafael's height.

$\dots\dots\dots$  cm [2]



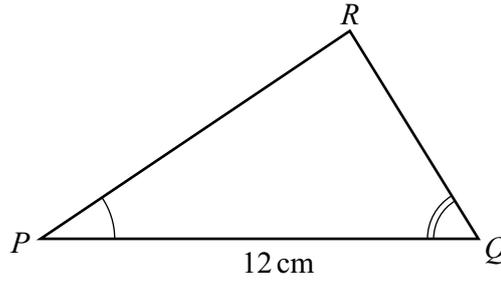
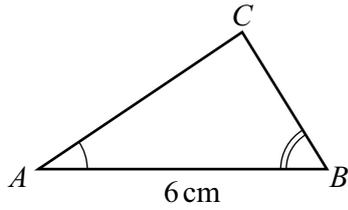
(a) By drawing suitable lines and shading the unwanted regions, find the region,  $R$ , where

$$x \geq 2, y \geq x \text{ and } 2x + y \leq 8. \quad [5]$$

(b) The point  $P$  lies in the region  $R$ .  
 The coordinates of  $P$  are  $(a, b)$ .  
 Write down the largest possible value of  $a + b$ .

..... [1]

17



NOT TO  
SCALE

Triangle  $ABC$  is mathematically similar to triangle  $PQR$ .  
The area of triangle  $ABC$  is  $15\text{ cm}^2$ .

(a) Work out the area of triangle  $PQR$ .

.....  $\text{cm}^2$  [2]

(b) The triangles are the cross-sections of prisms which are also mathematically similar.  
The volume of the smaller prism is  $300\text{ cm}^3$ .

Calculate the length of the larger prism.

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

- 18 (a) A cylinder with radius 2 cm and height  $h$  cm has the same volume as a sphere with radius 3 cm.

Find the value of  $h$ .

$$h = \dots\dots\dots [3]$$

- (b) A solid metal cube has sides with length 20 cm.  
The cube is melted down and made into 40 solid spheres, each of radius  $r$  cm.

Show that  $r = \sqrt[3]{\frac{150}{\pi}}$ .

[3]

- (c) A solid cylinder has radius  $x$  cm and height  $\frac{7x}{2}$  cm.  
The surface area of a sphere with radius  $R$  cm is equal to the total surface area of the cylinder.

Find an expression for  $R$  in terms of  $x$ .

$$R = \dots\dots\dots [3]$$

19  $f(x) = 3x + 2$        $g(x) = x^2 + 1$        $h(x) = 4^x$

(a) Find  $h(3)$ .

..... [1]

(b) Find  $fg(1)$ .

..... [2]

(c) Find  $gf(x)$  in the form  $ax^2 + bx + c$ .

..... [3]

(d) Find  $x$  when  $f(x) = g(7)$ .

$x =$  ..... [2]

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

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

(f) Find  $\frac{g(x)}{f(x)} + x$ .

Give your answer as a single fraction, in terms of  $x$ , in its simplest form.

$$\dots\dots\dots [3]$$

(g) Find  $x$  when  $h^{-1}(x) = 2$ .

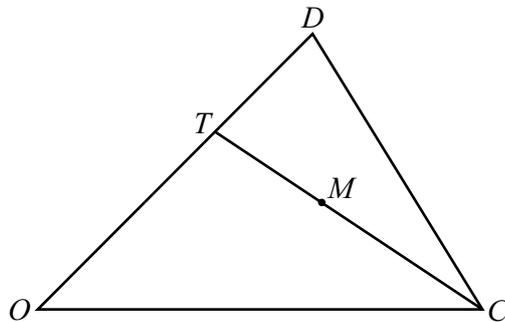
$$x = \dots\dots\dots [1]$$

20  $P = 2^{10} \times 3^8 \times 7^5$ .

Write  $12P^2$  as a product of prime factors.

..... [2]

21



NOT TO  
SCALE

In the diagram,  $O$  is the origin,  $OT = 2TD$  and  $M$  is the midpoint of  $TC$ .  
 $\vec{OC} = \mathbf{c}$  and  $\vec{OD} = \mathbf{d}$ .

Find the position vector of  $M$ .  
 Give your answer in terms of  $\mathbf{c}$  and  $\mathbf{d}$  in its simplest form.

..... [3]

22  $\sqrt[3]{y^2} = \sqrt[6]{x}$  and  $y = \sqrt[n]{x}$ .

Find the value of  $n$ .

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

23 Rationalise the denominator, giving your answer in its simplest form.

$$\frac{45}{\sqrt{6} + 1}$$

$\dots\dots\dots$  [3]

24 Tanya plants some seeds.

The probability that a seed will produce flowers is 0.8 .

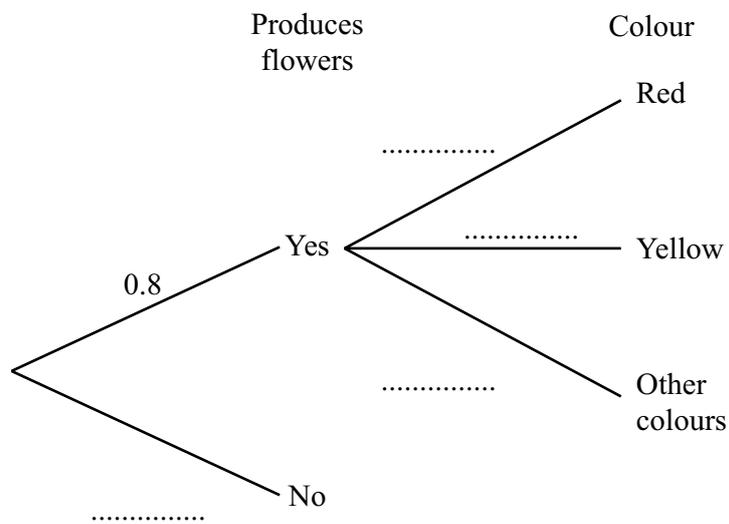
When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.

..... [1]

(b) (i) Complete the tree diagram.



[2]

(ii) Find the probability that a seed chosen at random produces red flowers.

..... [2]

(iii) Tanya chooses a seed at random.

Find the probability that this seed does not produce red flowers and does not produce yellow flowers.

..... [3]

(c) Two of the seeds are chosen at random.

Find the probability that one produces flowers and one does not produce flowers.

..... [3]

25 (a)  $y = x^4 - 4x^3$

(i) Find the value of  $y$  when  $x = -1$ .

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

(ii) Find the coordinates of the two stationary points on the graph of  $y = x^4 - 4x^3$ .

( ..... , ..... )

( ..... , ..... )

[6]

(b)  $y = x^p + 2x^q$

$$\frac{dy}{dx} = 11x^{10} + 10x^4.$$

Find the value of  $p$  and the value of  $q$ .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots$$

[2]

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