0580/SP3/22

IGCSE Extended Mathematics

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/02**

Paper 2 Non-calculator (Extended) **For examination from 2025**

2 hours

Sample paper 3

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.

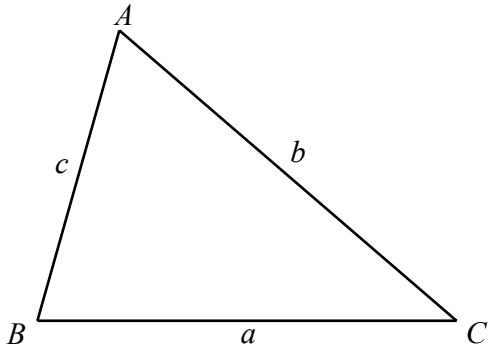
INFORMATION

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

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,



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

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

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

1. Write these values in order, smallest first.

74% $\sqrt{0.64}$ $\frac{3}{4}$ 0.085

..... , ... , ... , ... [2]

smallest

2. **(a)** Here are the first four terms of a sequence.

2 9 16 23

Find the nth term of this sequence.

..... [2]

(b) Here are the first four terms of a different sequence.

1 8 27 64

(i) Find the next term of this sequence.

..... [1]

(ii) 42 875 is a term in this sequence.

Work out the term number of 42 875.

..... [1]

3. c and d are whole numbers.

- $c^d = 64$

and

- $c < d$

Find the value of c and the value of d.

$c =$ .....

$d =$ ..... [2]

4. $\mathcal{E}$ = {integers from 1 to 20}
A = {multiples of 5}
P = {prime numbers}

(a) Write down the elements of A.

$A =$ { ..... } [1]

(b) Write down n(A).

n(A) = ... [1]

(c) Find $A \cap P$.

$A \cap P =$ { ..... } [1]

5. **(a)** Simplify $(m^3)^6$.

..... [1]

(b) $4x^3y^{-2} \times px^qy^r = 20x^{10}$

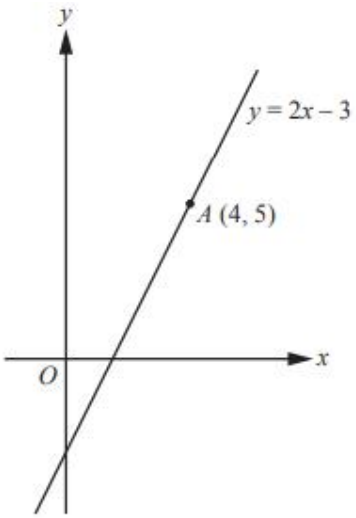
Find the values of p, q and r.

$p =$ .....

$q =$ .....

$r =$ ..... [3]

6.



NOT TO SCALE

The line $y = 2x - 3$ passes through the point A with coordinates (4, 5).

Find the equation of the straight line that passes through A and is perpendicular to $y = 2x - 3$.

(a) Show that $x^2 - 4x + 7 = (x - 2)^2 + 3$.

[1]

(b) Explain why the equation $x^2 - 4x + 7 = 0$ has no solutions.

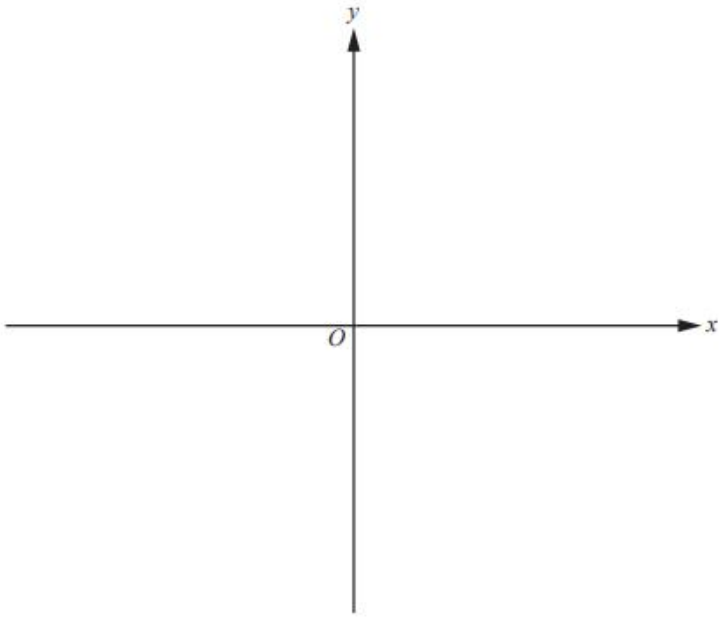
.....

..... [1]

(c) Write down the co-ordinates of the turning point of $y = x^2 - 4x + 7$.

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

(d) Sketch the graph of $y = x^2 - 4x + 7$ on the grid.



[2]

7. Make x the subject of this formula.

$$k = \frac{x^2}{2x - t}$$

Give your answer in its simplest form.

..... [4]

8. Work out.

$$5\frac{7}{9} - \frac{11}{12} \times \frac{2}{3}$$

Give your answer as a mixed number.

..... [3]

9. The surface area of a cube is $54\,cm^2$.

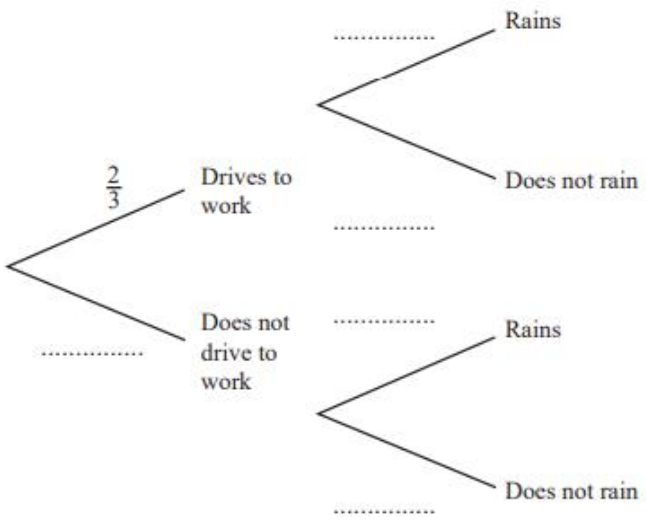
Find the volume of this cube.

.....cm^3 [3]

10. The probability that Marc drives to work on any day is $\frac{2}{3}$.

The probability that it rains on any day is $\frac{1}{5}$.

(a) Complete the tree diagram.



[2]

(b) Work out the probability that one day Marc drives to work and it does not rain.

.....[2]

11. Expand and simplify.

$$4(2r+3)+3(1-5r)$$

.....[2]

12. **(a)** Work out.

$$4\begin{pmatrix}3\\-1\end{pmatrix}-\begin{pmatrix}-5\\2\end{pmatrix}$$

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

(b) $$a\begin{pmatrix}4\\0\end{pmatrix}+b\begin{pmatrix}-2\\3\end{pmatrix}=\begin{pmatrix}-6\\12\end{pmatrix}$$

Find the value of a and the value of b.

$a =$ .....

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

13. A curve has equation $y = 2x^4 + \frac{x}{8}$.

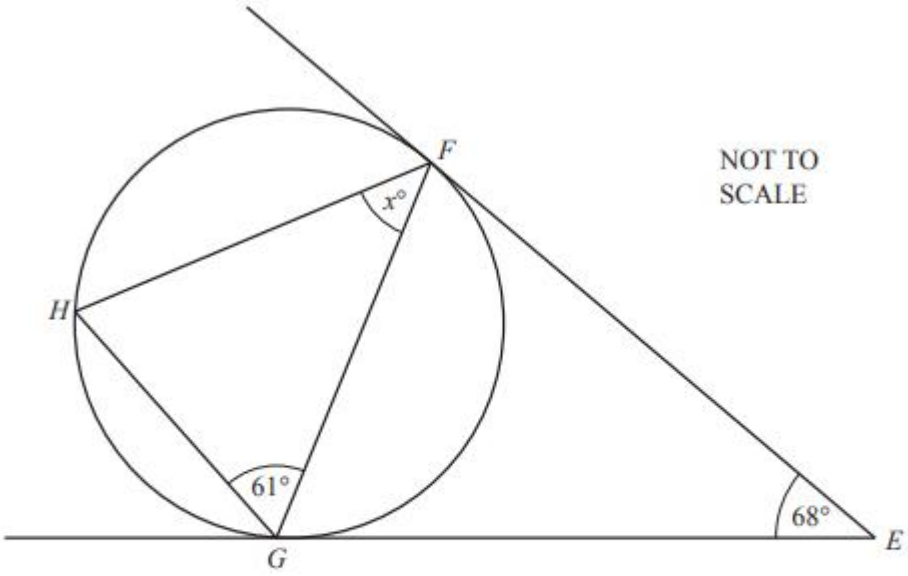
(i) Find $\frac{dy}{dx}$.

$\frac{dy}{dx} =$ ..... [2]

(ii) Find the x co-ordinate of the turning point of the curve.

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

(iii) Show that this turning point is a minimum.



F, G and H are points on the circumference of another circle.
EF and EG are tangents to the circle at F and G.

Work out the value of x.
Give a reason for each step of your working.

14. Write as a single fraction.

$$\frac{3x+2}{x+1}+\frac{2}{5}$$

Give your answer in its simplest form.

..... [3]

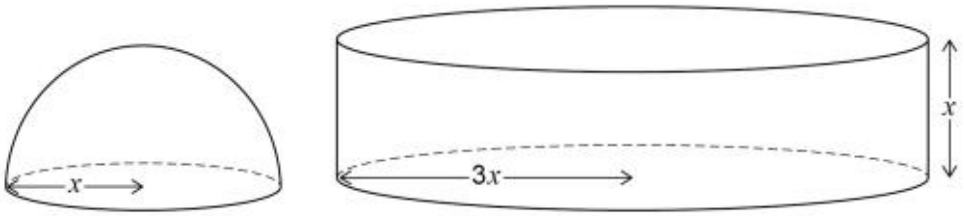
15. Solve.

$$8^{\frac{n}{3}}=\frac{1}{16}$$

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

16. A solid hemisphere has radius x.

A solid cylinder has radius $3x$ and height x.



Surface area of a sphere $= 4\pi r^2$ where r is the radius

17. Work out the ratio

total surface area of the hemisphere : total surface area of the cylinder

Give your answer in its simplest form.

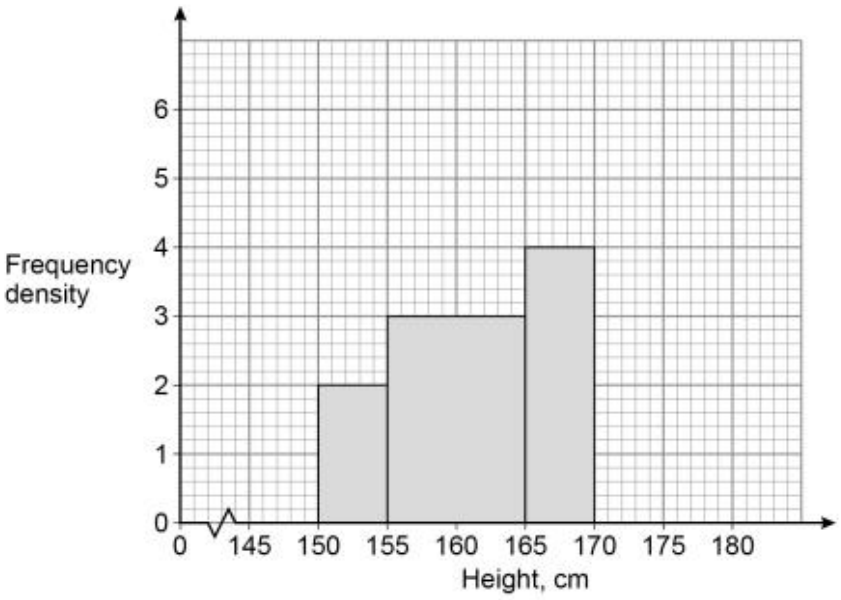
You **must** show your working.

[3 marks]

18. A histogram is drawn to represent the heights of a sample of women.

Three of the four bars are shown.

The bar for $170 \text{ cm} \leqslant \text{height} < 180 \text{ cm}$ is missing.

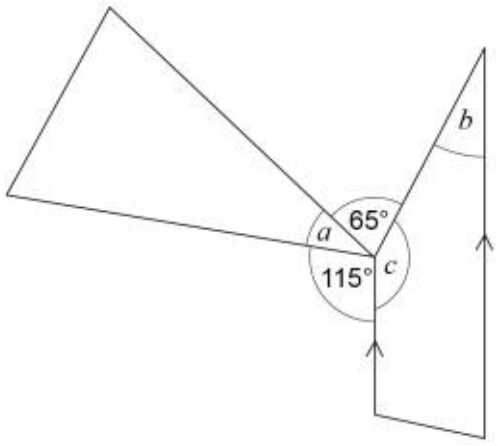


There are 74 women in the sample.

Complete the histogram.

[4 marks]

19. The diagram shows a triangle and a trapezium.



Not drawn accurately

Prove that $a = b$

[3 marks]

20. Given that p is a prime number, rationalise the denominator of $\frac{7\sqrt{p} - p^2}{\sqrt{p^3}}$

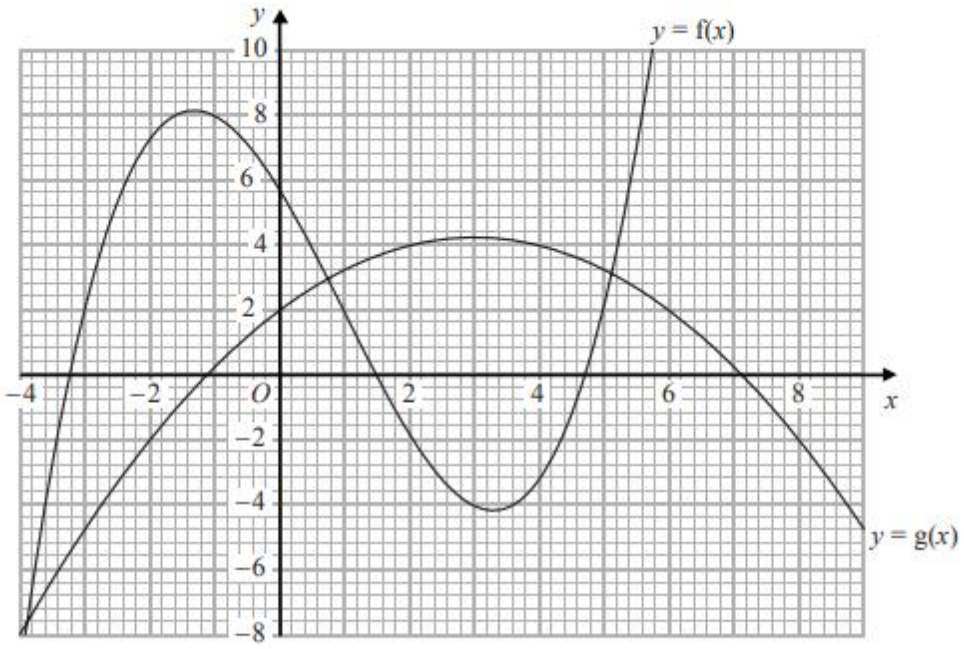
Simplify your answer.

3 marks)

21. The size of each interior angle of a regular polygon with n sides is $140°$

Work out the size of each interior angle of a regular polygon with $2n$ sides.

22. The diagram shows parts of the graphs of $y = f(x)$ and $y = g(x)$.



(a) Find g(0)

.....

(1)

(b) Find gf(−1)

.....

(2)

(c) Calculate an estimate for the gradient of the curve $y = f(x)$ at the point on the curve where $x = 3$

.....

(3)

23. P, R, Q and S are four points on a circle.

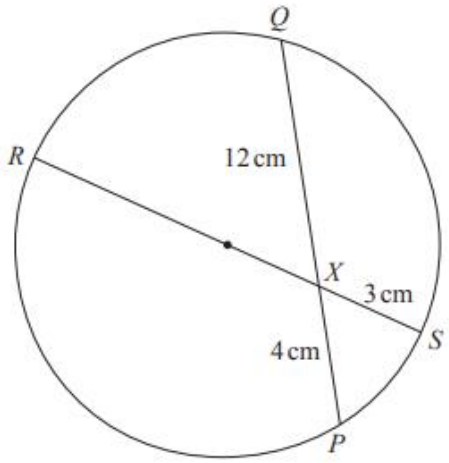


Diagram **NOT** accurately drawn

RXS is a diameter of the circle.
PXQ is a chord of the circle.

$PX = 4$ cm, $XQ = 12$ cm, $SX = 3$ cm.

Work out the radius of the circle.

..... cm

3 marks)

24. Here is a solid shape made from a cone and a hemisphere.

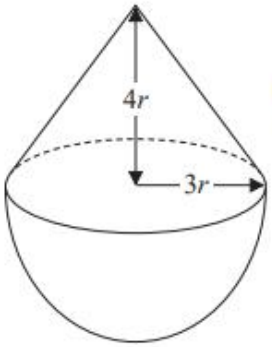


Diagram **NOT** accurately drawn

The radius of the hemisphere is $3r$ cm.

The radius of the base of the cone is $3r$ cm.
The height of the cone is $4r$ cm.

The volume of the solid shape is 330π cm^3

Find the value of r in the form $\sqrt[3]{n}$ where n is an integer.

.....

5 marks)

25. Here is a right-angled triangle.

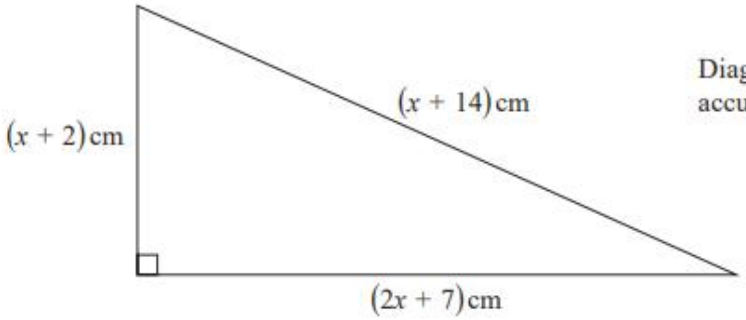


Diagram **NOT** accurately drawn

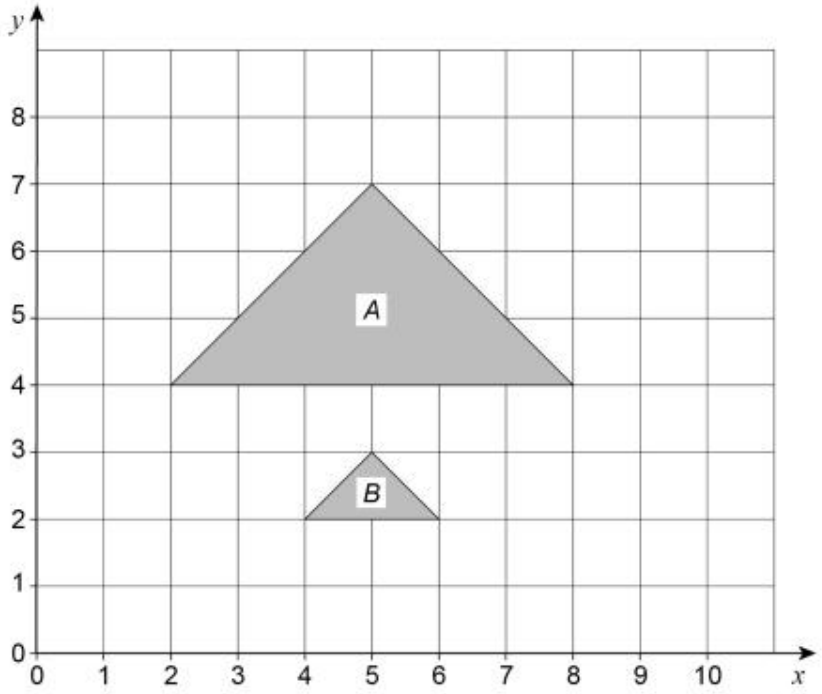
The area of the triangle is A cm^2

Work out the value of A.
Show your working clearly.

$A =$

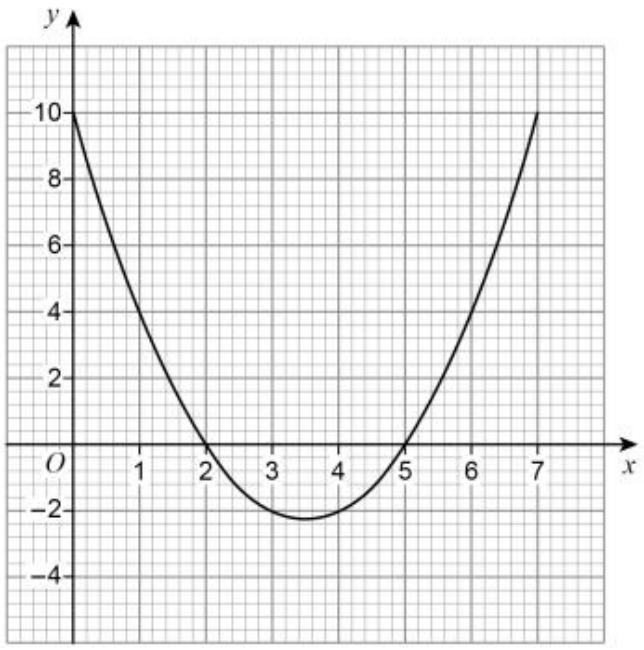
6 marks)

26. Describe fully the **single** transformation that maps triangle *A* to triangle *B*.



[3 marks]

27. Here is the graph of $y = x^2 - 7x + 10$ for values of x from 0 to 7



(a) Write down the roots of $x^2 - 7x + 10 = 0$

[2 marks]

Answer _____

(b) Write down the x-coordinate of the turning point of the curve.

[1 mark]

_____

Answer _____