* 0000800000001 * DFD

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/23**

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 **16** pages.

DC (DE/SG) 341842/3

[Turn over

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

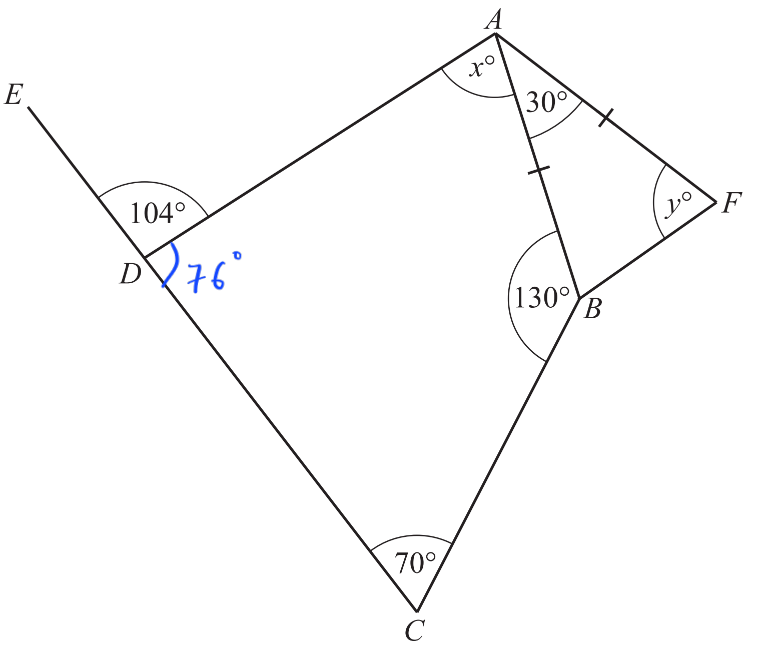
1 The probability of picking a green pen from a box is 0.17 .

Find the probability of not picking a green pen from the box.

$1 - 0.17 = 0.83$

.........0.83......... [1]

2



NOT TO SCALE

ABCD is a quadrilateral.
CDE is a straight line.
AFB is an isosceles triangle.

Find the value of x and the value of y.

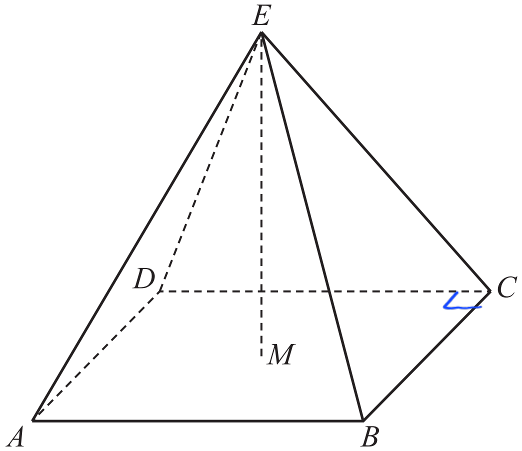
$x = 360° - 130° - 70° - 76° = 84°$

$y = \frac{180° - 30°}{2} = \frac{150°}{2} = 75°$

$x =$ ....84°.........

$y =$ ....75°.........
[4]

3



NOT TO SCALE

The diagram shows a pyramid *ABCDE* with a square base.
M is the centre of the square base.
E is vertically above *M*.

(a) Write down the number of planes of symmetry of this pyramid.

.................4................. [1]

(b) Using two of the letters from *A*, *B*, *C*, *D*, *E* and *M*, complete the statement about the pyramid.

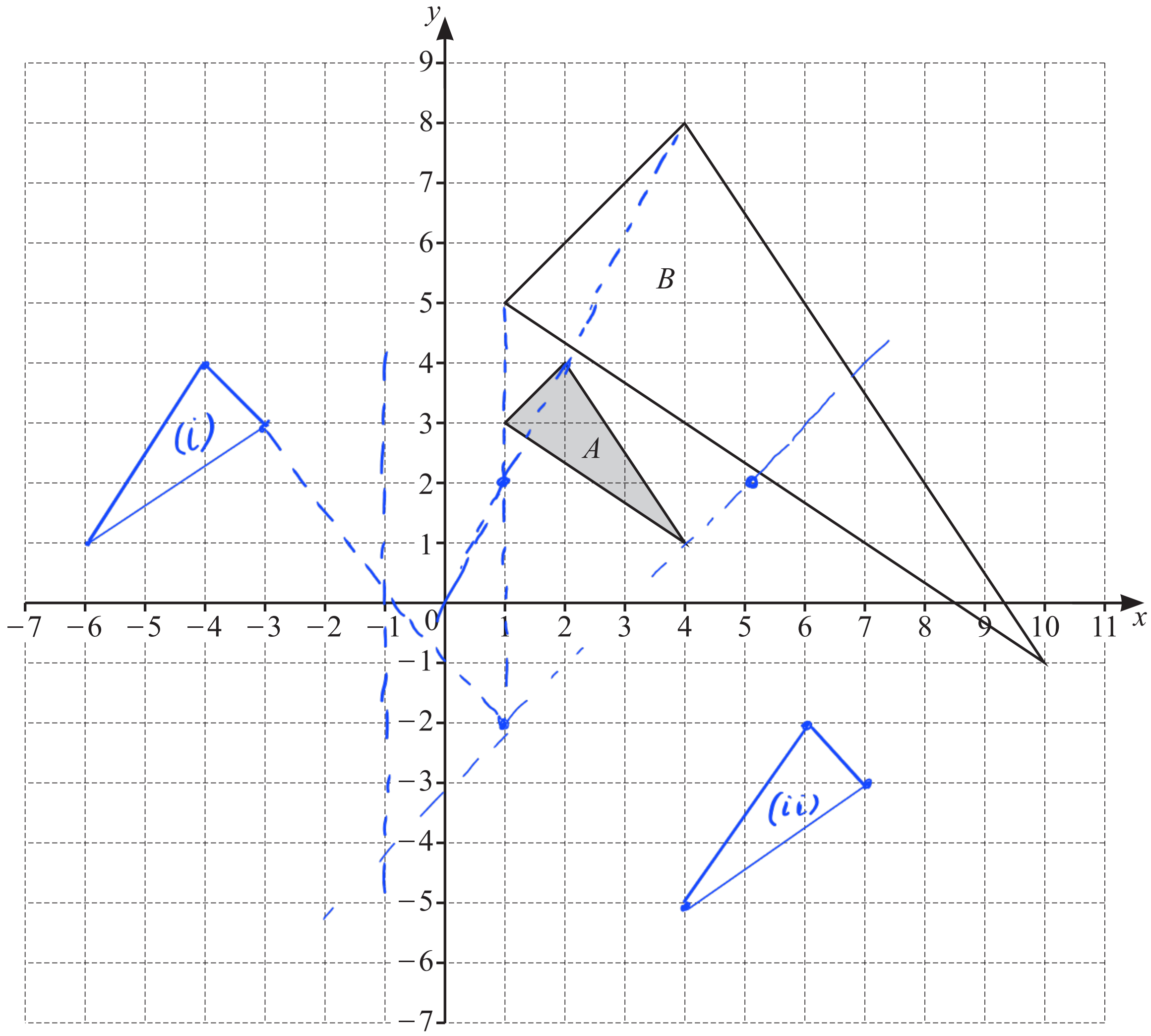
The axis of rotational symmetry passes through the points .....E..... and .....M..... [1]

4 The number of ice creams sold increases as the temperature rises.

What type of correlation does this statement describe?

.................positive................. [1]

5



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

Enlargement, center (1, 2), scale factor 3

.... [3]

(b) On the grid, draw the image of

(i) triangle A after a reflection in the line $x = -1$ [2]

(ii) triangle A after a rotation 90° clockwise, centre $(1, -2)$. [2]

6 There are 15 giraffes in a group.
The table gives information about the heights of the 15 giraffes.

One giraffe has a height of 2.6 m
No giraffe is shorter than 2.5 m
The range of heights for the 15 giraffes is 2.3 m
More than 3 giraffes have the same height
The modal height for the giraffes is 3.9 m

The stem-and-leaf diagram shows information about the height of 9 of these giraffes.

2	5	6					
3	2	7	7	9	9	9	9
4	1	1	4	5	7	8	

Key: 4|1 represents a giraffe height of 4.1 m

Use the information in the table to complete the stem-and-leaf diagram for the group of 15 giraffes.

[3]

DO NOT WRITE IN THIS MARGIN

7 Work out.

(a) $\frac{5}{6} - \frac{7}{12}$

Give your answer as a fraction in its simplest form.

$\frac{10}{12} - \frac{7}{12} = \frac{3}{12} = \frac{1}{4}$

$\frac{1}{4}$ .... [2]

(b) $1\frac{1}{3} \div \frac{8}{15}$

Give your answer as a mixed number in its simplest form.

$\frac{4}{3} : \frac{8}{15} = \frac{4}{3} \times \frac{15}{8} = \frac{4 \times 15}{3 \times 8} = \frac{5}{2} = 2\frac{1}{2}$

$2\frac{1}{2}$ .... [3]

8 **(a)** Write 42 as a product of its prime factors.

42
2 21
3 7

$2 \times 3 \times 7$ .... [2]

(b) Find the highest common factor (HCF) of 84 and 70.

$84 = 2^2 \times 3 \times 7$
84
4 21
2 2 3 7

$70 = 2 \times 5 \times 7$
70
2 35
5 7

$HCF(84, 70) = 2 \times 7 = 14$

14 .... [2]

9 **(a)** Solve.

$$5x^2 = 12 - 17x$$

$5x^2 + 17x - 12 = 0$

$(5x - 3)(x + 4) = 0$

$5x - 3 = 0$ or $x + 4 = 0$

$x = \frac{3}{5}$ or $x = -4$

$x =$ ....-4.... or $x =$ ....$\frac{3}{5}$.... [4]

(b) $ax^2 + a = b$ where a and b are integers.

One solution of this equation is $x = 6$.

Write down the other solution.

$ax^2 = b - a$

$x^2 = \frac{b-a}{a}$

$x = \pm\sqrt{\frac{b-a}{a}}$

$x =$ ....-6.... [1]

10 Solve the simultaneous equations.

$$4x - 5y = 13$$
$$3x - 2y = 8$$

$8x - 10y = 26$

$15x - 10y = 40$

$(15x - 10y) - (8x - 10y) = 40 - 26$

$15x - 8x = 14$

$7x = 14$

$x = 2$

$\Rightarrow 4 \times 2 - 5y = 13$

$5y = 8 - 13 = -5$

$y = -1$

$x =$ ....2....

$y =$ ....-1....

[4]

11 Angela picks a number at random from the numbers 1, 2 and 3.
She then picks a number at random from the numbers 4, 5 and 6.
She adds the two numbers to find the total.

(a) Complete the table to show the possible outcomes.

First number

	+	1	2	3
Second number	4	5	6	7
	5	6	7	8
	6	7	8	9

[2]

(b) Given that the total is odd, find the probability that one of the numbers Angela picks is 3.

$$\frac{P(\text{odd} \cap 3)}{P(\text{odd})} = \frac{2/9}{5/9}$$

.................$\frac{2}{5}$................. [2]

12 **(a)** $\mathbf{v} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Find $5\mathbf{v}$.

$\begin{pmatrix} 10 \\ -15 \end{pmatrix}$ [1]

(b) H is the point $(-3, 8)$ and K is the point $(-4, 0)$.

$\overrightarrow{HJ} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$

Find $|\overrightarrow{JK}|$.

$x_J - x_H = 7 \Rightarrow x_J = 7 + (-3) = 4$

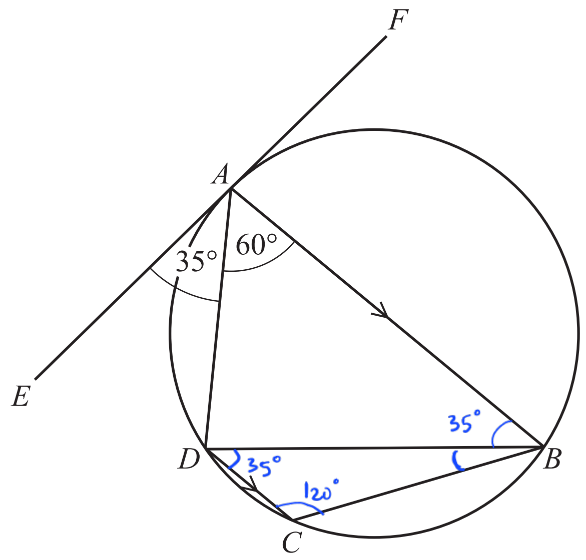
$y_J - y_H = -2 \Rightarrow y_J = -2 + (-2) = -4$

$\overrightarrow{JK} = \begin{pmatrix} -4-4 \\ 0-(-4) \end{pmatrix} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$

$|\overrightarrow{JK}| = \sqrt{(-8)^2 + 4^2} = \sqrt{100} = 10$

.................10................. [4]

13



NOT TO SCALE

A, B, C and D are points on a circle.
EF is a tangent to the circle at A.
AB is parallel to DC.

(a) Find angle DCB, giving a geometrical reason.

Angle DCB = 120° because the sum of 2 opposite angles in a cyclic quadrilateral is 180° [2]

(b) Find angle DBC.

$\widehat{BDC} = \widehat{ABD} = \widehat{DAE} = 35°$

$\widehat{DBC} = 180° - 35° - 120° = 25°$

Angle DBC = 25° [2]

14 Find the lowest common multiple (LCM) of $15xy^3$ and $18x^4y$.

$15 = 3 \times 5$

$18 = 2 \times 3^2$

$\mathrm{LCM}(15, 18) = 2 \times 3^2 \times 5 = 90$

$\mathrm{LCM}(15xy^3, 18x^4y) = 90x^4y^3$

$90x^4y^3$ [2]

15 **(a)** Simplify.

$$\sqrt{27}+\sqrt{12}$$

$\sqrt{9 \times 3} + \sqrt{4 \times 3}$

$= 3\sqrt{3} + 2\sqrt{3}$

$= 5\sqrt{3}$

$5\sqrt{3}$ [2]

(b) $\dfrac{40\sqrt{8}}{5\sqrt{2}} = k$, where k is an integer.

Find the value of k.

$\dfrac{40 \times 2\sqrt{2}}{5\sqrt{2}} = k$

$\dfrac{80}{5} = k$

$k =$ 16 [2]

(c) Rationalise the denominator.

$$\frac{1}{3-\sqrt{5}}$$

$\dfrac{3+\sqrt{5}}{(3-\sqrt{5})(3+\sqrt{5})} = \dfrac{3+\sqrt{5}}{9-5}$

$\dfrac{3+\sqrt{5}}{4}$ [2]

16 Write $0.3\dot{2}\dot{8}$ as a fraction in its simplest form.

$x = 0.328\,28\,28\ldots$

$10x = 3.28\,28\,28\ldots$

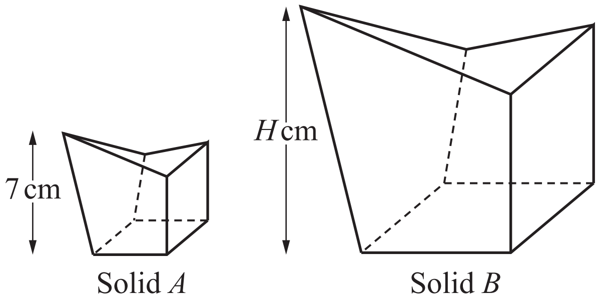
$1000x = 328.282828\ldots$

$990x = 328 - 3 = 325$

$x = \dfrac{325}{990} = \dfrac{65}{198}$

$\dfrac{65}{198}$ [3]

17 Solid A is mathematically similar to solid B.



The height of solid A is 7 cm and its surface area is 60 cm^2.
The surface area of solid B is 540 cm^2.

Calculate the height of solid B.

ratio of area = (ratio of side)^2

$$\frac{540}{60} = \left(\frac{H}{7}\right)^2$$

$$\frac{H}{7} = \sqrt{9} = 3 \Rightarrow H = 21$$

.... 21 .... cm [3]

18 Make t the subject of the formula.

$$2 = \frac{m(1-t)}{pt}$$

$$2pt = m - mt$$
$$2pt + mt = m$$
$$(2p+m)t = m$$
$$t = \frac{m}{2p+m}$$

$t =$ .... $\frac{m}{2p+m}$ .... [4]

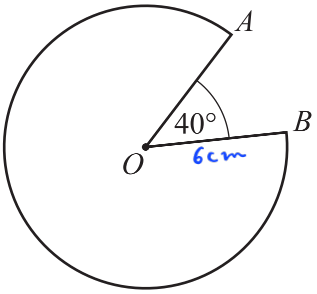
19 Simplify.

$$\frac{7x-x^2}{49-x^2}$$

$$\frac{x(7-x)}{(7-x)(7+x)} = \frac{x}{7+x}$$

.... $\frac{x}{7+x}$ .... [3]

20



NOT TO SCALE

The diagram shows a sector of a circle, centre O.
The radius of the circle is 6 cm.

Calculate the length of the major arc AB.
Give your answer in its simplest form in terms of π.

$40^\circ = \frac{40^\circ \times \pi}{180^\circ} = \frac{2\pi}{9}$ rad

Length of minor arc $AB = 6 \times \frac{2\pi}{9} = \frac{12\pi}{9}$ cm

Length of major arc $AB = 2\pi \times 6 - \frac{4\pi}{3} = \frac{32\pi}{3}$ cm

$\frac{32\pi}{3}$ cm [3]

21 **(a)** Differentiate $x^3 - 3x^2 + 1$.

$3x^2 - 6x$ [2]

(b) Find the coordinates of the turning points of the graph of $y = x^3 - 3x^2 + 1$.

$3x^2 - 6x = 0$

$3x(x-2) = 0$

$x = 0$ or $x = 2$

When $x = 0$: $y = 0^3 - 3 \times 0^2 + 1 = 1$

When $x = 2$: $y = 2^3 - 3 \times 2^2 + 1 = -3$

(0 , 1)

(2 , −3)

[4]

22 $\mathrm{f}(x) = 2x + 5$ $\mathrm{g}(x) = x - 4$ $\mathrm{h}(x) = 5^x$

(a) Find f(3).

$2 \times 3 + 5 = 11$

11 [1]

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

$y = 2x + 5$

$y - 5 = 2x$

$\frac{y-5}{2} = x$

$\mathrm{f}^{-1}(x) =$ $\frac{x-5}{2}$ [2]

(c) Solve $\mathrm{fg}(x) = 25$.

$2(x - 4) + 5 = 25$

$2x - 8 + 5 = 25$

$2x = 28$

$x = 14$

$x =$ 14 [3]

(d) Find x when $\mathrm{h}^{-1}(x) = 2$.

$y = 5^x$

$\sqrt[x]{y} = 5$

Swap: $\sqrt[y]{x} = 5$

$\sqrt[2]{x} = 5$

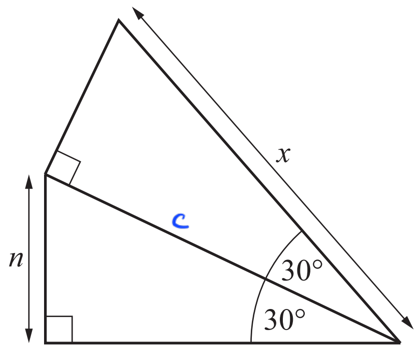
$x =$ 25 [2]

DO NOT WRITE IN THIS MARGIN

23 **(a)** Write down the value of cos 90°.

.................0................. [1]

(b)



NOT TO SCALE

The diagram shows two different right-angled triangles joined by a common side.

Find x in terms of n.

$\sin 30° = \frac{n}{c}$

$\Rightarrow c = n : \sin 30° = n : \frac{1}{2} = 2n$

$\cos 30° = \frac{c}{x}$

$\Rightarrow x = c : \cos 30° = c : \frac{\sqrt{3}}{2} = \frac{2c}{\sqrt{3}}$

sub $c = 2n$ into x :

$x = \frac{2 \times 2n}{\sqrt{3}} = \frac{4n}{\sqrt{3}}$

$x =$ ....$\frac{4n}{\sqrt{3}}$........ [5]

24 **(a)** A is the point $(a, 12)$ and B is the point $(b, 27)$.

(i) Find the y-coordinate of the midpoint of AB.

$$\frac{12+27}{2} = \frac{39}{2}$$

.......19.5....... [1]

(ii) The line AB has gradient 3.

Find an expression for a in terms of b.

$$m_{AB} = 3$$

$$\frac{27-12}{b-a} = 3$$

$$b-a = \frac{15}{3} = 5$$

$a =$ ....$b-5$....... [3]

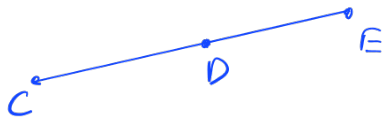
(b) D is the point $(22, 34)$ and E is the point $(23, 39)$.
D is the point on CE such that $2CE = 5DE$.

Find the coordinates of C.

$$CE = \frac{5}{2}DE$$

$\Rightarrow CE > DE$

$\Rightarrow$ D is between C and E



$$\Rightarrow \overrightarrow{CE} = \frac{5}{2}\overrightarrow{DE}$$

$$\begin{pmatrix} 23 - x_c \\ 39 - y_c \end{pmatrix} = \frac{5}{2}\begin{pmatrix} 23-22 \\ 39-34 \end{pmatrix}$$

$$23 - x_c = \frac{5}{2} \Rightarrow x_c = 23 - \frac{5}{2} = \frac{41}{2}$$

$$39 - y_c = \frac{5}{2} \times 5 \Rightarrow y_c = 39 - \frac{25}{2} = \frac{53}{2}$$

(.......$\frac{41}{2}$....... , ...$\frac{53}{2}$.......) [3]