

Cambridge IGCSE™

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MATHEMATICS

0580/02

Paper 2 Non-calculator (Extended)

For examination from 2025

SPECIMEN PAPER B

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.



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

- 1 Write the ratio 12 : 30 in its simplest form.

$\mathcal{K}$

..... 2 : 5 [1]

- 2 Write down the number of lines of symmetry of a kite.

$\mathcal{K}$

..... 1 [1]

- 3 The stem-and-leaf diagram shows the number of minutes taken by each of 18 students to complete a task.

$\mathcal{K}$

1	<u>2</u>	<u>3</u>	<u>6</u>	<u>9</u>				
2	<u>1</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>4</u>	8	8	9
3	1	4	5	5	9	9		

Key: 1 | 2 represents 12 minutes

- (a) Find the range.

$$39 - 12 = 27$$

..... 27 minutes [1]

- (b) Find the median.

$$\frac{9^{\text{th}} + 10^{\text{th}}}{2} = \frac{24 + 28}{2}$$

..... 26 minutes [1]

- (c) A student draws a pie chart to show the information in the stem-and-leaf diagram.

Complete the table for the angles on the pie chart.

Frequency	Number of minutes (t)	Angle on pie chart ($^{\circ}$)
<u>4</u>	$10 < t \leq 20$	<u>80</u>
<u>8</u>	$20 < t \leq 30$	<u>160</u>
<u>6</u>	$30 < t \leq 40$	<u>120</u>

$$\frac{360^{\circ}}{18} \begin{cases} \times 4 \\ \times 8 \\ \times 6 \end{cases}$$

[2]

- 4 Work out $\frac{3}{7} \times \frac{14}{15}$.

R

Give your answer as a fraction in its simplest form.

$$\frac{3 \times 14}{7 \times 15} = \frac{2}{5}$$

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

- 5 Find the size of an interior angle of a regular decagon.

R

$$\frac{(10-2) 180^\circ}{10} = 8 \times 18^\circ$$

$$144^\circ \dots\dots\dots [2]$$

- 6 Convert 5.7 litres into cm^3 .

R

$$5.7 \times 1000$$

$$5700 \dots\dots\dots \text{cm}^3 [1]$$

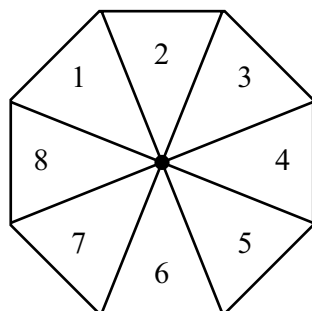
- 7 Write these numbers in order, starting with the smallest.

R

$$\begin{array}{ccccccc} & & \frac{3}{20} & & 0.143 & & \frac{1}{6} & & 16\% \\ & & \downarrow & & & & \downarrow & & \swarrow \\ \frac{3}{2} : 10 = 0.15 & & & & & & 0.1666\dots & & 0.16 \end{array}$$

$$0.143 \text{ (smallest)}, \frac{3}{20}, 16\%, \frac{1}{6} \dots\dots\dots [2]$$

- 8 Jude has a fair 8-sided spinner numbered 1 to 8.



- (a) Jude spins the spinner once.

Find the probability that the spinner lands on

- (i) a number greater than 6

$$\frac{2}{8} \dots\dots\dots [1]$$

- (ii) an even number or a multiple of 7.

$$\frac{5}{8} \dots\dots\dots [1]$$

- (b) Jude spins the spinner 240 times.

Work out the expected number of times the spinner lands on a number greater than 6.

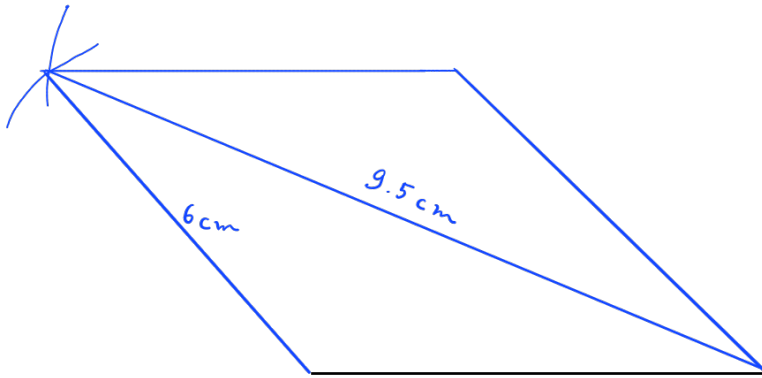
$$240 \times \frac{2}{8} = \frac{240}{8} \times 2 = 30 \times 2$$

$$\dots\dots\dots 60 \dots\dots\dots [1]$$

- 9 Using a ruler and pair of compasses only, construct a rhombus with side length 6 cm and a diagonal of length 9.5 cm.

R

One side has been drawn for you.



[3]

- 10 The time that Rafiq works is divided into meetings, planning and working on a computer.

R

One day, Rafiq is

- in meetings for $\frac{3}{4}$ of the time
- planning for $\frac{1}{5}$ of the time
- working on a computer for the remaining 25 minutes of the time.

Work out the total time that Rafiq works this day.

Give your answer in hours and minutes.

$$\begin{aligned}
 \text{Total time} &: t \\
 \text{meeting} &: \frac{3}{4}t, \text{ planning: } \frac{1}{5}t \\
 \Rightarrow t - \frac{3}{4}t - \frac{1}{5}t &= 25 \\
 20t - 15t - 4t &= 25 \times 20 \\
 t &= 500 \text{ minutes} \\
 \frac{500}{60} &= \frac{50}{6} = 8\frac{2}{6} \text{ h}
 \end{aligned}$$

.....8..... hours20..... minutes [5]

11 (a) Expand.

K

$$2x(3x^2 - 8x)$$

$$\dots\dots\dots 6x^3 - 16x^2 \dots\dots\dots [2]$$

(b) (i) Factorise.

$$x^2 - 19^2$$

$$\dots\dots\dots (x - 19)(x + 19) \dots\dots\dots [1]$$

(ii) Work out.

$$81^2 - 19^2$$

$$(81 - 19)(81 + 19)$$

$$62 \times 100$$

$$\dots\dots\dots 6200 \dots\dots\dots [2]$$

12 A force of 196 newtons is applied to a square surface of side 4.9 cm.

K

By writing each number correct to 1 significant figure, work out an estimate of the pressure applied to the square surface.

[Pressure = force $\div$ area]

[Pressure is measured in newtons/cm²]

$$\text{pressure} = \frac{\text{force}}{\text{area}} = \frac{196}{4.9^2} \approx \frac{200}{5^2} = \frac{200}{25} = 8$$

$$\dots\dots\dots 8 \dots\dots\dots \text{ newtons/cm}^2 [3]$$

- Rotation around center $(-2, 1)$
clock wise 90°

14 Write $0.\dot{3}\dot{8}$ as a fraction.

K Give your answer in its simplest form.

$$\begin{aligned}x &= 0.3888 \dots \\10x &= 3.8888 \dots \\100x &= 38.8888 \dots \\90x &= 38 - 3 = 35 \\x &= \frac{35}{90}\end{aligned}$$

$$\frac{7}{18} \dots \dots \dots [3]$$

15 Freya records how many minutes she takes to complete a crossword each day.

K

On Tuesday, she takes 10% less time than on Monday.

On Wednesday, she takes 50% less time than on Tuesday.

On Wednesday, she takes 9 minutes to complete the crossword.

Find the number of minutes Freya takes to complete the crossword on Monday.

$$\begin{aligned}\text{On Tuesday, she takes } m - 10\% m &= 0.9m \\ \text{On Wednesday, she takes } 0.9m - 50\% 0.9m &= 0.45m \\ \Rightarrow 0.45m &= 9 \\ \Rightarrow m &= \frac{9}{0.45} = \frac{900}{45} = \frac{180}{9} = 20\end{aligned}$$

$$\dots \dots \dots 20 \dots \dots \dots \text{ minutes } [3]$$

16 $\vec{PQ} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\vec{QR} = \begin{pmatrix} 1 \\ 9 \end{pmatrix}$.

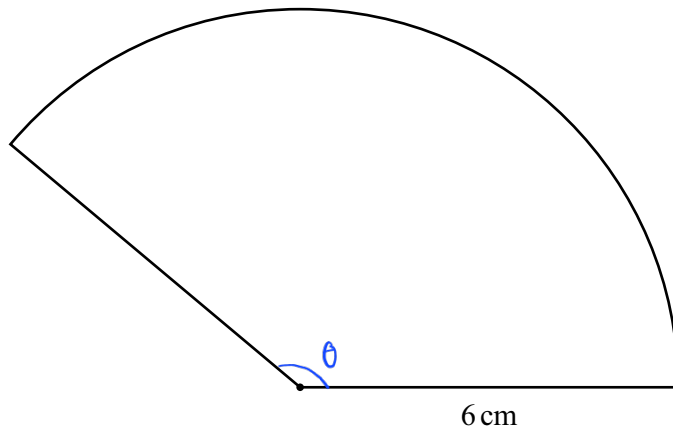
K

Work out the length of $\vec{PR}$.

$$\begin{aligned}\vec{PR} &= \vec{PQ} + \vec{QR} = \begin{pmatrix} 3 \\ -1 \end{pmatrix} + \begin{pmatrix} 1 \\ 9 \end{pmatrix} = \begin{pmatrix} 4 \\ 8 \end{pmatrix} \\ |\vec{PR}| &= \sqrt{4^2 + 8^2} = \sqrt{16 + 64} = \sqrt{80}\end{aligned}$$

$$\dots \dots \dots \sqrt{80} \dots \dots \dots [3]$$

17

NOT TO
SCALE

The diagram shows a sector of a circle with radius 6 cm.
The area of the sector is $15\pi \text{ cm}^2$.

- (a) Work out the perimeter of the sector.
Give your answer in the form $a + b\pi$, where a and b are integers.

$$\begin{aligned} \frac{1}{2} \times 6^2 \theta &= 15\pi \\ \Rightarrow \theta &= \frac{15}{18} \pi = \frac{5}{6} \pi \\ \text{Perimeter of sector} &= 6 \times 2 + 6 \times \frac{5}{6} \pi \\ &= 12 + 5\pi \end{aligned}$$

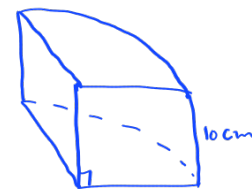
..... $12 + 5\pi$ cm [4]

- (b) The sector is the cross-section of a prism of length 10 cm.

Work out, giving your answer in terms of π ,

- (i) the volume of the prism

$$V = 15\pi \times 10 = 150\pi$$



..... 150π cm^3 [1]

- (ii) the total surface area of the prism.

$$\begin{aligned} \underbrace{2 \times 10 \times 6}_{2 \text{ sides}} &+ \underbrace{10 \times 6 \times \frac{5}{6} \pi}_{\text{curve}} + \underbrace{2 \times 15\pi}_{2 \text{ bases}} \\ &= 120 + 50\pi + 30\pi \end{aligned}$$

..... $120 + 80\pi$ cm^2 [3]

- 18 (a) (i) Write $x^2 - 8x + 10$ in the form $(x - a)^2 - b$.

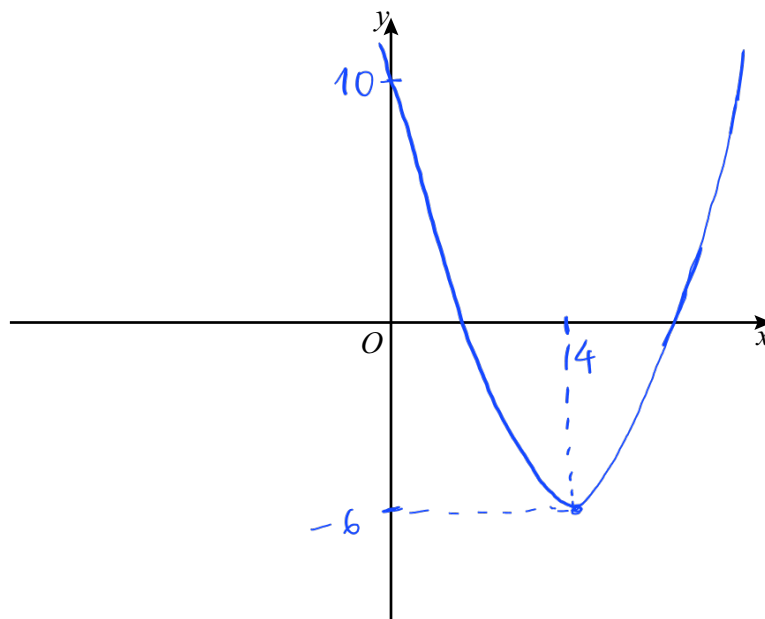
7

$$x^2 - 2 \times 4 + 4^2 - 4^2 + 10$$

$$(x - 4)^2 - 6$$

$$(x - 4)^2 - 6 \dots\dots\dots [2]$$

- (ii) Sketch the graph of $y = x^2 - 8x + 10$.
On the sketch, label the coordinates of the turning point and the y-intercept.



[3]

- (b) A point P lies on the graph of $y = x^2 - 8x + 10$.
The gradient of the graph at P is 6.

Find the coordinates of P .

$$\frac{dy}{dx} = 2x - 8 = 6$$

$$\Rightarrow 2x = 14$$

$$x_p = 7$$

$$\Rightarrow y_p = 7^2 - 8 \times 7 + 10 = 3$$

$$(\dots\dots\dots 7 \dots\dots\dots , \dots\dots\dots 3 \dots\dots\dots) [4]$$

19 (a) Simplify.

R

$$\begin{aligned} & \sqrt{75} - \sqrt{3} \\ & \sqrt{25 \times 3} - \sqrt{3} \\ & 5\sqrt{3} - \sqrt{3} \end{aligned}$$

$$\dots\dots\dots 4\sqrt{3} \dots\dots\dots [2]$$

(b) Rationalise the denominator and simplify.

$$\begin{aligned} & \frac{8}{1-\sqrt{5}} \\ & \frac{8(1+\sqrt{5})}{(1-\sqrt{5})(1+\sqrt{5})} \\ & \frac{8(1+\sqrt{5})}{1-5} = \frac{8(1+\sqrt{5})}{-4} = -2(1+\sqrt{5}) \end{aligned}$$

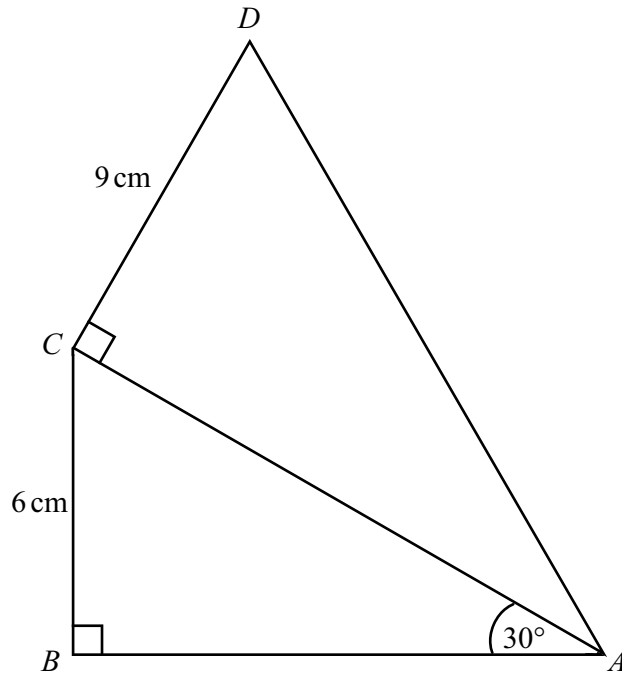
$$\dots\dots\dots -2(1+\sqrt{5}) \dots\dots\dots [3]$$

20 Expand and simplify.

R

$$\begin{aligned} & (2x-3)(x+1)(2-3x) \\ & (2x^2 - 3x + 2x - 3)(2-3x) \\ & (2x^2 - x - 3)(2-3x) \\ & 4x^2 - 2x - 6 - 6x^3 + 3x^2 + 9x \\ & \quad - 6x^3 + 7x^2 + 7x - 6 \end{aligned}$$

$$\dots\dots\dots -6x^3 + 7x^2 + 7x - 6 \dots\dots\dots [3]$$



NOT TO
SCALE

The diagram shows two right-angled triangles, ABC and ACD .

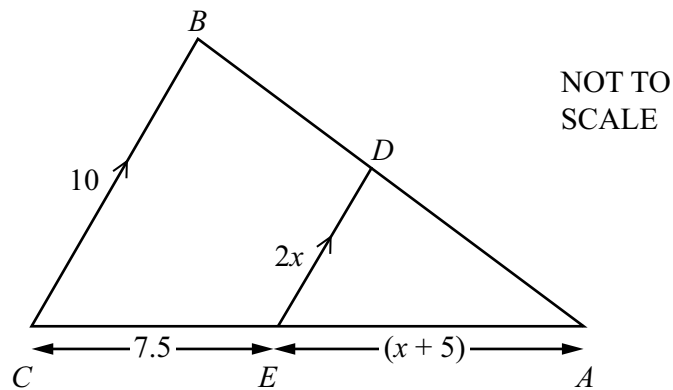
Find the value of $\cos ADC$.

$$\begin{aligned} \sin 30^\circ &= \frac{6}{AC} \\ \Rightarrow AC &= 6 : \sin 30^\circ = 6 : \frac{1}{2} = 12 \\ \Rightarrow AD &= \sqrt{9^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15 \\ \cos \hat{ADC} &= \frac{CD}{AD} = \frac{9}{15} \end{aligned}$$

$$\cos ADC = \frac{9}{15} \dots\dots\dots [5]$$

22 In this question, all lengths are given in centimetres.

K



Triangle ABC is mathematically similar to triangle ADE .

(a) (i) Show that $2x^2 + 15x - 50 = 0$.

$$\begin{aligned} \Delta ABC &\sim \Delta ADE \\ \Rightarrow \frac{AC}{AE} &= \frac{BC}{DE} \\ \Rightarrow \frac{x + 5 + 7.5}{x + 5} &= \frac{10}{2x} \\ \Rightarrow (x + 12.5) 2x &= 10(x + 5) \\ 2x^2 + 25x &= 10x + 50 \\ 2x^2 + 15x - 50 &= 0 \end{aligned}$$

[3]

(ii) Solve by factorising $2x^2 + 15x - 50 = 0$.

$$\begin{aligned} (2x - 5)(x + 10) &= 0 \\ 2x - 5 = 0 \quad \text{or} \quad x + 10 = 0 \\ x = 2.5 \quad \text{or} \quad x = -10 \end{aligned}$$

$$x = \dots\dots 2.5 \dots\dots \text{ or } x = \dots\dots -10 \dots\dots [3]$$

(iii) Find the length AC .

$$\begin{aligned} \text{Because } x > 0 \quad \text{so} \quad x &= 2.5 \\ AC = x + 12.5 &= 2.5 + 12.5 = 15 \end{aligned}$$

$$AC = \dots\dots 15 \dots\dots \text{ cm } [1]$$

- (b) The area of triangle ABC is $k \text{ cm}^2$.

Find an expression for the area of the quadrilateral $BCED$.

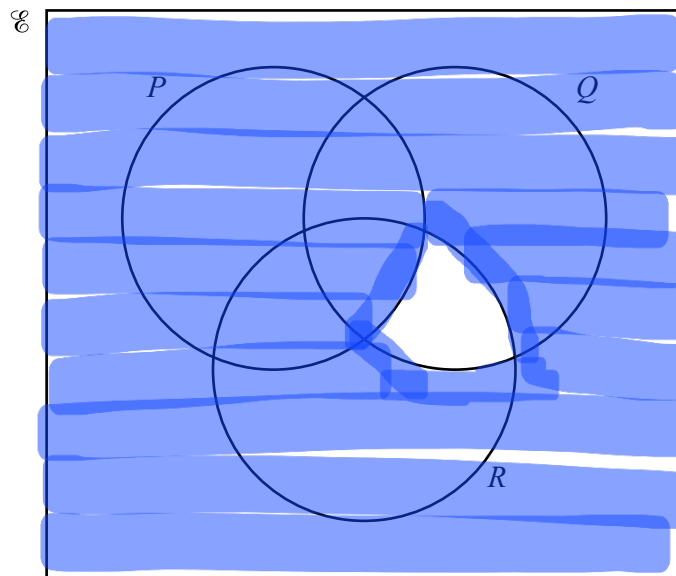
Give your answer in terms of k .

$$\frac{A_{\triangle ADE}}{A_{\triangle ABC}} = \left(\frac{AE}{AC}\right)^2 = \left(\frac{7.5}{15}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$\Rightarrow A_{\triangle ADE} = \frac{1}{4} k$$

$$\Rightarrow A_{BCED} = k - \frac{1}{4} k = \frac{3}{4} k \text{ cm}^2 [2]$$

23

In the Venn diagram, shade the region $P \cup Q' \cup R'$.

[1]

- 24 Rearrange the formula to make p the subject.



$$d = \frac{2p+3}{2-py}$$

$$d(2-py) = 2p+3$$

$$2d - dpy = 2p+3$$

$$2d - 3 = 2p + dpy$$

$$2d - 3 = (2 + dy)p$$

$$\frac{2d-3}{2+dy} = p$$

$$p = \frac{2d-3}{2+dy} [4]$$

25 (a) Simplify.

R

(i) $(2xy)^0$

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

$$\begin{aligned}
 \text{(ii)} \quad \left(\frac{81m^8}{3m^2}\right)^{\frac{2}{3}} &= \left(27m^6\right)^{\frac{2}{3}} \\
 &= 27^{\frac{2}{3}} m^{6 \times \frac{2}{3}} \\
 &= \left(\sqrt[3]{27}\right)^2 m^4 \\
 &= 3^2 m^4
 \end{aligned}$$

..... $9m^4$ [3](b) Find the value of x .

$$\begin{aligned}
 32^x \times 2^{x+3} &= \frac{1}{4} \\
 (2^5)^x \times 2^{x+3} &= 2^{-2} \\
 2^{5x+x+3} &= 2^{-2} \\
 6x+3 &= -2 \\
 6x &= -5 \\
 x &= \frac{-5}{6}
 \end{aligned}$$

 $x = \frac{-5}{6}$ [3]