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CANDIDATE NAME

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7079859176

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2024**

2 hours 30 minutes

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.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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[Turn over

1 **(a)** Anvi buys a new car.

(i) The price of the car is $28 240.
She is given a 7.5% discount.

Calculate the amount she pays.

$ ..... [2]

(ii) The fuel tank in the new car has a capacity of 45 litres.
This is 72% of the capacity of the fuel tank in her old car.

Calculate the capacity of the fuel tank in her old car.

..... litres [2]

(b) Aadi buys a new car costing $28 000.
He pays for the car using a finance plan.
The finance plan is

- a deposit
- 47 equal monthly payments of $330
- a final payment of $11 490.

Using this finance plan, Aadi pays a total of $31 900 for the car.

Calculate the deposit paid as a percentage of $28 000.

..... % [4]

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(c) A car travels 64 km and uses 2.5 litres of fuel.
It then travels 128 km and uses 6 litres of fuel.

Calculate the rate at which the car uses fuel during the whole journey.
Give your answer in litres per 100 km.

..... litres per 100 km [2]

(d) At the start of 2021 the value of a car was $46 500.
At the end of 2021 the value of the car was 20% less.
At the end of 2022 the value of the car was 15% less than its value at the end of 2021.

Calculate the value of the car at the end of 2022.

$ ..... [2]

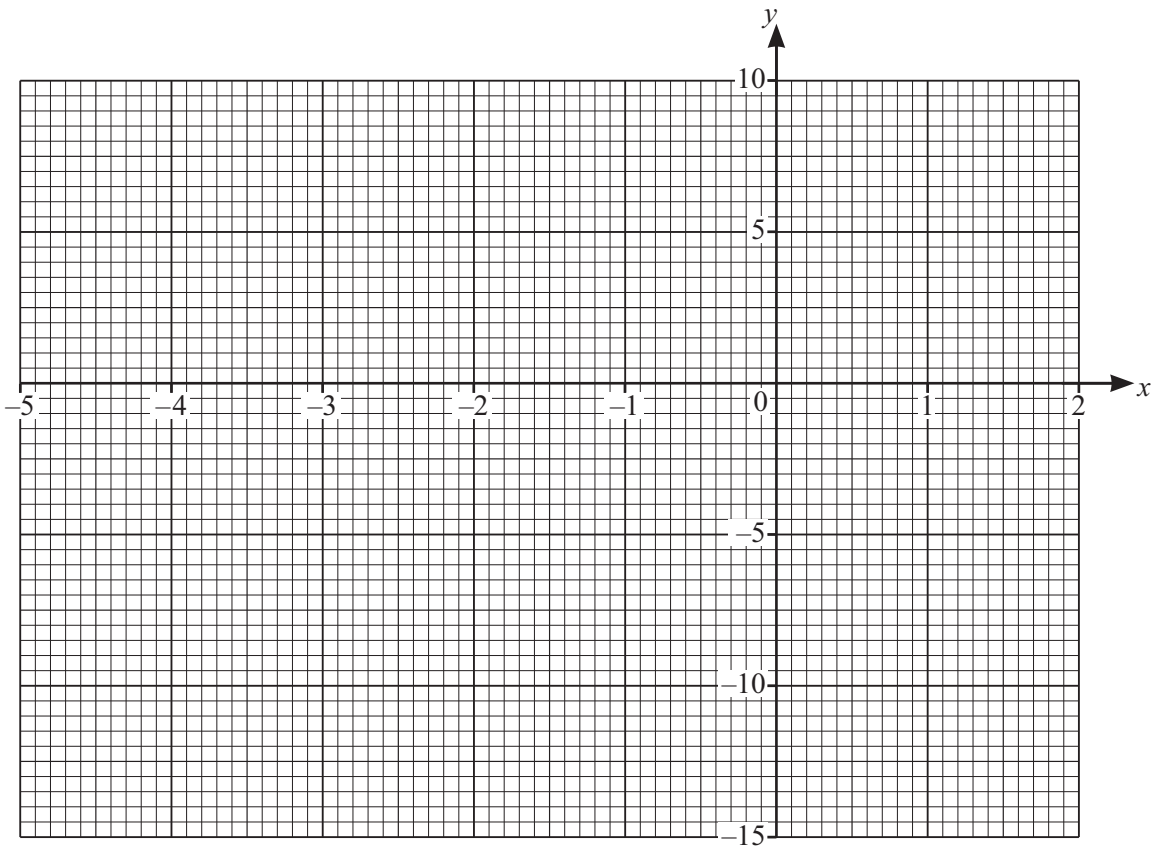
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2 The table shows some values for $y = x^3 + 4x^2 - 4$.

x	-4.5	-4	-3	-2	-1	0	1	1.5
y	-14.1		5	4		-4	1	8.4

(a) Complete the table. [2]

(b) On the grid, draw the graph of $y = x^3 + 4x^2 - 4$ for $-4.5 \leqslant x \leqslant 1.5$.



[4]

(c) **(i)** Draw the tangent to the graph at the point $(1, 1)$. [1]

(ii) Use your tangent to estimate the gradient of the curve at the point $(1, 1)$.

..... [2]

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(d) By drawing a suitable straight line on the grid, solve the equation $x^3 + 4x^2 - x - 6 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

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3 **(a)** Simplify.

(i) $3m - 5n - 4m + 8n$

..... [2]

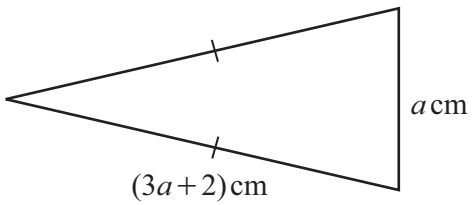
(ii) $(3a^2c^3)^4$

..... [2]

(iii) $\frac{4x}{5} - \frac{3x}{10} + \frac{2x}{15}$

..... [2]

(b) This isosceles triangle has a perimeter of 35.5 cm.



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Find the value of a.

$a =$ ..... [3]

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(c) Using the quadratic formula, solve $5x^2 - 4x - 3 = 0$.
You must show all your working.

$x =$ ..... or $x =$ ..... [3]

(d) Solve these simultaneous equations.

$$y = x^2 - 4x + 5$$
$$y = 2x - 3$$

You must show all your working.

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [5]

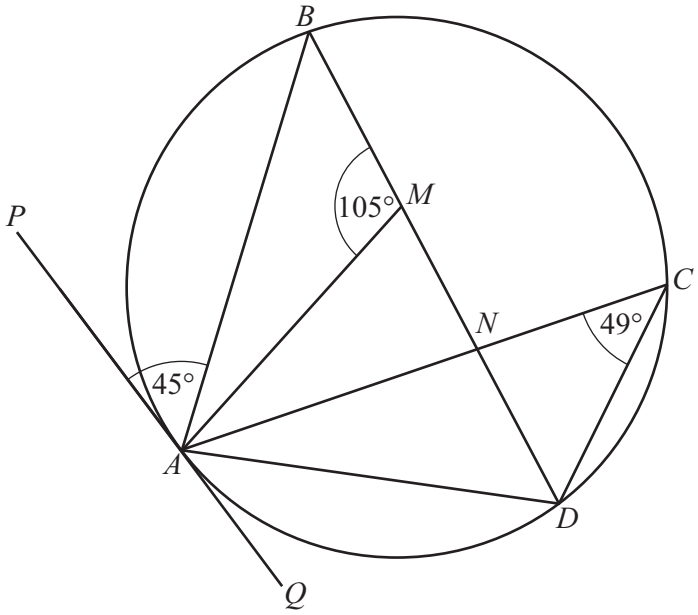
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4 **(a)** The angles of a quadrilateral are $w°$, $x°$, $y°$ and $z°$.
The ratio $w : (x+y+z) = 3 : 5$.

Find the value of w.

$w =$ ..... [2]

(b)



NOT TO SCALE

A, B, C and D are points on a circle.
PQ is the tangent to the circle at A.
$BMND$ is a straight line.
Angle $ACD = 49°$, angle $AMB = 105°$ and angle $PAB = 45°$.

(i) Find angle BAM.

Angle $BAM =$ ..... [2]

(ii) **(a)** Find angle BAD.

Angle $BAD =$ ..... [2]

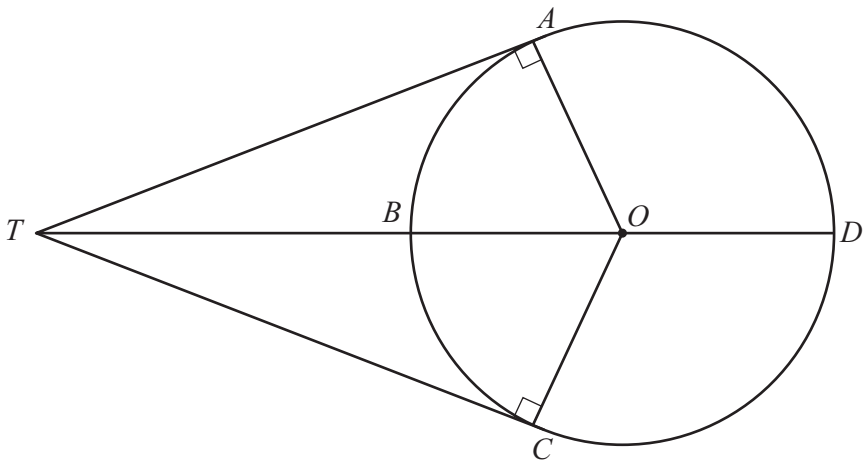
(b) Give a geometrical reason why BD is **not** the diameter of the circle.

.....

..... [1]

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(c)



NOT TO SCALE

A, B, C and D are points on a circle, centre O.
TA and TC are tangents to the circle.
$OA = 6.75$ cm and $OT = 11.5$ cm.

(i) Show that angle $AOC = 108.12°$, correct to 2 decimal places.

[3]

(ii) Calculate the length of the **minor** arc ABC.

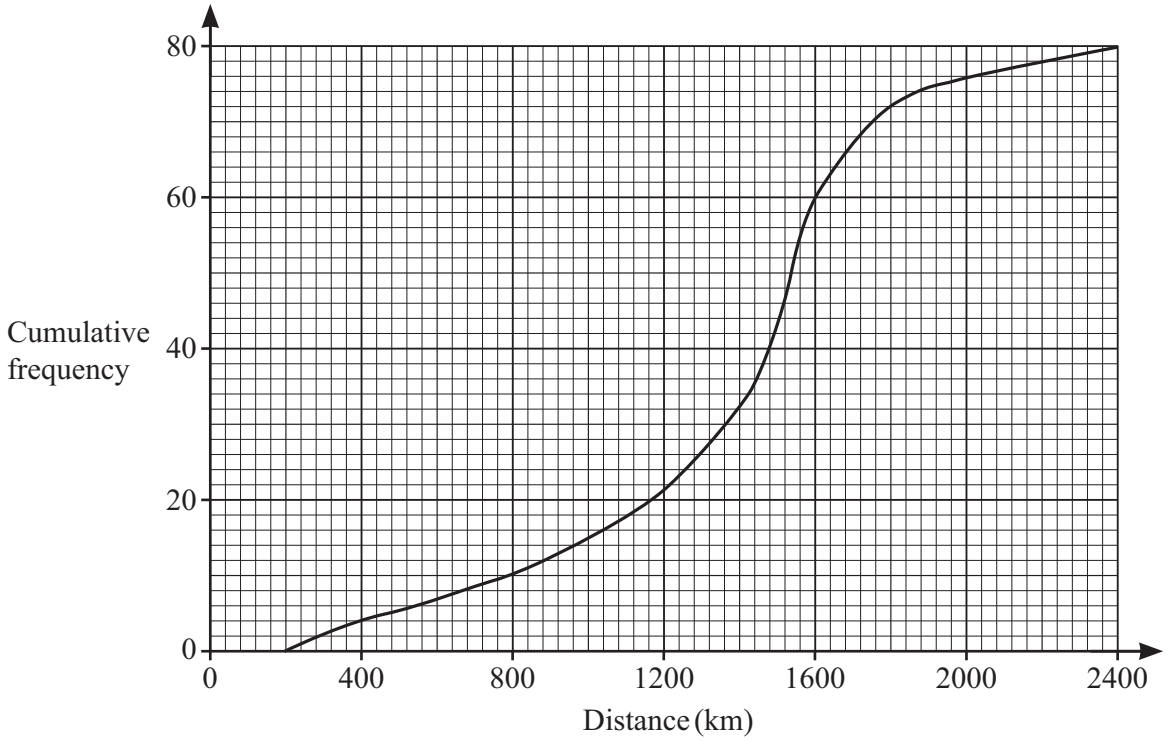
..... cm [2]

(iii) Calculate the area of the **major** sector $OCDA$.

..... cm^2 [3]

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5 **(a)** The cumulative frequency diagram shows information about the distance travelled by each of 80 motorists in a month.



(i) Use the cumulative frequency diagram to find an estimate for

(a) the median

..... km [1]

(b) the interquartile range

..... km [2]

(ii) One of these motorists is picked at random.

Find the probability that this motorist travels more than 1800 km.

..... [2]

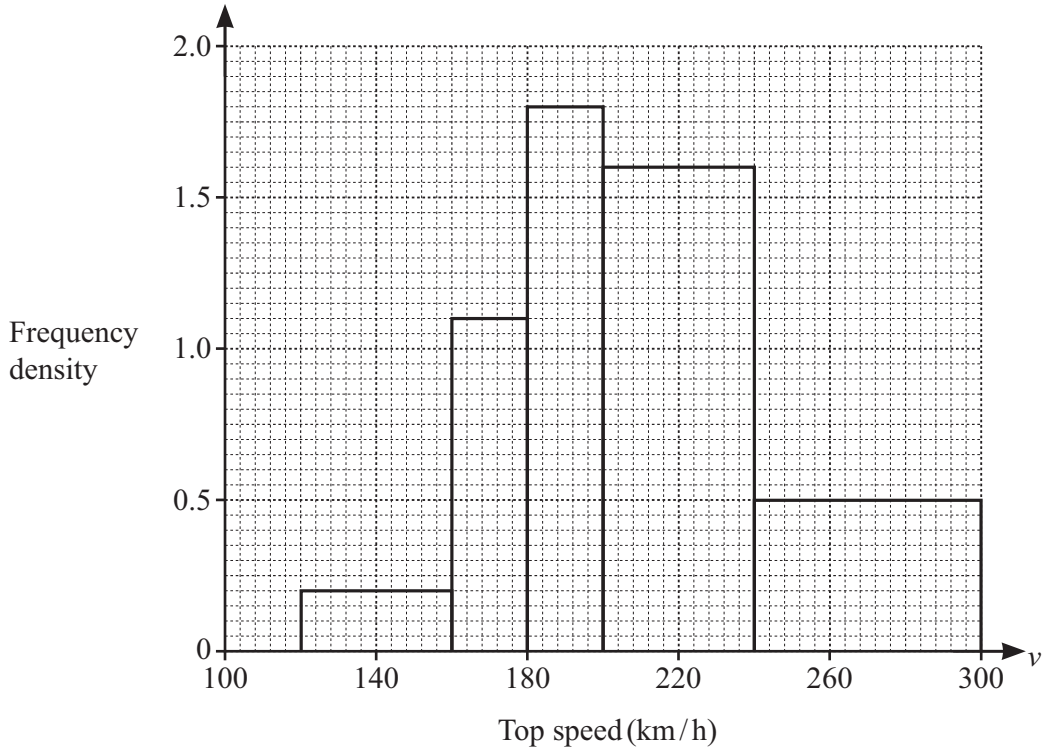
(b) The distance around a racing track is 5.104 km.
The time taken by a car to complete one lap of the track is 1 min 18 s.

Calculate the average speed of the car.
Give your answer in km/h.

..... km/h [3]

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(c) The top speed, v km/h, of each of 160 cars is recorded.
The histogram shows this information.



(i) Show that there are 8 cars with a top speed in the interval $120 < v \leqslant 160$.

[1]

(ii) Calculate an estimate of the mean top speed.
You must show all your working.

..... km/h [6]

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6 **(a)** Work out $2\begin{pmatrix} 3 \\ -5 \end{pmatrix} - \begin{pmatrix} 2 \\ -7 \end{pmatrix}$.

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

(b) $\overrightarrow{MN} = \begin{pmatrix} -6 \\ 4 \end{pmatrix}$.

(i) M is the point $(2, -5)$.

Find the coordinates of N.

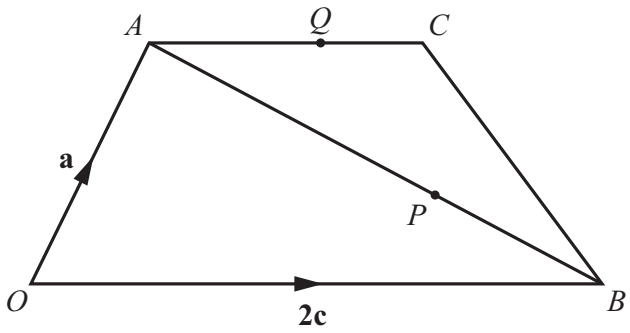
(..... , ...) [1]

(ii) Find $\left|\overrightarrow{MN}\right|$.

..... [2]

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(c)



NOT TO SCALE

$OACB$ is a trapezium with $OB = 2AC$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{2c}$.
$AP : PB = 4 : 1$ and $AQ = \frac{4}{5}AC$.

(i) Write each of the following in terms of **a** and **c**.
Give each answer in its simplest form.

(a) $\overrightarrow{AB}$

..... [1]

(b) $\overrightarrow{CB}$

..... [1]

(c) $\overrightarrow{OP}$

..... [2]

(d) $\overrightarrow{QP}$

..... [2]

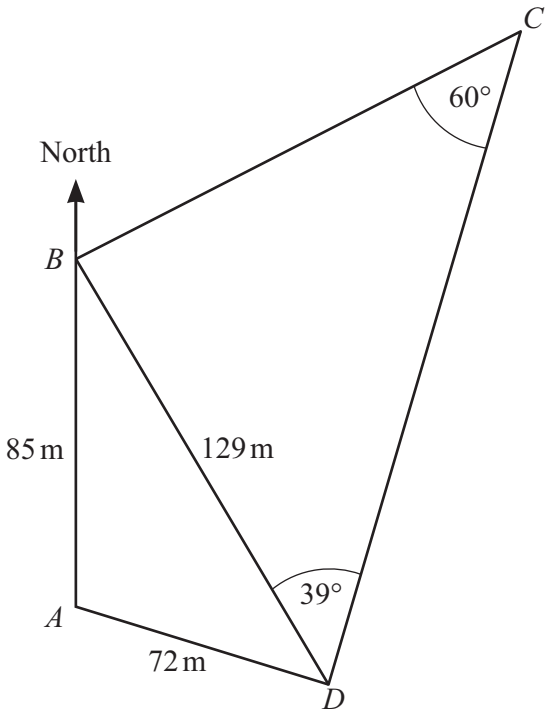
(ii) Use your answers to make **two** statements about the relationship between lines QP and CB.

.....

..... [2]

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7 (a)



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The diagram shows a field, *ABCD* with *B* north of *A*.
BD is a path across the field.
AB = 85 m, *AD* = 72 m, *BD* = 129 m, angle *BDC* = 39° and angle *BCD* = 60°.

(i) Show that angle *CBD* = 81°.

[1]

(ii) Calculate *CD*.

..... m [3]

(iii) Show that angle *ABD* = 31.6°, correct to 1 decimal place.

[4]

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(iv) Find the shortest distance from A to BD.

..... m [3]

(v) Find the bearing of B from C.

..... [2]

(vi) Trees are planted in the field.
The number of trees planted is 1100 per hectare.

Calculate the total number of trees planted in the field.
[1 hectare = 10 000 m^2]

..... [4]

(b) A rectangle has an area of 9400 cm^2, correct to the nearest 100 cm^2.
The length of the rectangle is 80 cm, correct to the nearest 10 cm.

Calculate the upper bound of the width of the rectangle.

..... cm [3]

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8 **(a)** A bag contains 24 coloured beads.
Some are red, some are blue and 10 are yellow.
One bead is picked at random from the bag.

Find the probability that

(i) the bead is yellow

..... [1]

(ii) the bead is not yellow.

..... [1]

(b) Another bag contains 5 green marbles, 6 white marbles and 4 black marbles.
Meera picks 2 marbles at random from the bag, without replacement.

Find the probability that

(i) the first marble is black and the second marble is white

..... [2]

(ii) both marbles have different colours.

..... [4]

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9 $f(x) = 2x - 5$ $g(x) = x^2 - 2x$

(a) Find

(i) $f(7)$

..... [1]

(ii) $gf(7)$

..... [1]

(iii) $f^{-1}(x)$.

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

(b) Find $gf(x) - 3g(x)$.
Give your answer in the form $ax^2 + bx + c$.

..... [4]

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10 A curve has the equation $y = x^3 - 9x^2 - 48x$.

(a) Differentiate $x^3 - 9x^2 - 48x$.

..... [2]

(b) Find the coordinates of the turning points of the graph of $y = x^3 - 9x^2 - 48x$.
You must show all your working.

(..... , ...) and (..... , ...)
[4]

(c) Determine whether each of the turning points is a maximum or a minimum.
Give reasons for your answers.

[3]

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