

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]

- (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]

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

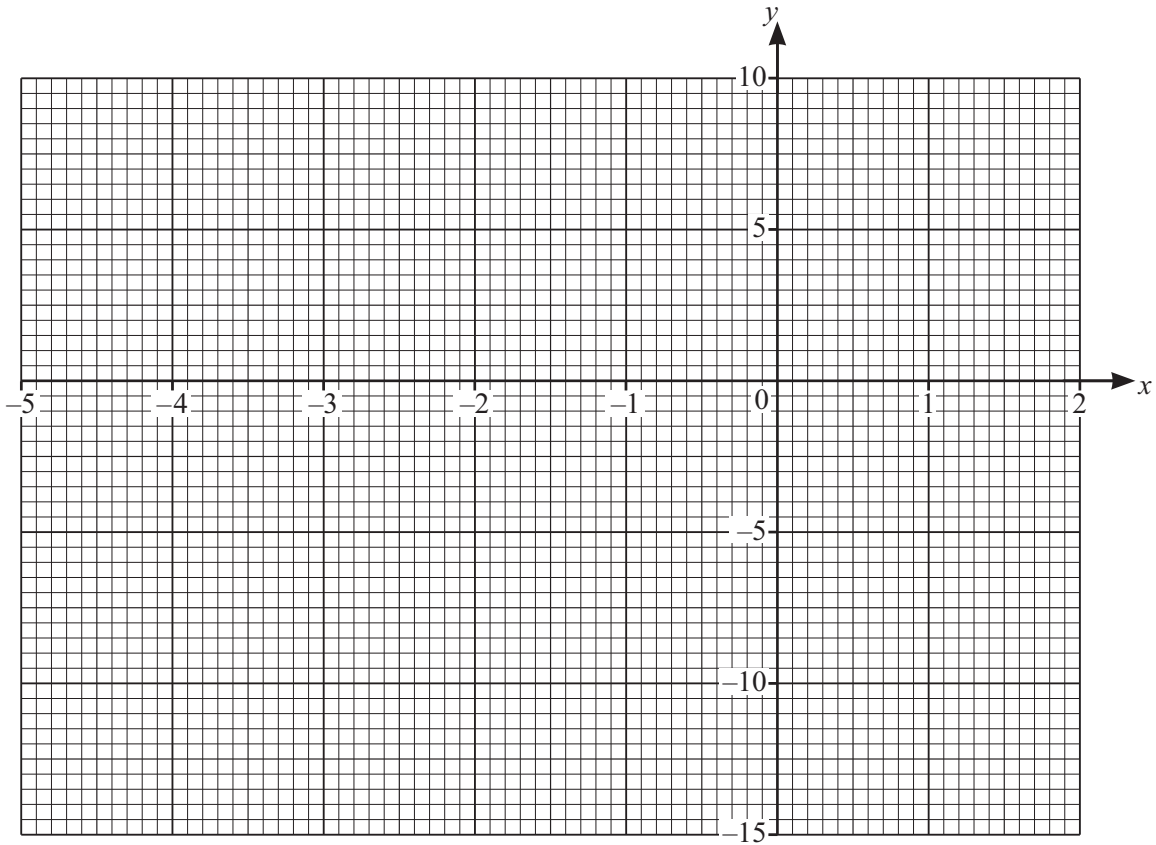


$x$	-4.5	-4	-3	-2	-1	0	1	1.5
$y$	-14.1		5	4		-4	1	8.4

- (a) Complete the table.

[2]

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



[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]

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

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [4]

3 (a) Simplify.



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

..... [2]

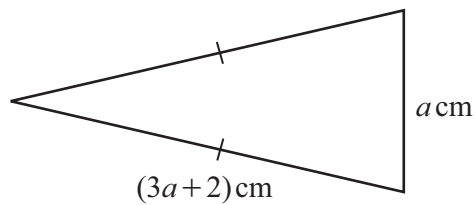
(ii)  $(3a^2c^3)^4$

..... [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]

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

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

- (d) Solve these simultaneous equations.

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

You must show all your working.

$$x = \dots\dots\dots y = \dots\dots\dots$$

$$x = \dots\dots\dots y = \dots\dots\dots [5]$$

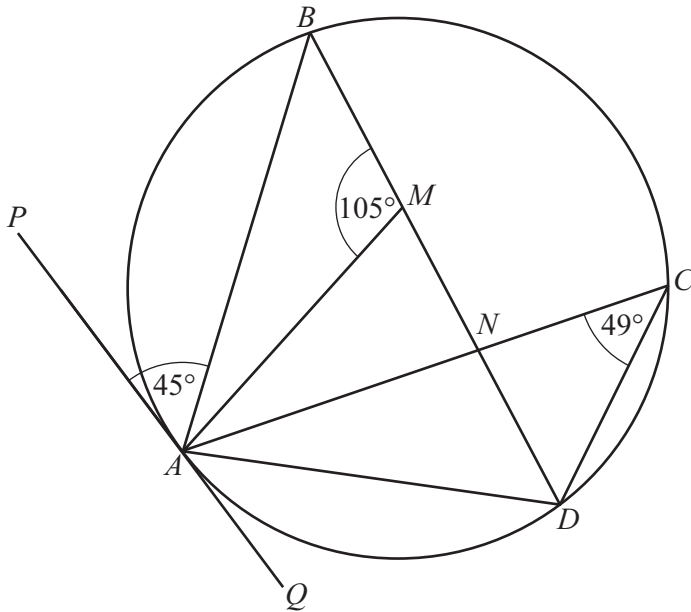
- 4 (a) The angles of a quadrilateral are  $w^\circ$ ,  $x^\circ$ ,  $y^\circ$  and  $z^\circ$ .  
 The ratio  $w : (x + y + z) = 3 : 5$ .



Find the value of  $w$ .

$w = \dots\dots\dots$  [2]

(b)



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

- (i) Find angle  $BAM$ .

Angle  $BAM = \dots\dots\dots$  [2]

- (ii) (a) Find angle  $BAD$ .

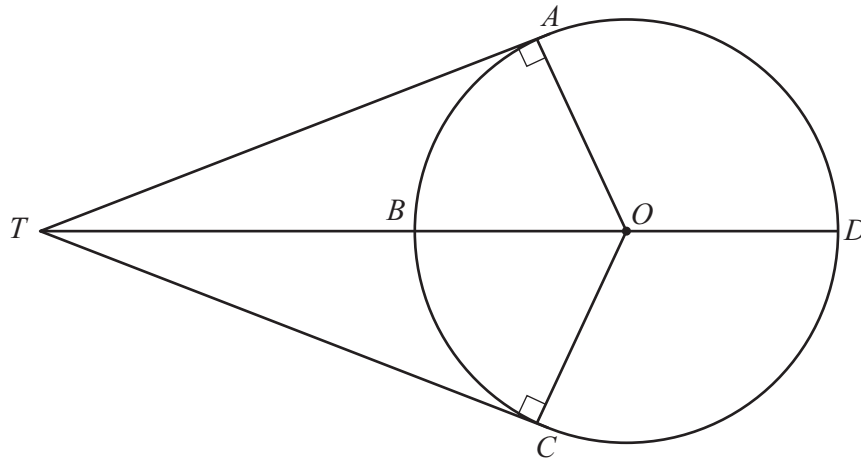
Angle  $BAD = \dots\dots\dots$  [2]

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

.....

..... [1]

(c)



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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  $AOC = 108.12^\circ$ , correct to 2 decimal places.

[3]

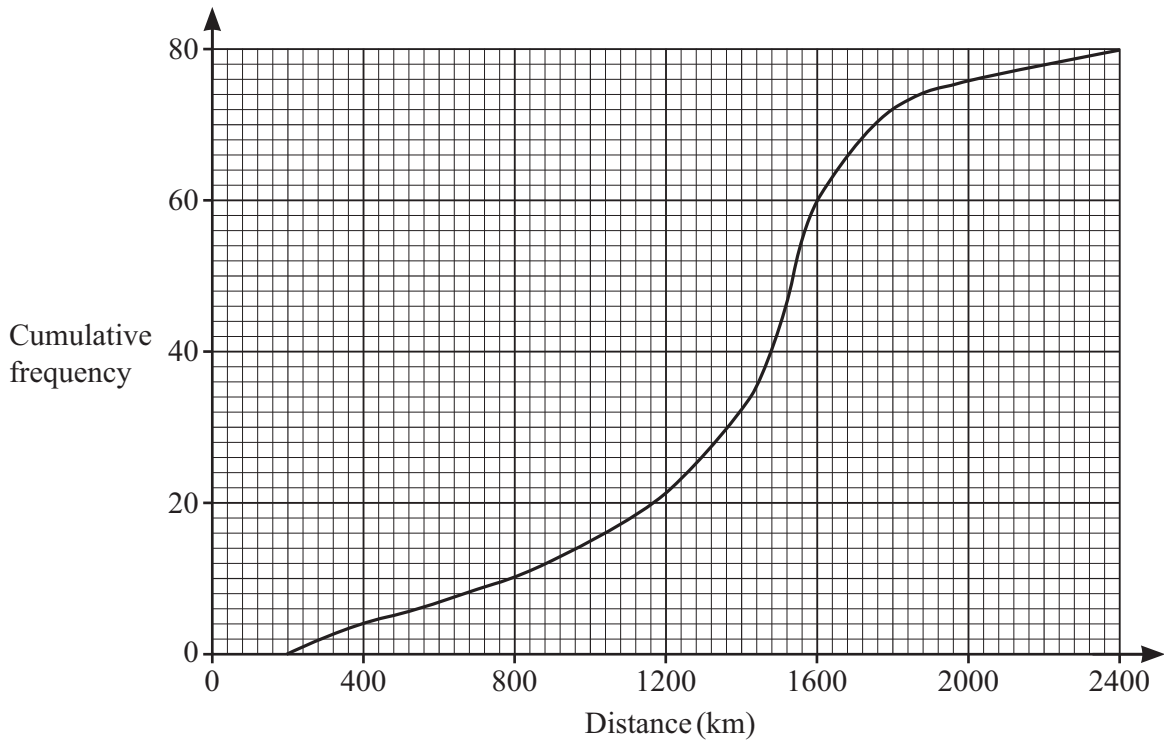
(ii) Calculate the length of the **minor** arc  $ABC$ .

..... cm [2]

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

.....  $\text{cm}^2$  [3]

- 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.

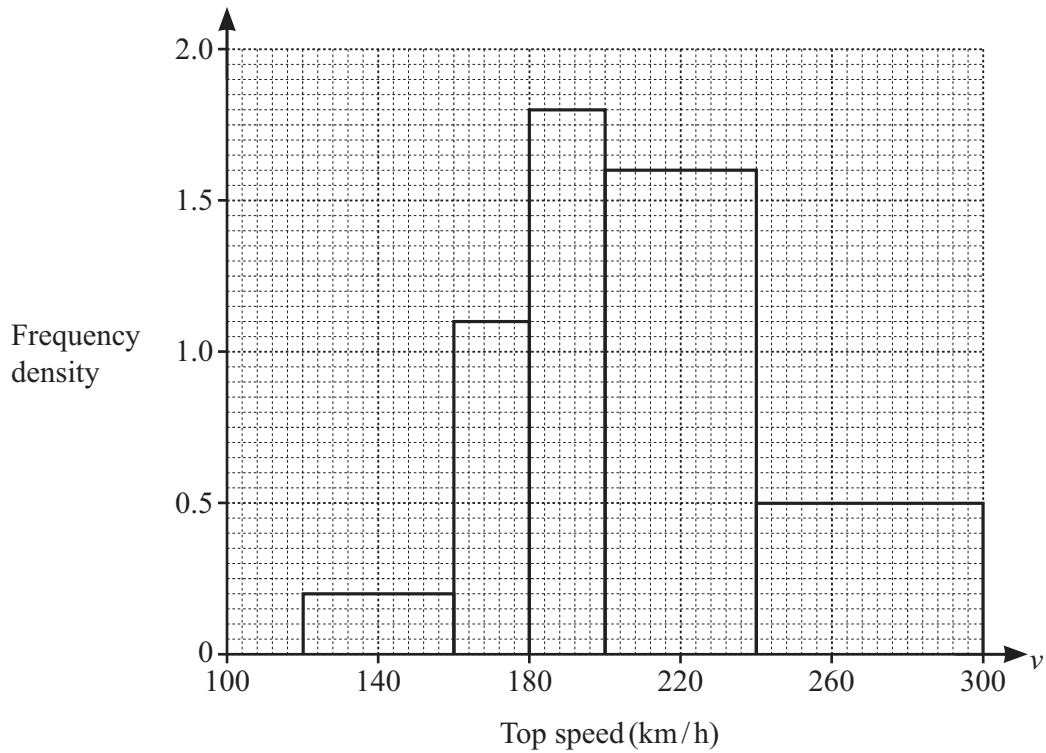
..... [2]

(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]

- (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  $120 < v \leq 160$ .

[1]

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

..... km/h [6]

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



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

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

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

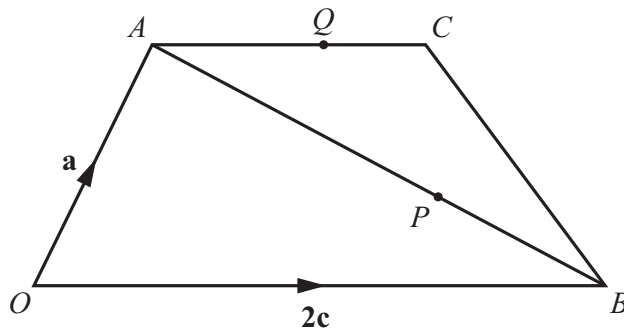
Find the coordinates of  $N$ .

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

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

..... [2]

(c)



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$OACB$  is a trapezium with  $OB = 2AC$ .

$\overrightarrow{OA} = \mathbf{a}$  and  $\overrightarrow{OB} = 2\mathbf{c}$ .

$AP : PB = 4 : 1$  and  $AQ = \frac{4}{5}AC$ .

(i) Write each of the following in terms of  $\mathbf{a}$  and  $\mathbf{c}$ .  
Give each answer in its simplest form.

(a)  $\overrightarrow{AB}$

..... [1]

(b)  $\overrightarrow{CB}$

..... [1]

(c)  $\overrightarrow{OP}$

..... [2]

(d)  $\overrightarrow{QP}$

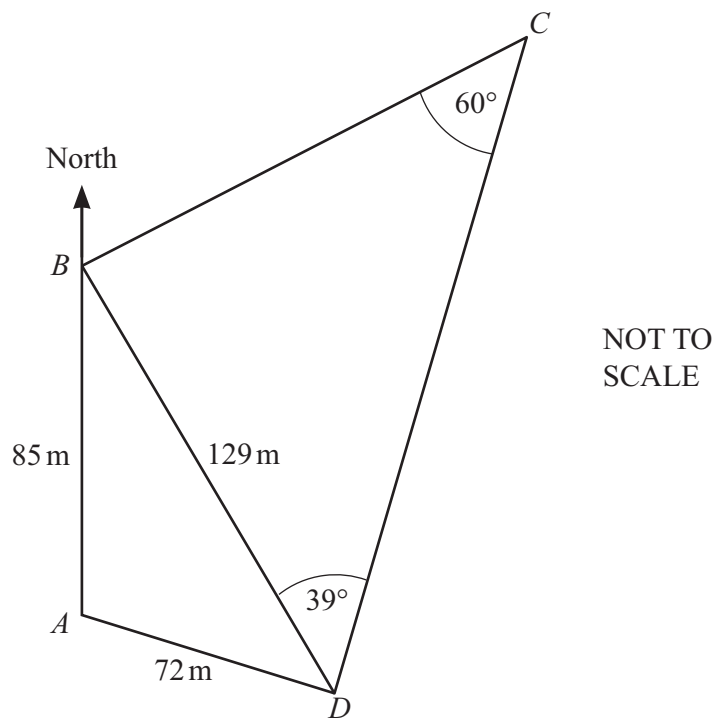
..... [2]

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

.....

..... [2]

7 (a)



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  $BDC = 39^\circ$  and angle  $BCD = 60^\circ$ .

(i) Show that angle  $CBD = 81^\circ$ .

[1]

(ii) Calculate  $CD$ .

..... m [3]

(iii) Show that angle  $ABD = 31.6^\circ$ , correct to 1 decimal place.

[4]

(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<sup>2</sup>]

..... [4]

- (b) A rectangle has an area of 9400 cm<sup>2</sup>, correct to the nearest 100 cm<sup>2</sup>.  
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]

- 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]

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]

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]