

1 A football club sells tickets at different prices dependent on age group.

(a) (i) At one game, the club sold tickets in the ratio

$$\text{under 18} : \text{18 to 60} : \text{over 60} = 2 : 7 : 3.$$

There were 6100 tickets sold for people aged under 18.

Calculate the **total** number of tickets sold for the game.

..... [3]

(ii) Calculate the percentage of tickets sold for people aged under 18.

.....% [1]

(b) The table shows the football ticket prices for the different age groups.

Age	Price
Under 18	\$15
18 to 60	\$35
Over 60	\$18

At a **different** game there were 42 600 tickets sold.

- 14% were sold to people aged under 18
- $\frac{2}{3}$ of the tickets were sold to people aged 18 to 60
- The remainder were sold to people aged over 60

Calculate the total amount the football club receives from ticket sales for this game.

\$ [5]

- (c) In a sale, the football club shop reduced the price of the football shirts to \$23.80 .
An error was made when working out this sale price.
The price was reduced by 30% instead of 20%.

Calculate the correct sale price for the football shirt.

\$..... [5]

- 2 (a) Solve the inequality.

$$5x - 3 > 9$$

..... [2]

- (b) Factorise completely.

(i) $xy - 18 + 3y - 6x$

..... [2]

(ii) $8x^2 - 72y^2$

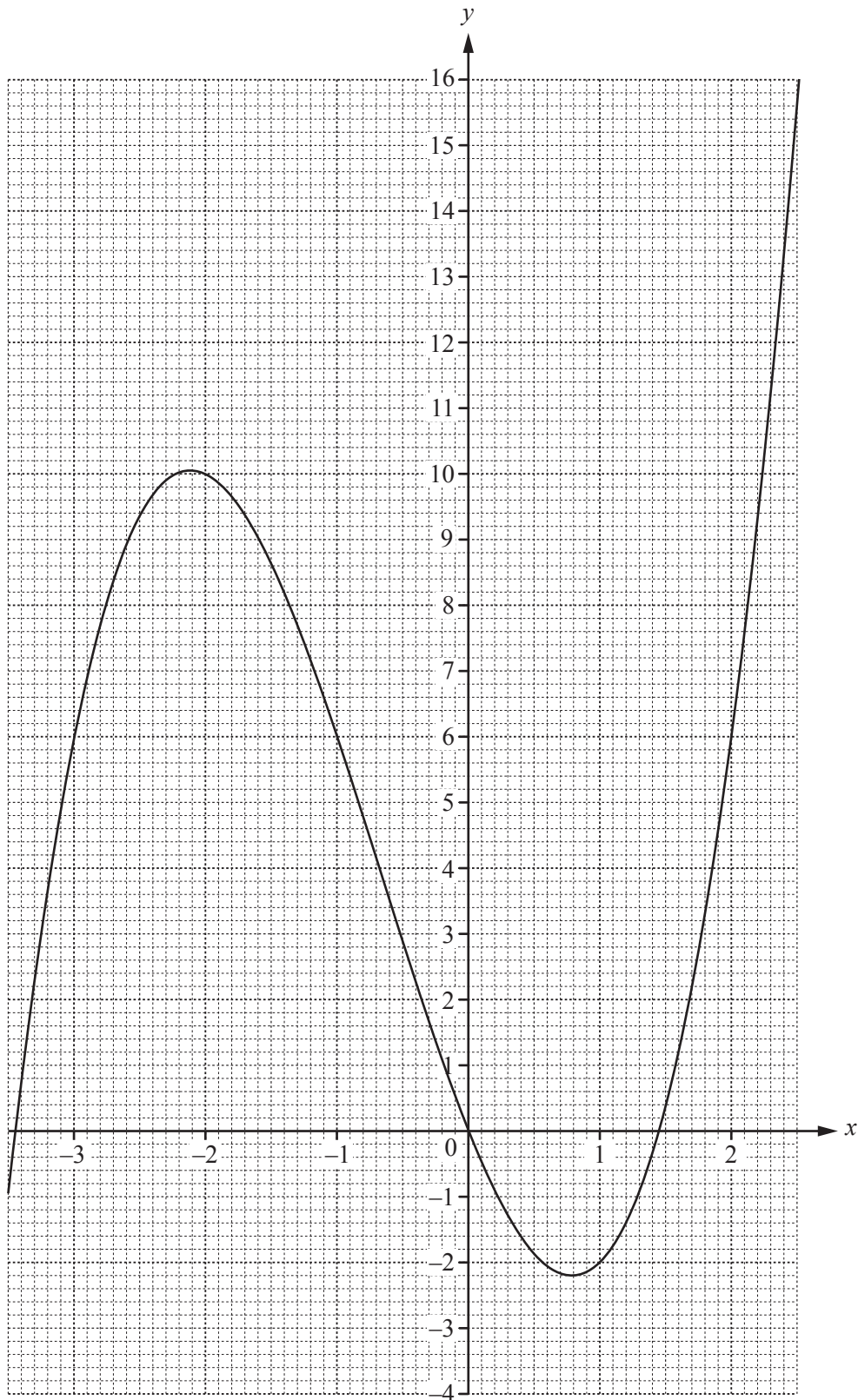
..... [3]

- (c) Make r the subject of the formula.

$$p + 5 = \frac{1 - 2r}{r}$$

$r =$ [4]

3 The diagram shows the graph of $y = f(x)$ for $-3.5 \leq x \leq 2.5$.



(a) (i) Find $f(-2)$.

..... [1]

(ii) Solve the equation $f(x) = 2$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

(iii) Two tangents, each with gradient 0, can be drawn to the graph of $y = f(x)$.

Write down the equation of each tangent.

.....
 [2]

(b) (i) Complete the table for $g(x) = \frac{2}{x} + 3$ for $-3.5 \leq x \leq -0.5$ and $0.5 \leq x \leq 2.5$.

x	-3.5	-3	-2	-1	-0.5		0.5	1	2	2.5
$g(x)$	2.4	2.3		1			7	5		3.8

[3]

(ii) On the grid opposite, draw the graph of $y = g(x)$.

[4]

(iii) Use your graph to solve the equation $f(x) = g(x)$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

(c) Find $gf(-2)$.

..... [2]

(d) Find $g^{-1}(5)$.

..... [1]

- 4 Coins are put into a machine to pay for parking cars.
The probability that the machine rejects a coin is 0.05 .

(a) Adhira puts 2 coins into the machine.

(i) Calculate the probability that the machine rejects **both** coins.

..... [2]

(ii) Calculate the probability that the machine accepts at **least one** coin.

..... [1]

(b) Raj puts 4 coins into the machine.

Calculate the probability that the machine rejects **exactly one** coin.

..... [3]

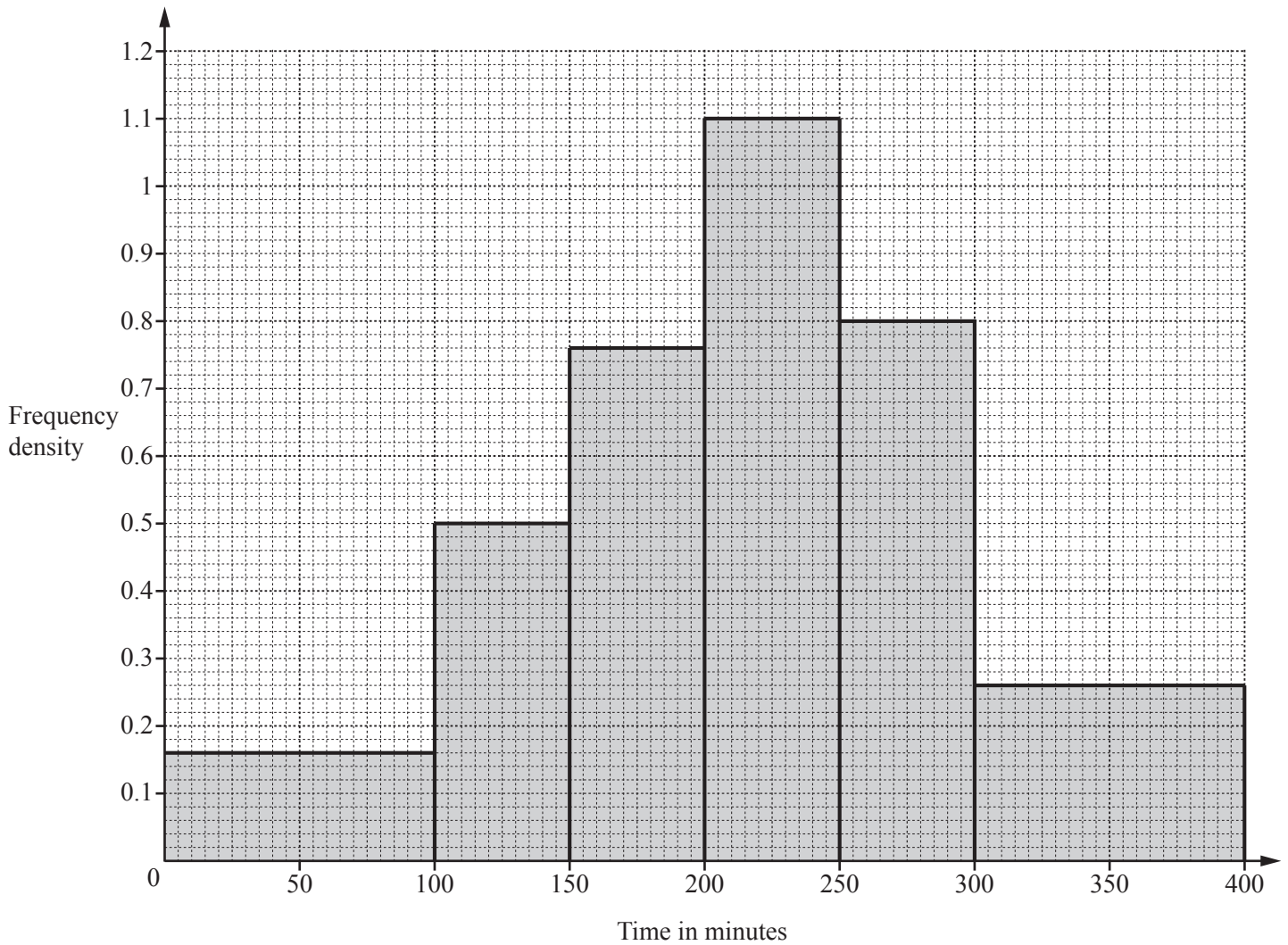
(c) The table shows the amount of money, \$ a , received for parking each day for 200 days.

Amount (\$ a)	$200 < a \leq 250$	$250 < a \leq 300$	$300 < a \leq 350$	$350 < a \leq 400$	$400 < a \leq 450$	$450 < a \leq 500$
Frequency	13	19	27	56	62	23

Calculate an estimate of the mean amount of money received each day.

\$..... [4]

(d) The histogram shows the length of time that 200 cars were parked.



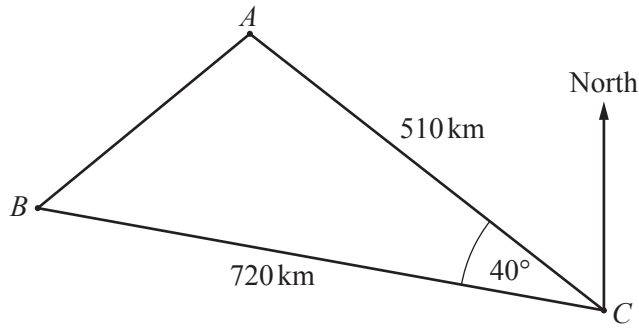
(i) Calculate the number of cars that were parked for 100 minutes or less.

..... [1]

(ii) Calculate the percentage of cars that were parked for more than 250 minutes.

.....% [2]

NOT TO SCALE



A plane flies from A to C and then from C to B .
 $AC = 510$ km and $CB = 720$ km.
 The bearing of C from A is 135° and angle $ACB = 40^\circ$.

(a) Find the bearing of

(i) B from C ,

..... [2]

(ii) C from B .

..... [2]

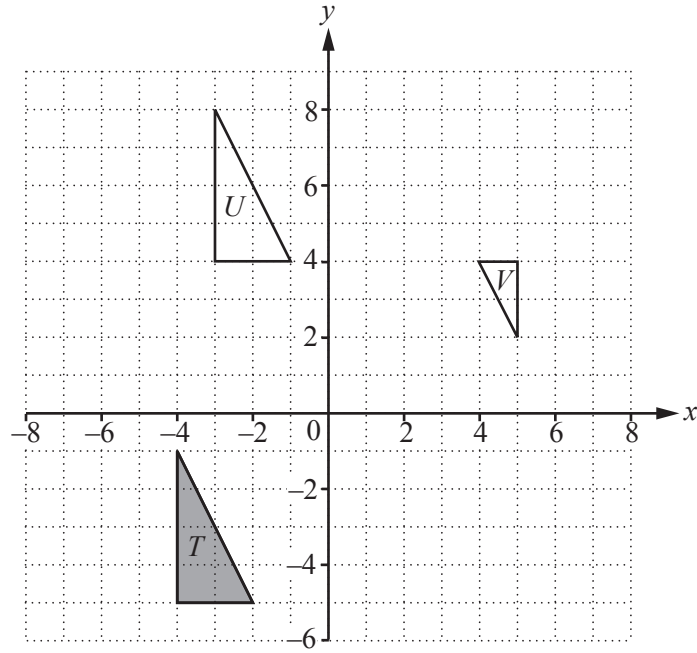
(b) Calculate AB and show that it rounds to 464.7 km, correct to 1 decimal place.

[4]

(c) Calculate angle ABC .

Angle $ABC =$ [3]

6



(a) (i) Draw the image of triangle *T* after a reflection in the line $x = 0$. [2]

(ii) Draw the image of triangle *T* after a rotation through 90° clockwise about $(-2, -1)$. [2]

(iii) Describe fully the **single** transformation that maps triangle *T* onto triangle *U*.
 [2]

(iv) Describe fully the **single** transformation that maps triangle *T* onto triangle *V*.
 [3]

(b) (i) Find the matrix that represents the transformation in **part (a)(i)**.

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

(ii) Describe fully the **single** transformation represented by the inverse of the matrix in **part (b)(i)**.
 [2]

- 7 Alfonso runs 10 km at an average speed of x km/h.
The next day he runs 12 km at an average speed of $(x - 1)$ km/h.

The time taken for the 10 km run is 30 minutes less than the time taken for the 12 km run.

- (a) (i) Write down an equation in x and show that it simplifies to $x^2 - 5x - 20 = 0$.

[4]

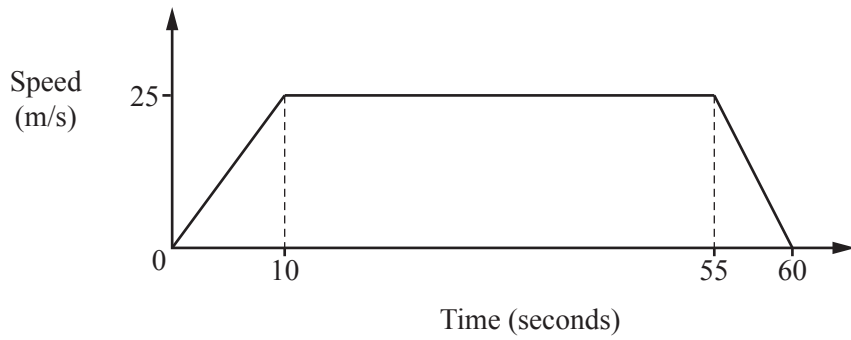
- (ii) Use the quadratic formula to solve the equation $x^2 - 5x - 20 = 0$.
Show your working and give your answers correct to 2 decimal places.

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

- (iii) Find the time that Alfonso takes to complete the 12 km run.
Give your answer in hours and minutes correct to the nearest minute.

$\dots\dots\dots$ hours $\dots\dots\dots$ minutes [2]

- (b) A cheetah runs for 60 seconds.
The diagram shows the speed-time graph.



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- (i) Work out the acceleration of the cheetah during the first 10 seconds.

..... m/s² [1]

- (ii) Calculate the distance travelled by the cheetah.

..... m [3]

$$8 \quad \mathbf{A} = \begin{pmatrix} 2 & 0 \\ -1 & 5 \\ 3 & -4 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 1 & 3 \\ -1 & 5 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} 7 \\ -4 \end{pmatrix} \quad \mathbf{D} = (2 \ 5)$$

- (a) Work out each of the following if the answer is possible.
If a calculation is not possible, write “not possible” in the answer space.

(i) \mathbf{BA}

[1]

(ii) $2\mathbf{A}$

[1]

(iii) \mathbf{CD}

[2]

(iv) \mathbf{DC}

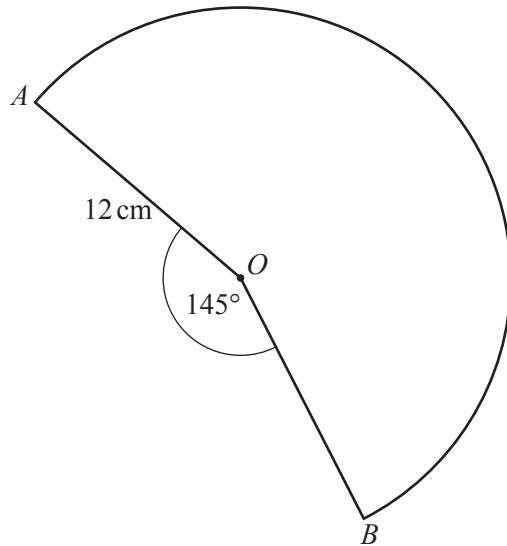
[2]

(v) \mathbf{B}^2

[2]

- (b) Find \mathbf{B}^{-1} , the inverse of \mathbf{B} .

$$\left(\begin{array}{cc} & \\ & \end{array} \right) [2]$$



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The diagram shows a sector, centre O , and radius 12 cm.

(a) Calculate the area of the sector.

..... cm² [3]

(b) The sector is made into a cone by joining OA to OB .

Calculate the volume of the cone.

[The volume, V , of a cone with base radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm³ [6]

10

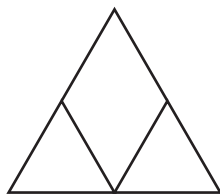


Diagram 1

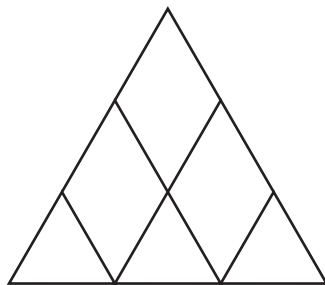


Diagram 2

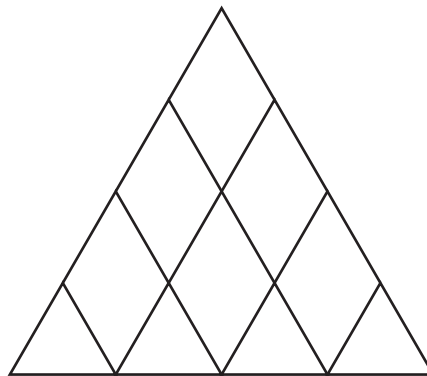


Diagram 3

Each diagram is made from tiles in the shape of equilateral triangles and rhombuses. The length of a side of each tile is 1 unit.

(a) Complete the table below for this sequence of diagrams.

Diagram	1	2	3	4	5
Number of equilateral triangle shaped tiles	2	3	4	5	6
Number of rhombus shaped tiles	1	3	6		
Total number of tiles	3	6	10		
Number of 1 unit lengths	8	15	24		

[6]

(b) (i) The number of 1 unit lengths in Diagram n is $n^2 + 4n + p$.

Find the value of p .

$p = \dots\dots\dots$ [2]

(ii) Calculate the number of 1 unit lengths in Diagram 10.

$\dots\dots\dots$ [1]

- (c) The total number of tiles in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots [5]$$

- (d) Part of the Louvre museum in Paris is in the shape of a square-based pyramid made from glass tiles. Each of the triangular faces of the pyramid is represented by Diagram 17 in the sequence.

- (i) Calculate the total number of glass tiles on one triangular face of this pyramid.

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

- (ii) 11 tiles are removed from one of the triangular faces to create an entrance into the pyramid.

Calculate the total number of glass tiles used to construct this pyramid.

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

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