

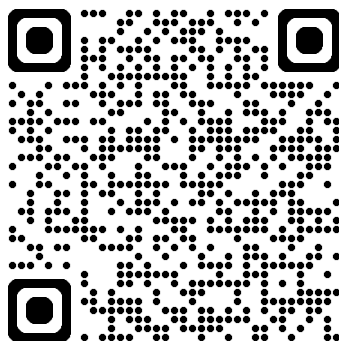


MR TOMPKINS EDTECH

Maths and Edtech videos for students and teachers...

GCSE Exam Questions Compilation Top 10 Topics for Paper 2

Complete the questions first, and then use the video to mark/uplevel your work in red pen. Video link: <https://youtu.be/32yzNNscxNw>



Suitable for Higher Tier Students

- Repeated Percentage Change
 - Construction and Loci
 - Angles
 - Pythagoras and Trigonometry
 - Averages from a Frequency Table
- Complete the Square and Turning Points
 - Cumulative Frequency
 - Histogram
 - Advanced Trigonometry
 - Functions
 - Straight Line Graphs

Repeated Percentage Change

Q1. Daniel invests £2500 for 3 years.

The compound interest rate is 2.9% per year.

(a) Which calculation works out the total value after 3 years? Circle your answer.

$$£2500 \times 1.029 \times 3$$

$$£2500 \times 2.9 \times 3$$

$$£2500 \times 2.9^3$$

$$£2500 \times 1.029^3$$

(1)

(b) Anna invests £2500 for 3 years.

The interest rate is

3.5% for the first year

2.3% for the second year onwards.

Whose investment is worth more after 3 years?

You **must** show your working.

Answer _____ (4)

(Total 5 marks)

Q2. A marathon takes place each year. In 2020 there were 6500 runners.

Prediction

For each of the next 3 years the number of runners will increase by 5%
--

Does this predict that in 2023 there will be more than 7500 runners?

You **must** show your working.

(Total 3 marks)

Q3. The population of butterflies in a park is 4200

- (a) Assume that the population increases by 12% each day.

Show that after 20 days the population would be greater than 40 000

(2)

- (b) In fact, the population
increases by 13% each day for 19 days
then
decreases by 8% for 1 day.

After the 20 days, is the actual population greater than 40 000 ? Tick a box.

Yes

No

Show working to support your answer.

(2)

(Total 4 marks)

Q4. The value of a second-hand car is £9000

Each year it loses 20% of its value at the start of that year.

Work out its value in four years time.

Answer £ _____

(Total 3 marks)

Q5. The number of hedgehogs in England is expected to **reduce** by 4% each year.
Assume there are now 1 000 000 hedgehogs in England.

Work out the expected number of hedgehogs in England after **five** years.
You **must** show your working.

Answer _____

(Total 3 marks)

Q6. £2448 is invested in an account at a rate of compound interest.
One year after the investment there is £2496.96 in the account.

How much is in the account four years after the investment?

Answer £ _____

(Total 3 marks)

Construction and Loci

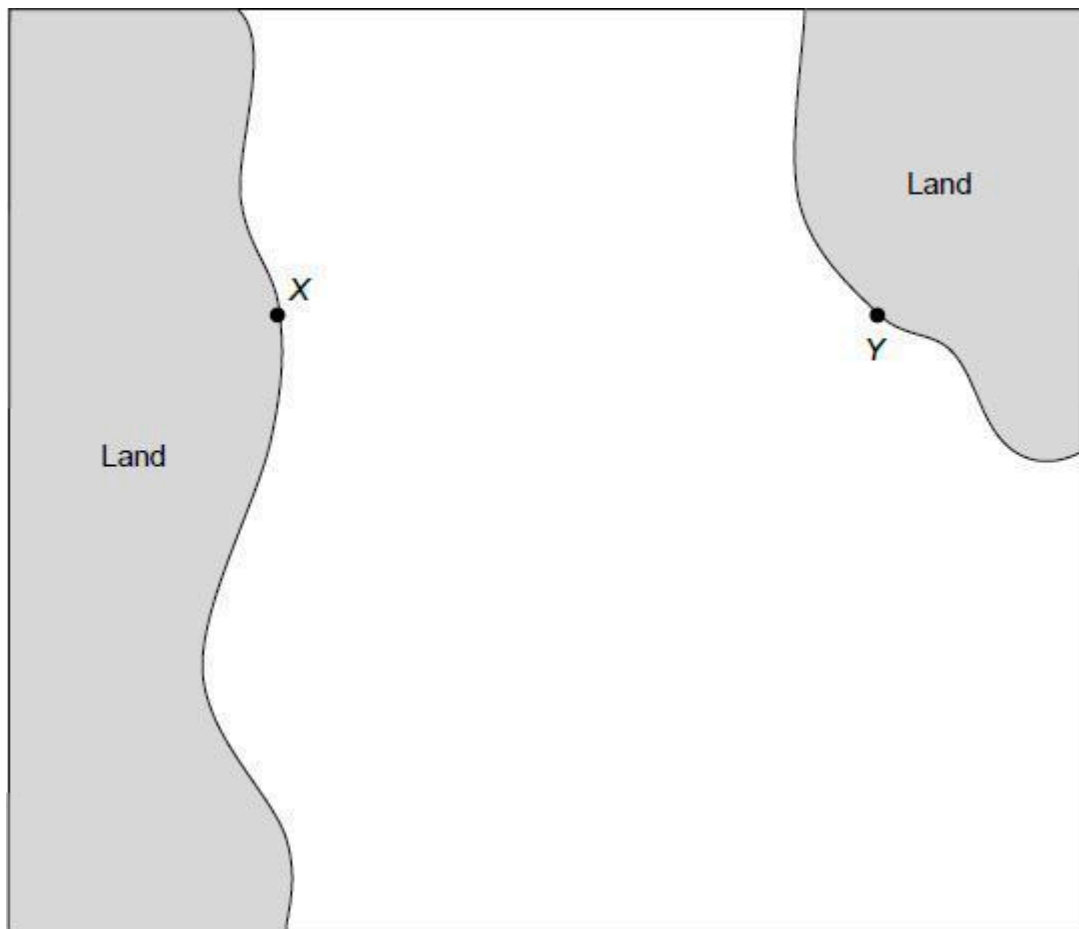
Q7. Use ruler and compasses for this question.

A wind turbine needs to be positioned
closer to port *X* than port *Y*
less than 11 km from *Y*.

The map below shows the positions of *X* and *Y*.

On the map, show the region where the wind turbine could be positioned.
Label it *R*.

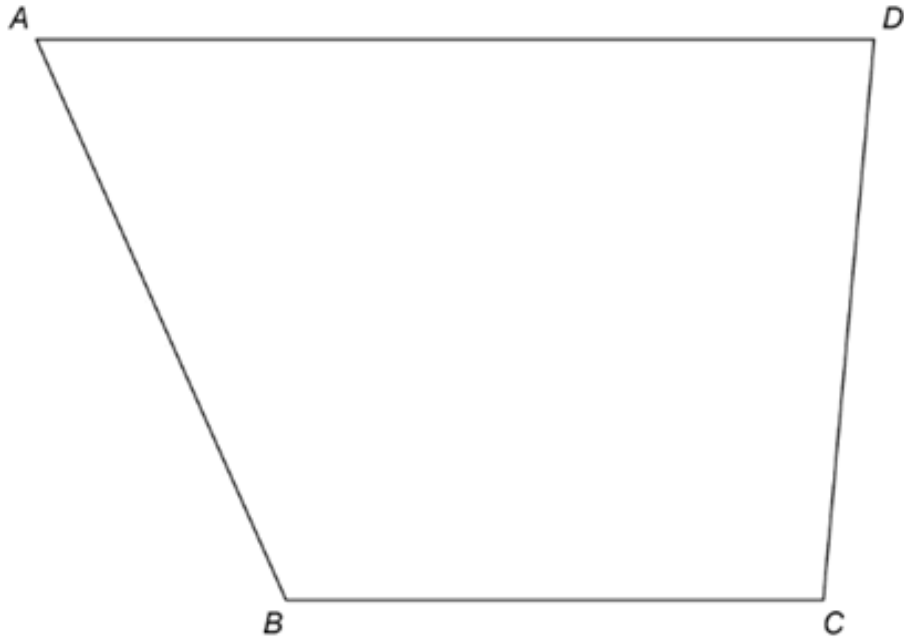
Scale 1 cm represents 2 km



(Total 4 marks)

Q8. Use ruler and compasses to answer this question.

$ABCD$ represents a garden.



A tree is to be planted in the garden.

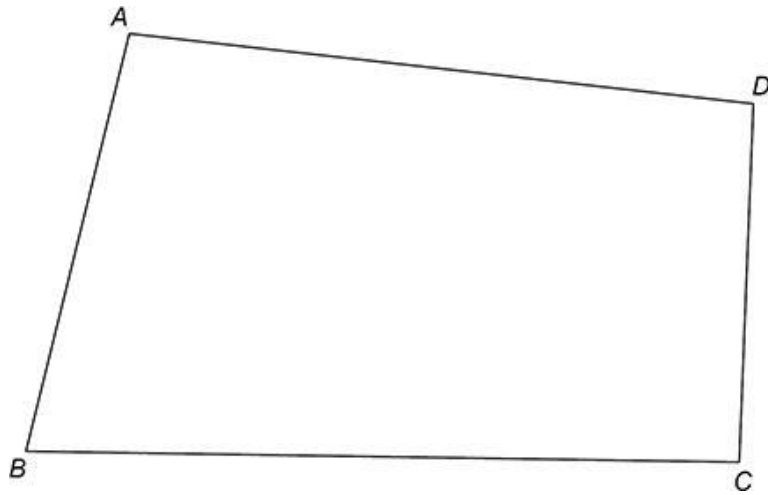
The tree will be in the region that is closer to AB than to BC .

Label the region, R , where the tree could be planted.

Show all your construction lines.

[3 marks]

Q9. $ABCD$ represents the plan of a field.



There is a path across the field that
starts at B
is the same distance from BA and BC .

Using ruler and compasses, show the position of the path. **(Total 2 marks)**

Angles

Q10. Part of a regular polygon with 15 sides is shown.

Not drawn accurately

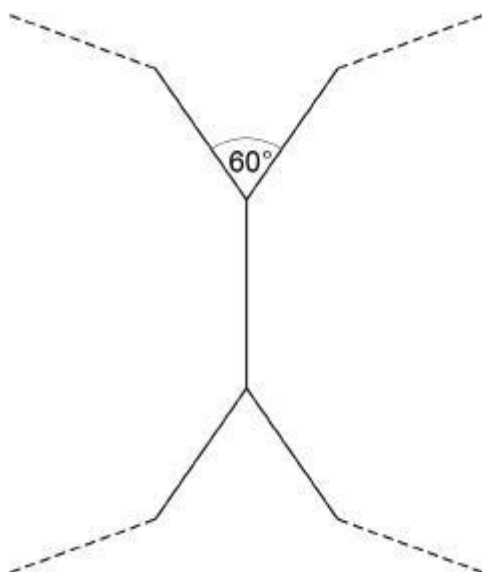


Work out the size of an **interior** angle.

Answer _____ degrees
(Total 2 marks)

Q11. Two congruent regular polygons are joined together.

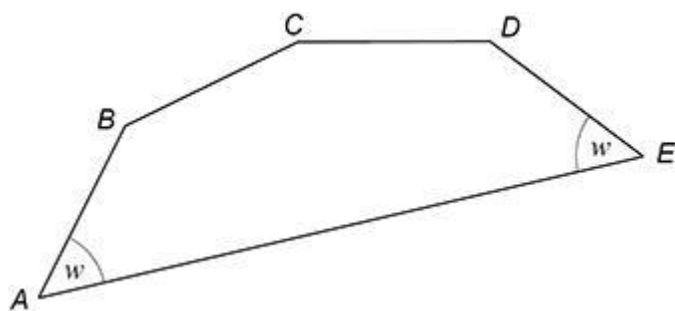
Not drawn accurately



Work out the number of sides on each polygon.

Answer _____
(Total 3 marks)

Q12. AB , BC , CD and DE are four of the sides of a regular decagon.

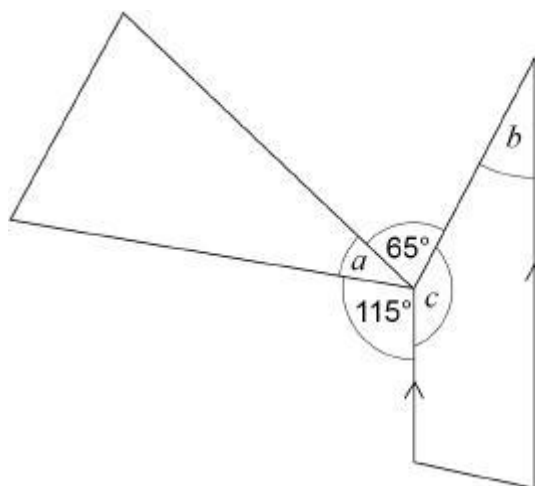


Not drawn accurately

Work out the size of angle w .

Answer _____ degrees
(Total 3 marks)

Q13. The diagram shows a triangle and a trapezium.



Not drawn accurately

Prove that $a = b$

(Total 3 marks)

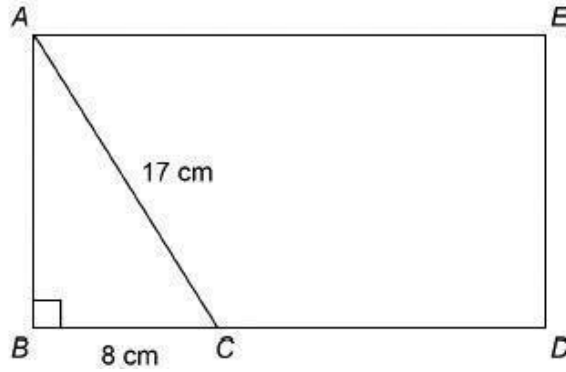
Pythagoras and Trigonometry

Q15. The diagram shows rectangle $ABDE$ and right-angled triangle ABC .

$AC = 17 \text{ cm}$

$BC = 8 \text{ cm}$

Not drawn accurately



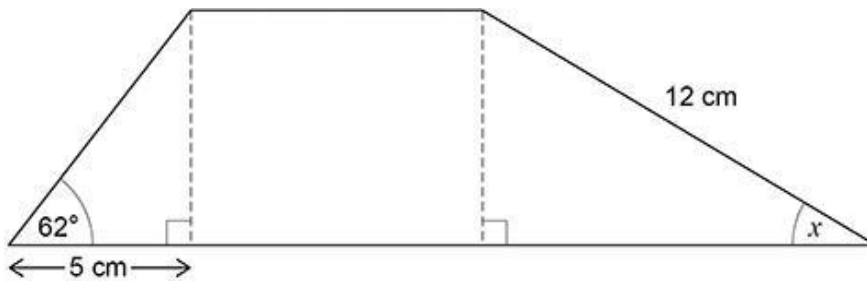
$BC : CD = 1 : 2$

Work out the area of rectangle $ABDE$.

Answer _____ cm^2
(Total 4 marks)

Q16. This shape is made from two right-angled triangles and a rectangle.

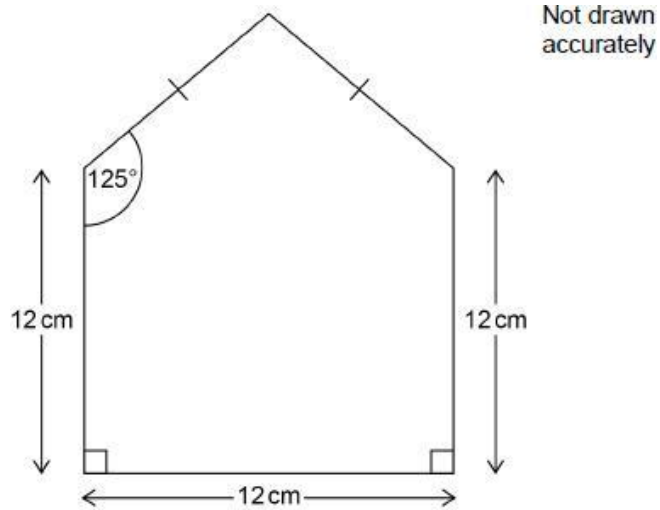
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Work out the size of angle x .

Answer _____ degrees
(Total 4 marks)

Q17. A pentagon is made from a square and an isosceles triangle.

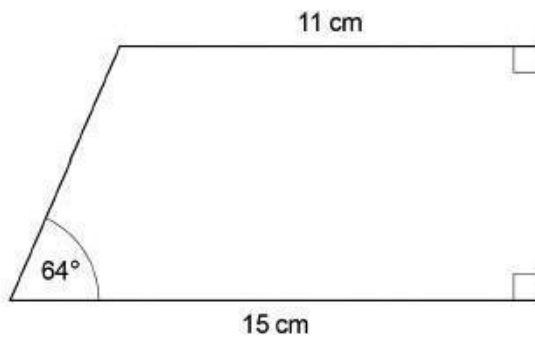


Work out the perimeter of the pentagon.

Answer _____ cm
(Total 4 marks)

Q18. Work out the area of the trapezium.

Not drawn accurately

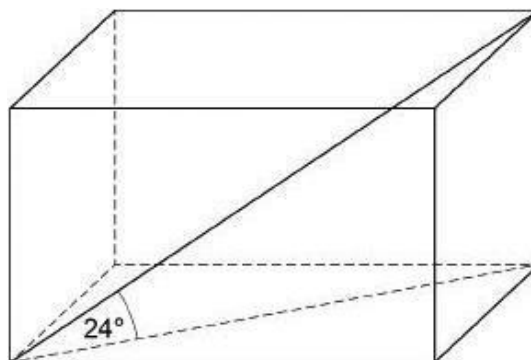


Answer _____ cm²
(Total 4 marks)

Q19. The length of a diagonal of a cuboid is 20 cm

The diagonal makes an angle of 24° with the base.

The area of the base is 150 cm^2



Work out the volume of the cuboid.

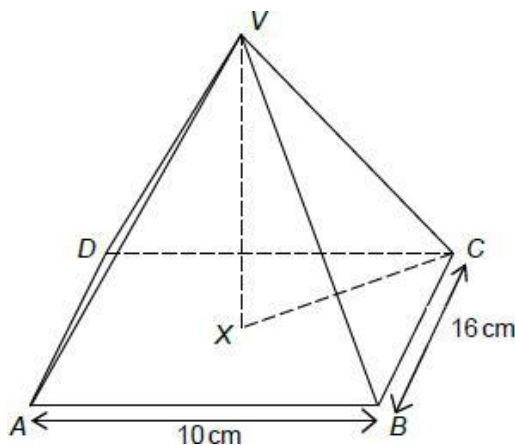
Answer _____ cm^3

(Total 3 marks)

Q20. Volume of a pyramid = $\frac{1}{3} \times$ area of base \times perpendicular height

$VABCD$ is a rectangular-based pyramid with volume 640 cm^3

X is the centre of the horizontal base, directly below V .



Work out the angle between VC and the base.

Answer _____ degrees

(Total 6 marks)

Averages from a Frequency Table

Q21. Here is some information about the times taken by 40 people to fill in a form.

Time, t minutes	Number of people
$0 < t \leq 5$	3
$5 < t \leq 10$	9
$10 < t \leq 15$	11
$15 < t \leq 20$	17

In which class interval is the median?

Circle your answer.

$0 < t \leq 5$

$5 < t \leq 10$

$10 < t \leq 15$

$15 < t \leq 20$

(Total 1 mark)

Q22. Here is a frequency table for the times taken to solve a puzzle.

Times, t (min)	Frequency
$0 < t \leq 1$	38
$1 < t \leq 2$	16
$2 < t \leq 3$	17
$3 < t \leq 4$	15
$4 < t \leq 5$	14
	Total = 100

Which class interval contains the median?

Answer _____

(Total 2 marks)

Q23. The table shows information about the distances walked by 120 students on their way to school one week.

Distance, x (miles)	Frequency		
$0 < x \leq 5$	20		
$5 < x \leq 10$	48		
$10 < x \leq 15$	30		
$15 < x \leq 20$	22		
	Total = 120		

Work out an estimate for the mean distance.

Answer _____ miles
(Total 3 marks)

Q24. An athlete runs in 10 000 metre races.
The table shows the times for his last 20 races.

Time, t (minutes)	Frequency		
$30 < t \leq 32$	3		
$32 < t \leq 34$	9		
$34 < t \leq 36$	6		
$36 < t \leq 38$	2		

Calculate an estimate of his mean time.

Answer _____ minutes
(Total 4 marks)

Q25. The amounts spent on clothes by 40 boys and 40 girls in one month were recorded.

The table shows information about the amounts spent by the boys.

Amount, x (£)	Midpoint	Number of boys	
$0 \leq x < 20$		22	
$20 \leq x < 40$		9	
$40 \leq x < 60$		6	
$60 \leq x < 80$		3	
		Total = 40	

The mean for the girls was £35

Estimate the mean for the girls as a percentage of the mean for the boys.

Answer _____ %
(Total 5 marks)

Complete the Square and Turning Points

Q26. Express $x^2 - 6x - 15$ in the form $(x - a)^2 - b$ where a and b are integers.

Answer _____

(Total 2 marks)

Q27. (a) Write $x^2 + 10x + 28$ in the form $(x + a)^2 + b$

Answer _____ (2)

(b) Hence, write down the coordinates of the turning point of the curve $y = x^2 + 10x + 28$

Answer (_____ , _____) (1)

(Total 3 marks)

Q28. The equation of a curve is $y = x^2 - 18x + 70$

By completing the square, work out the coordinates of the turning point.

You **must** show your working.

Answer (_____ , _____)

(Total 3 marks)

Q29. (a) Write $x^2 + 6x + 10$ in the form $(x + a)^2 + b$

Answer _____ (2)

(b) Hence, write down the coordinates of the turning point of the curve $y = x^2 + 6x + 10$

Answer (.....,) (1)

(Total 3 marks)

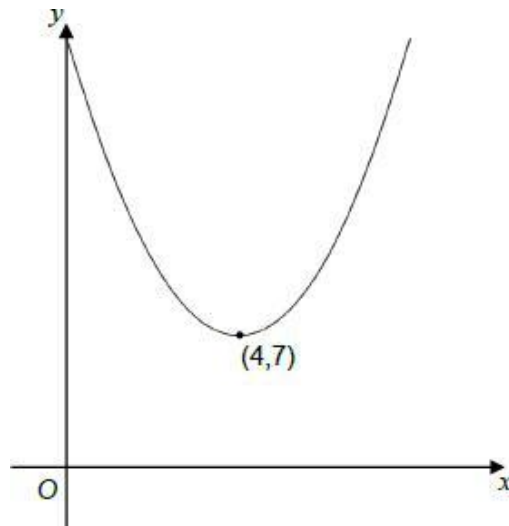
Q30. (a) Write $x^2 + 8x + 6$ in the form $(x + a)^2 + b$

Answer _____ (2)

(b) A sketch of $y = x^2 + cx + d$ is shown.

The turning point is (4, 7)

Not drawn accurately



Work out the values of c and d .

$c =$ _____ $d =$ _____ (3)

(Total 5 marks)

Q31. (a) Show that $x^2 - 8x + 20$

can be written in the form $(x - a)^2 + a$

where a is an integer.

(3)

(b) Hence explain how you know that $x^2 - 8x + 20$ is always positive.

(2)

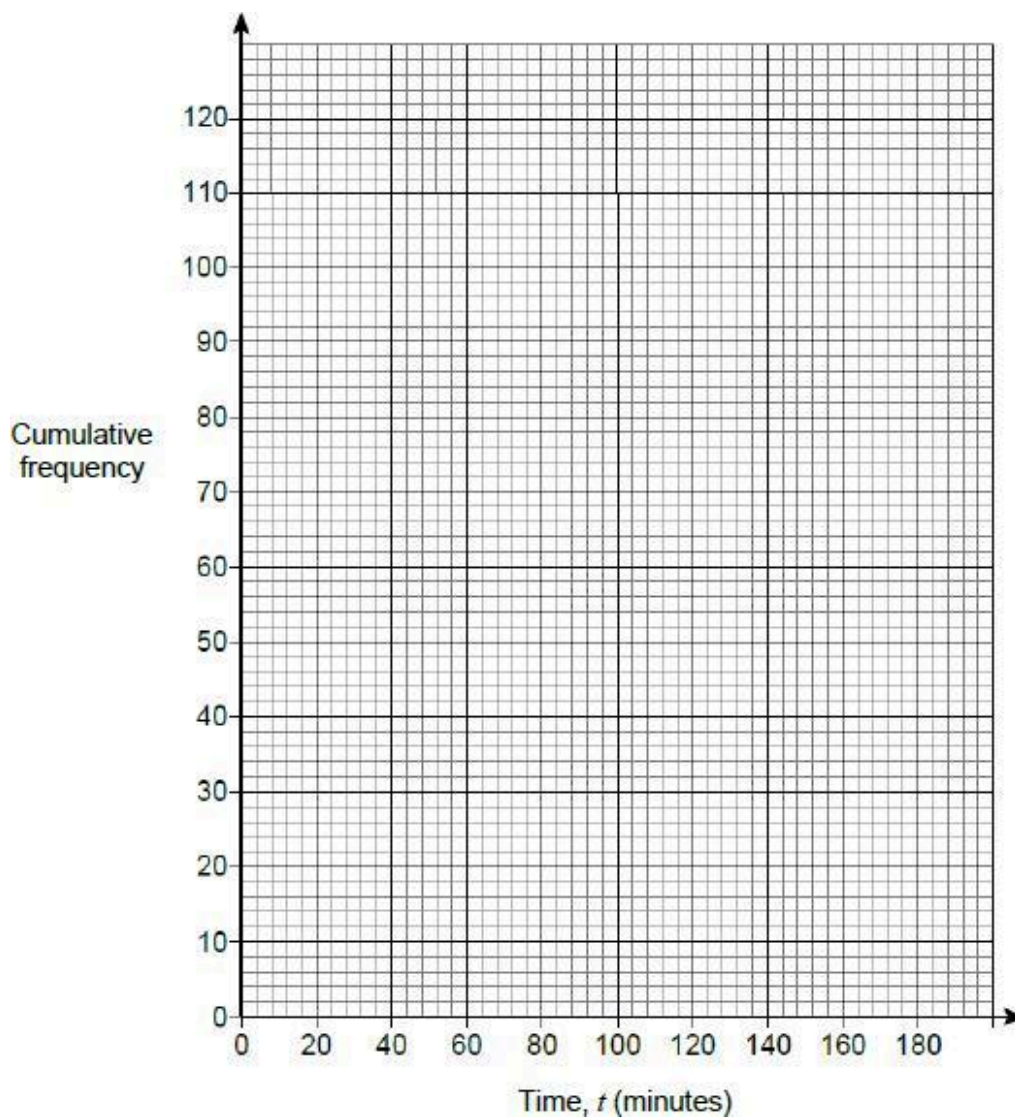
(Total 5 marks)

Cumulative Frequency

Q32. The table shows the running times of some films.

Time, t (minutes)	Number of films
$0 \leq t < 80$	0
$80 \leq t < 100$	12
$100 \leq t < 120$	38
$120 \leq t < 140$	36
$140 \leq t < 160$	24
$160 \leq t < 180$	10

(a) Draw a cumulative frequency graph on the grid below to represent the data.



(3)

(b) Estimate the number of these films with a running time of less than 130 minutes.

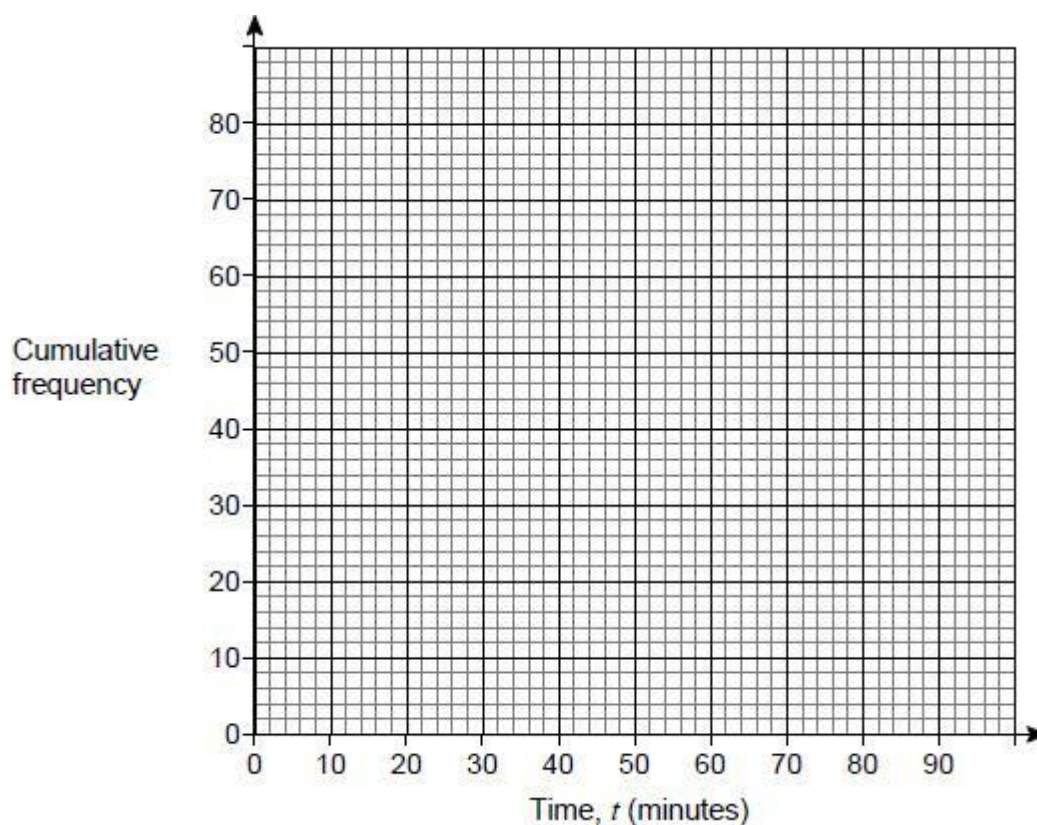
Answer _____ (1)

(Total 4 marks)

Q33. Here is some information about the times, in minutes, 80 teachers took to get to work.

Time t (minutes)	Frequency		
$0 < t \leq 20$	21		
$20 < t \leq 40$	30		
$40 < t \leq 60$	19		
$60 < t \leq 90$	10		

(a) On the grid, draw a cumulative frequency graph.



(3)

(b) Estimate the percentage of teachers who took over 45 minutes to travel to work.

Answer _____ %

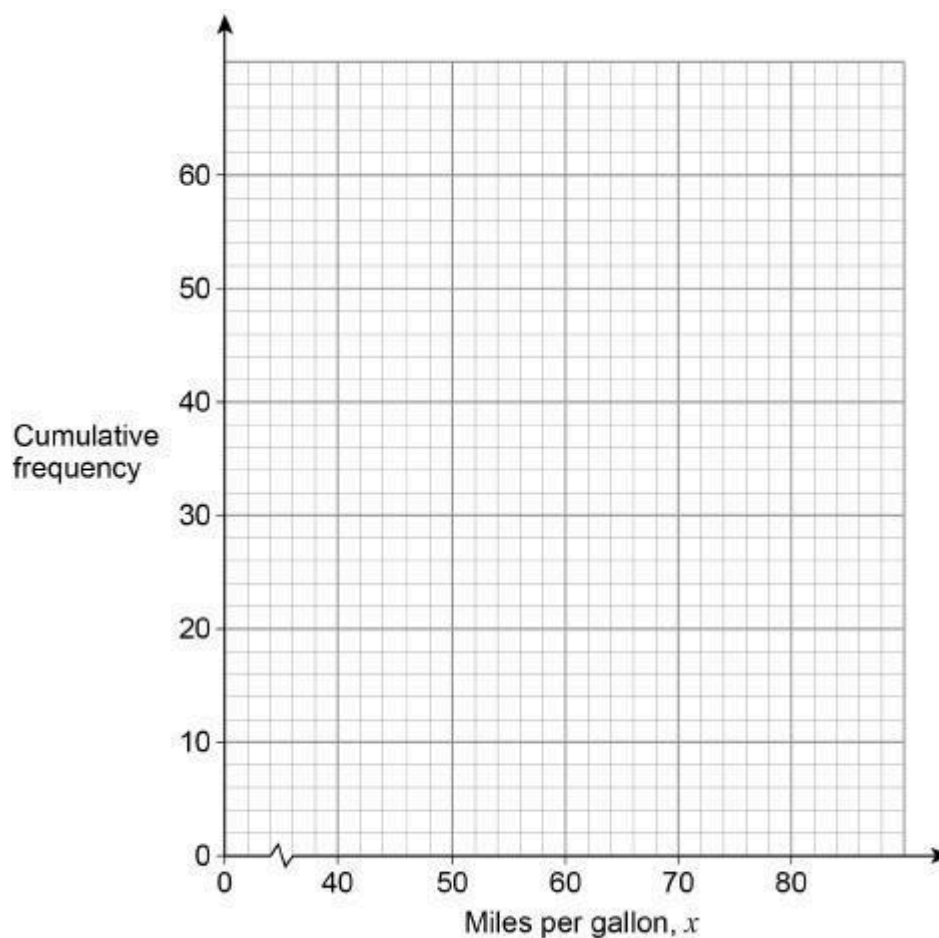
(2)

(Total 5 marks)

Q34 Here is some information about the miles per gallon of 60 cars.

Miles per gallon, x	Frequency		
$40 < x \leq 50$	6		
$50 < x \leq 60$	16		
$60 < x \leq 70$	28		
$70 < x \leq 80$	10		

(a) Draw a cumulative frequency graph.



(3)

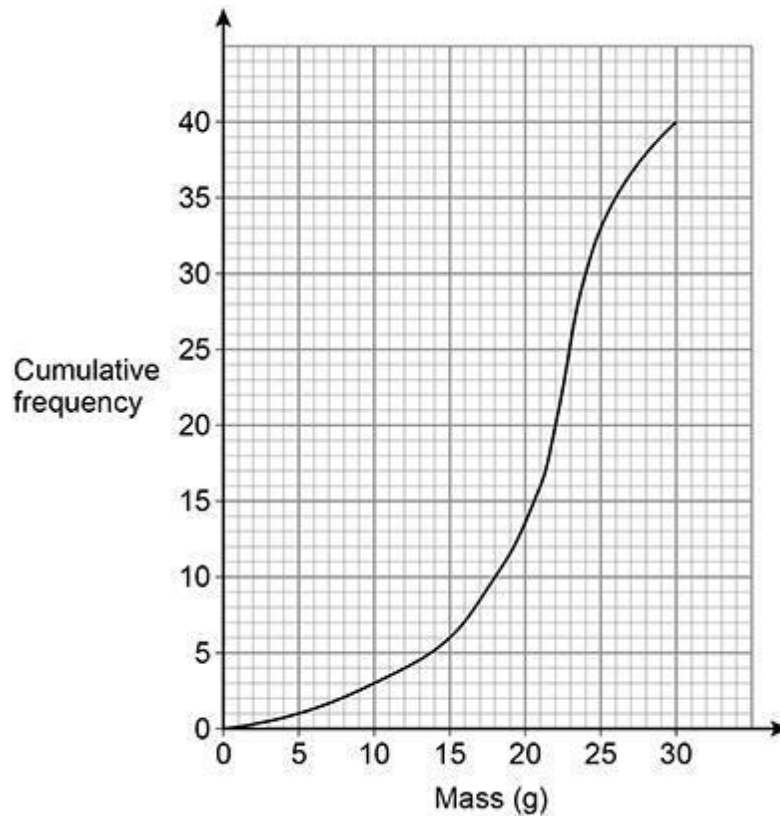
(b) Use the graph to work out the interquartile range.

Answer _____ miles per gallon

(2)

(Total 5 marks)

Q35. The cumulative frequency graph represents the masses of 40 necklaces.

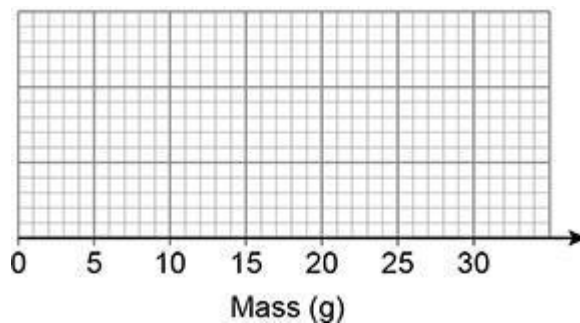


- (a) A jeweller buys every necklace with mass **greater than 21 grams**.
Use the graph to estimate how many she buys.

Answer _____

(2)

- (b) The lowest mass was 3 grams.
The highest mass was 28 grams.
Draw a box plot to represent the data.

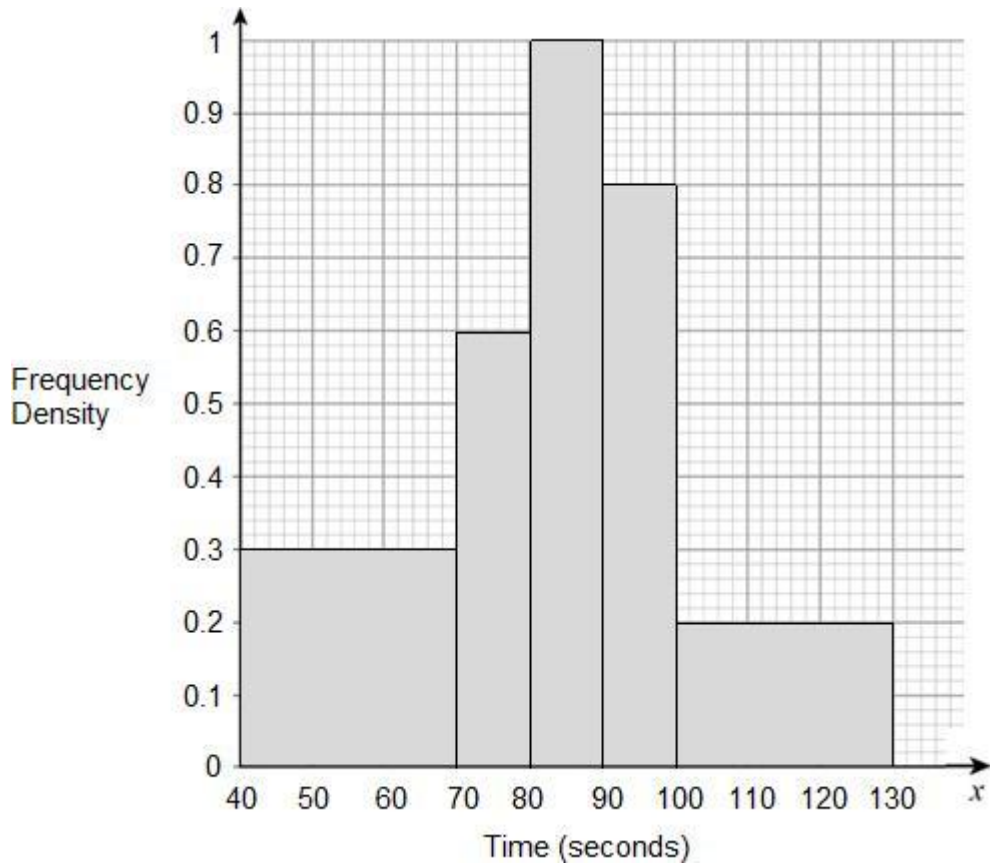


(3)

(Total 5 marks)

Histograms

Q36. The histogram shows information about the times some children took to complete a puzzle.



Estimate the number of students who took less than 85 seconds to complete the puzzle.

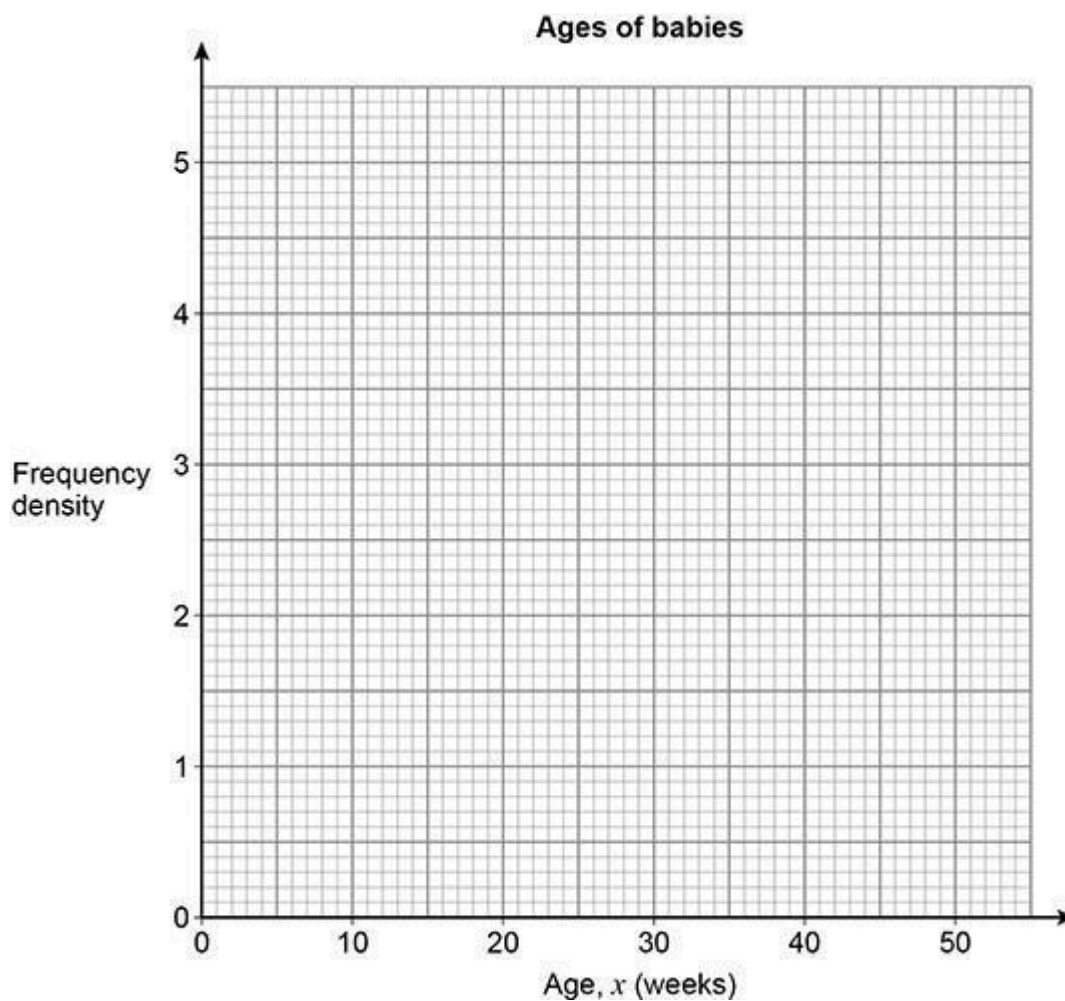
Answer _____

(Total 3 marks)

Q37. Here is some information about the ages of babies at a clinic.

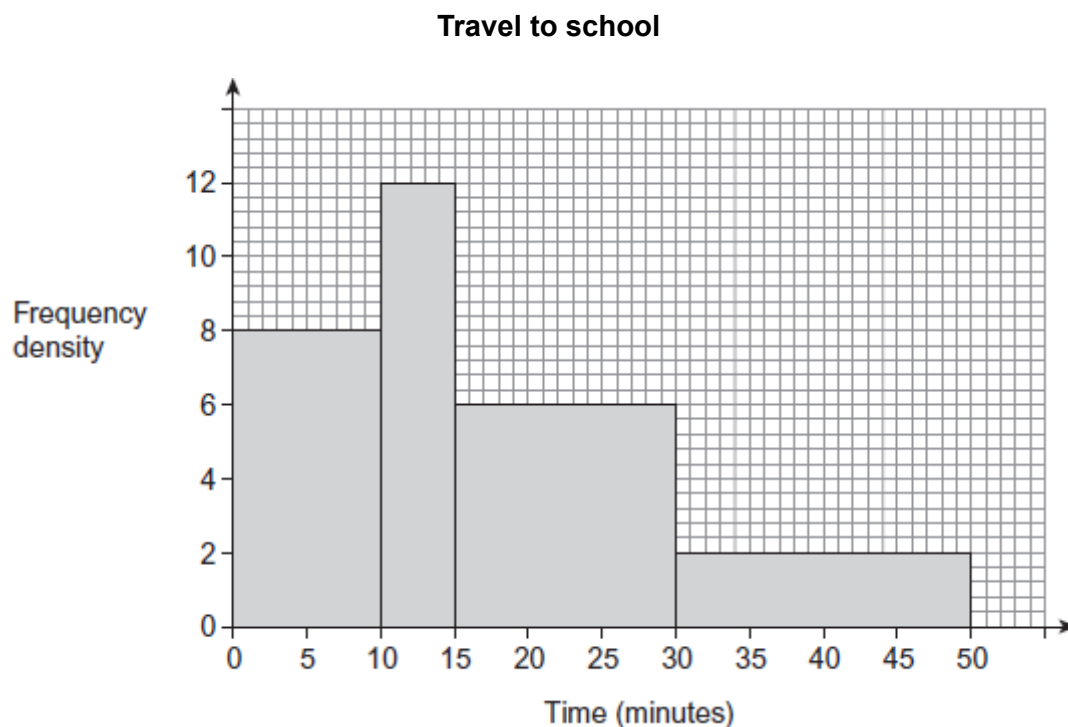
Age, x (weeks)	Frequency		
$0 \leq x < 5$	18		
$5 \leq x < 10$	23		
$10 \leq x < 20$	17		
$20 \leq x < 50$	21		

Draw a histogram to represent the information.



(Total 4 marks)

Q38. The histogram shows the time it takes 270 students to travel to school.



Kirsty says 30% of the students take more than 25 minutes to travel to school.

Is she correct?

Use the histogram to decide.

You **must** show your working.

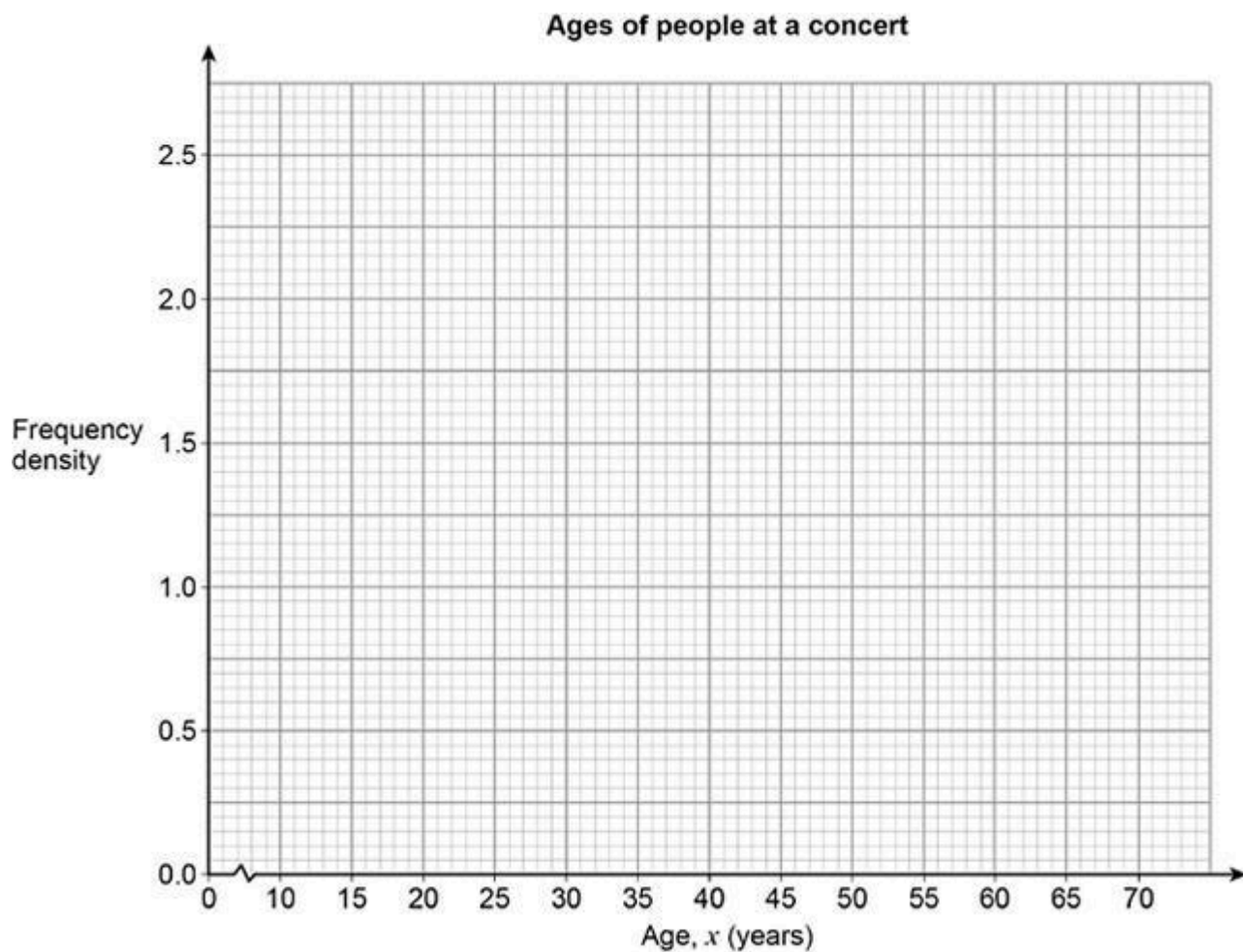
Answer _____

(Total 5 marks)

Q39. Here is some information about the ages of people at a concert.

Age, x (years)	Frequency
$10 \leq x < 15$	8
$15 \leq x < 25$	24
$25 \leq x < 40$	30
$40 \leq x < 70$	39

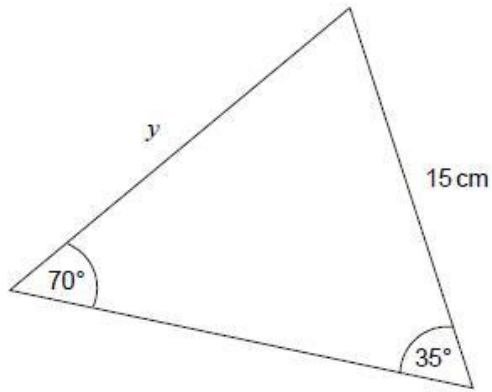
Draw a histogram to represent the information.



(Total 3 marks)

Advanced Trigonometry

Q40. Work out the value of y .

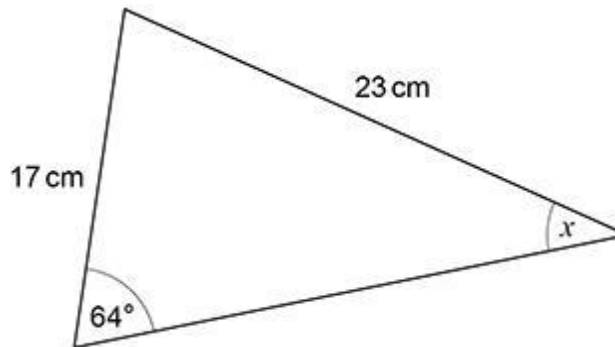


Not drawn accurately

Work out the value of y .

Answer _____ cm
(Total 2 marks)

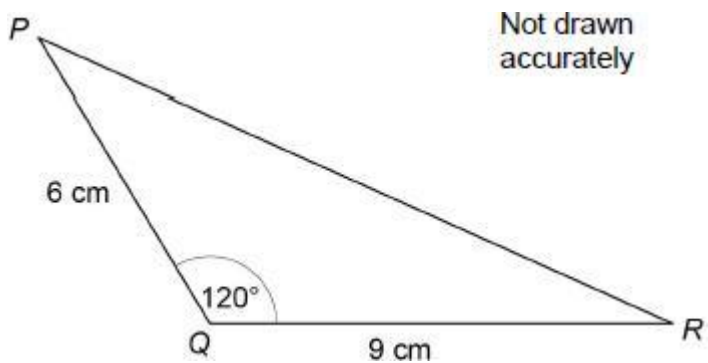
Q41. Use the sine rule to work out the size of angle x .



Not drawn accurately

$x =$ _____ $^\circ$
(Total 3 marks)

Q42. Here is a triangle.

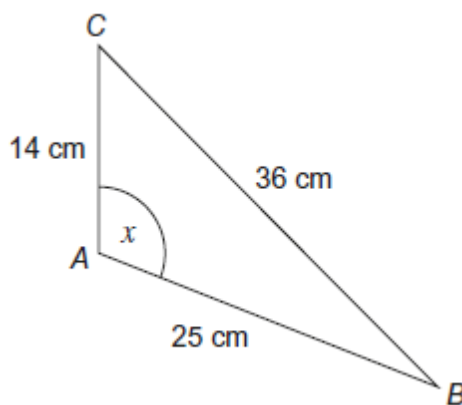


Work out the length PR .

Answer _____ cm
(Total 3 marks)

Q43. Work out the size of angle x .

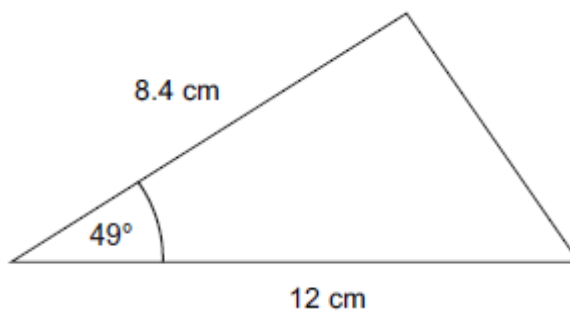
Not drawn accurately



Answer _____ degrees
(Total 3 marks)

Q44. Work out the area of the triangle.

Not drawn accurately

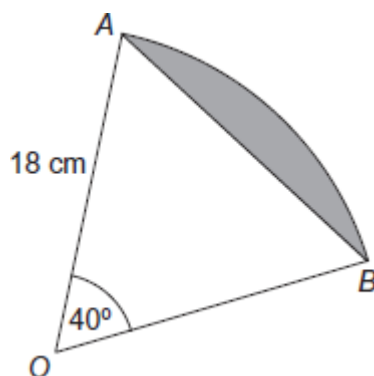


Answer _____ cm²

(Total 2 marks)

Q45. The diagram shows a sector of a circle, centre O, radius 18 cm

Not drawn accurately



Work out the area of the shaded segment.

Answer _____ cm²

(Total 3 marks)

Straight Line Graphs

Q46. Work out the gradient of the straight line $y - 3x + 1 = 0$

Answer _____

(Total 2 marks)

Q47. Work out the equation of the line that

is parallel to the line $y = 4x - 1$

passes through $(-1, 1)$

Answer _____

(Total 3 marks)

Q48. Line A has equation $y = 4x - 1$

Line B is

perpendicular to line A and

passes through the point $(8, 5)$

Work out the coordinates of the point where line B intersects the x -axis.

Answer (_____ , _____)

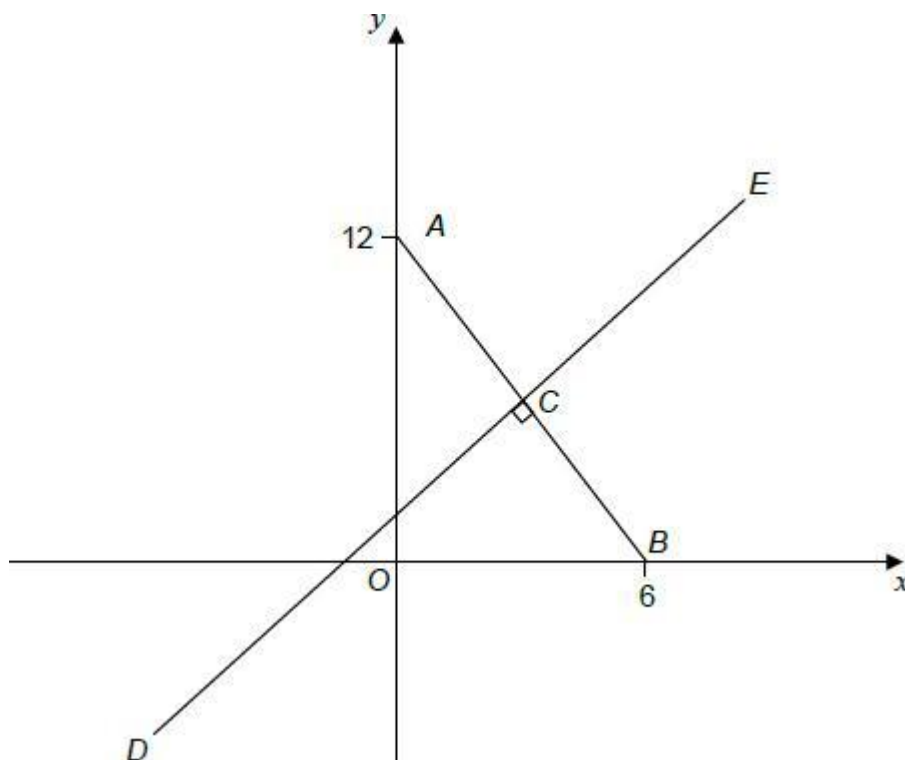
(Total 4 marks)

Q49. ACB is a straight line.

A is the point $(0, 12)$, and B is the point $(6, 0)$

C is the midpoint of AB .

Line DCE is perpendicular to line ACB .



Not drawn accurately

Work out the equation of line DCE .

Answer _____

(Total 5 marks)

Functions

Q50. $f(x) = 8x - 5$

Work out the value of $f(-2)$

Answer _____

(Total 1 mark)

Q51. For all values of x , $f(x) = \frac{9x+4}{7}$

Work out $f^{-1}(x)$

Answer _____

(Total 3 marks)

Q52. $f(x) = \frac{3x+9}{5}$ and $g(x) = 6x - 1$

(a) Show that $gf(2)$ is an integer.

(b) Show that $f^{-1}(8)$ is **not** an integer.

(2)

(Total 4 marks)

Q53. $f(x) = 2x + 5$

Show that $3f(x) - 12f^{-1}(x)$ simplifies to an integer.

(Total 4 marks)

Q54. $f(x) = 2x^2$ $g(x) = x + 5$

Work out the composite function $fg(x)$

Write your answer in the form $ax^2 + bx + c$ where a , b and c are integers to be found.

Answer _____

(Total 2 marks)

Q55. $g(x) = 16 - x$ $h(x) = x^3$

Solve $gh(x) = 24$

$x =$ _____

(Total 3 marks)

