Easter Intervention

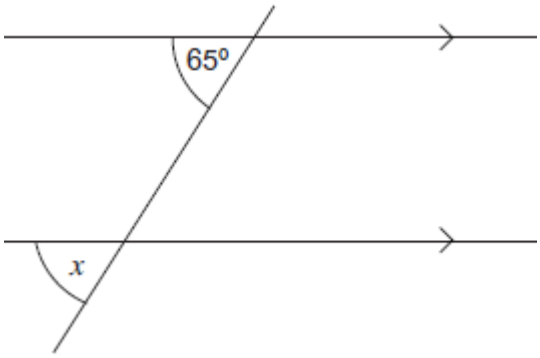
Higher Paper Questions

Topic			
Angles			
Circles			
Circle Theorems			
Cumulative Frequency			
Simultaneous Equations			
Expanding Brackets			
Factorising			
Solving Quadratics			
Linear and Quadratic graphs			
Histograms			
Sequences			
Percentages			
Pythagoras and Trigonometry			
Vectors			
Volume			
Sine Rule / Cosine Rule / Area of Triangle			

If you have any questions feel free to email: bonea@ianramsey.org.uk

Angles

Q1. Write down the size of angle x. Give a reason for your answer.



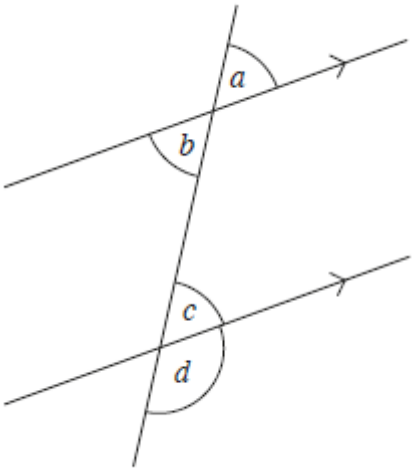
Answer _____ degrees

Reason _____

_____

(Total 2 marks)

Q2.



(a) Which angles are vertically opposite? Circle your answer

a and b a and c b and c b and d c and d

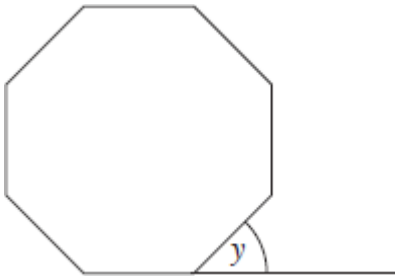
(b) Which angles are alternate? Circle your answer

a and b a and c b and c b and d c and d

(c) Which angles are corresponding? Circle your answer

a and b a and c b and c b and d c and d

Q3. (a) The diagram shows a regular octagon.



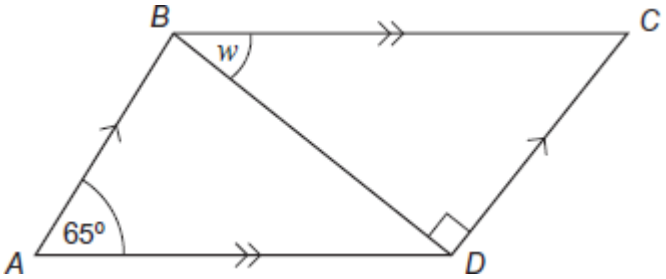
The base line of the octagon is extended. Work out the size of angle y.

_____

Answer _____ degrees

(2)

(b) *ABCD* is a parallelogram. *BD* is a diagonal.



Work out the size of angle w.

_____

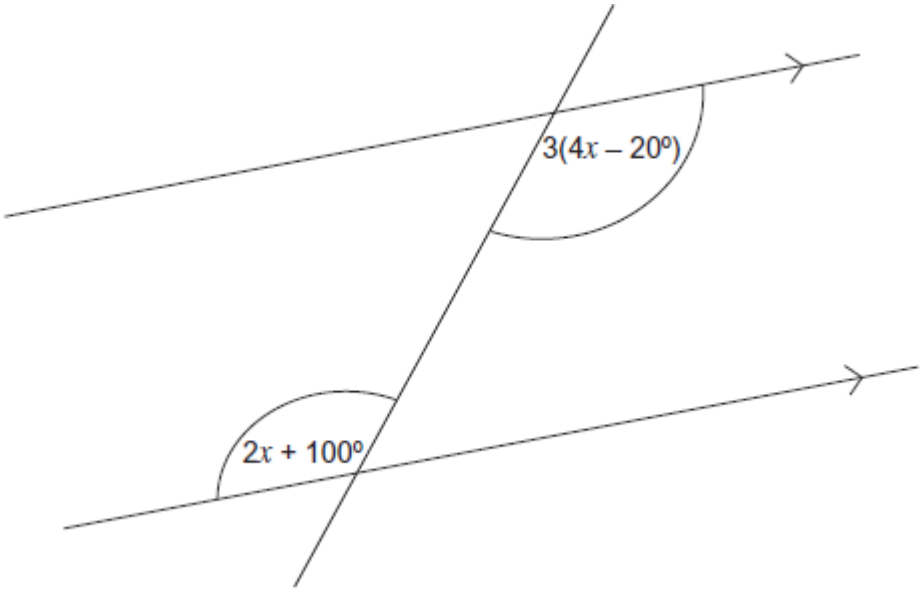
_____

Answer _____ degrees

(3)

(Total 5 marks)

Q4. The diagram shows three straight lines.



(a) Which of the following describes the pair of angles marked? Circle your answer.

Alternate Corresponding Interior Vertically opposite

(1)

(b) Work out the value of x.

_____

_____

_____

_____

_____

_____

_____

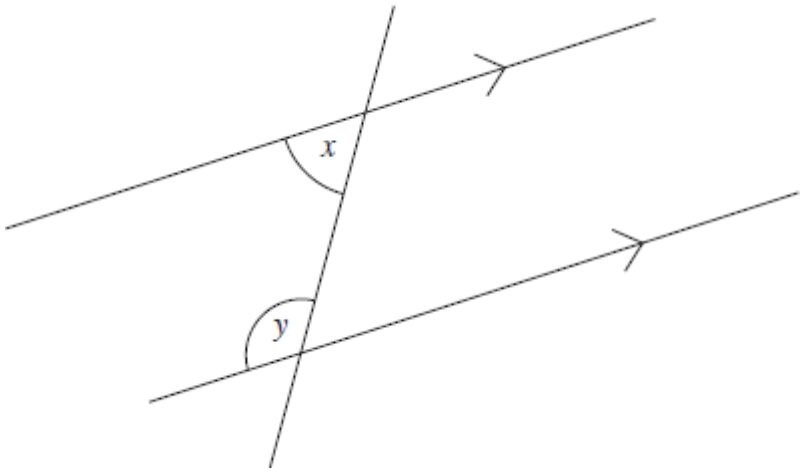
_____

x = _____ degrees

(4)

(Total 5 marks)

Q5.



(a) Use the diagram to write an equation connecting x and y.

Answer _____

(1)

(b) The ratio $x : y = 2 : 3$

Use this information to write another equation connecting x and y.

_____

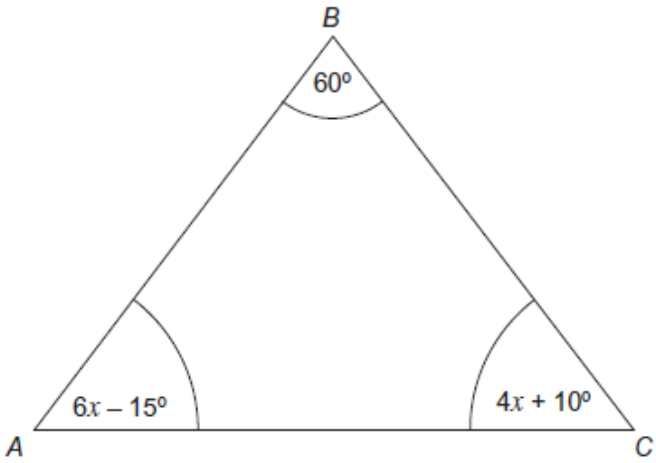
_____

Answer _____

(1)

(Total 2 marks)

Q6. Show that *ABC* is an equilateral triangle.



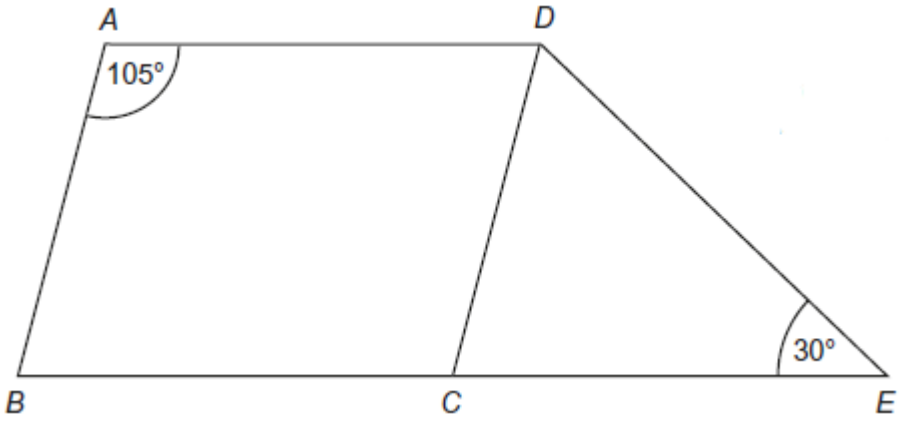
_____

_____

_____

(Total 5 marks)

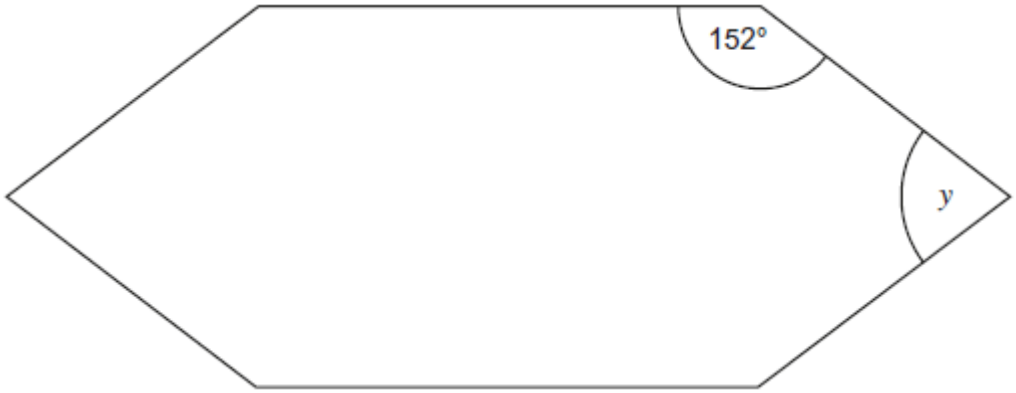
Q7. A parallelogram *ABCD* and a triangle *DCE* are joined as shown. *BCE* is a straight line.



Show that *DCE*is an isosceles triangle. You **must** show your working.

(Total 4 marks)

Q8. This hexagon has two lines of symmetry.



Work out the size of angle y.

Answer _____ degrees

(Total 3 marks)

Circles

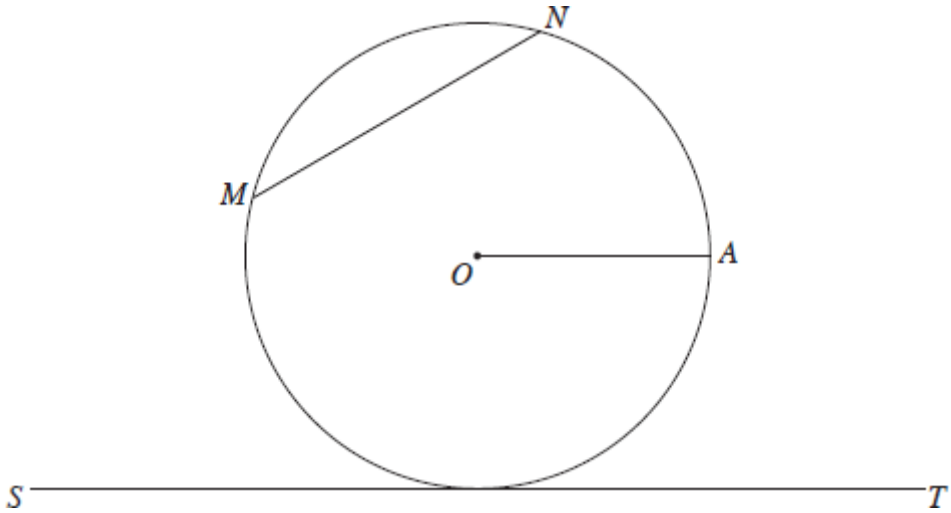
Q1. A circle has equation $x^2 + y^2 = 4$

Circle the length of its radius.

2 4 8 16

(Total 1 mark)

Q2. *O* is the centre of the circle.



Circle the word to complete each sentence.

(a) The line OA is a

chord circumference diameter radius tangent

(1)

(b) The line MN is a

chord circumference diameter radius tangent

(1)

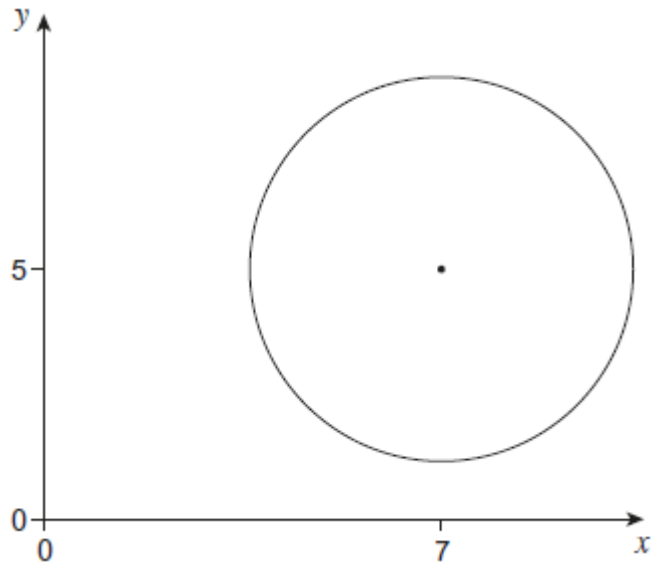
(c) The line ST is a

chord circumference diameter radius tangent

(1)

(Total 3 marks)

Q3. A circle radius 3 units, centre (7, 5) is shown.

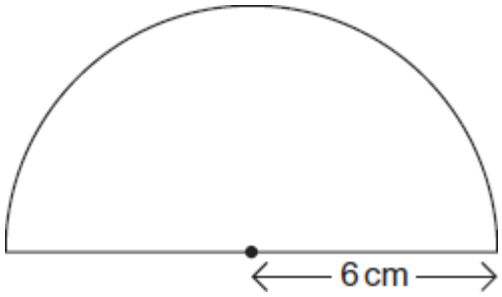


Work out the coordinates of **any** point that lies on the circumference of the circle.
You **must** show your working, which may be on the diagram.

Answer (_____ , _____)

(Total 2 marks)

Q4. Work out the area of a semi-circle of radius 6 cm. Give your answer in terms of π.



_____

_____

_____

Answer _____ cm^2

(Total 2 marks)

Q5.(a) The circumference of a circle is 25 cm

Work out the radius of the circle.

_____

_____

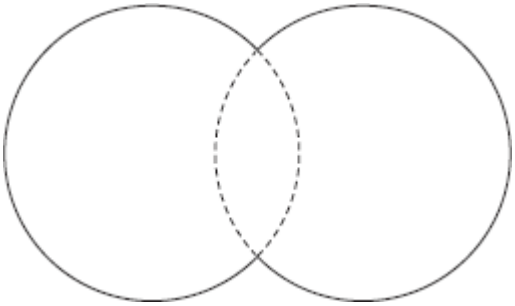
Answer _____ cm

(2)

(b) The diagram shows two identical circles joined together.

Each circle has a circumference of 32 cm

The dashed lines are one-quarter of each circumference.



Work out the perimeter of the outer shape.

_____

_____

_____

_____

Answer _____ cm

(3)

(Total 5 marks)

Q6. Work out the circumference of a circle, radius 4.2 cm. Give your answer to 1 decimal place.

_____

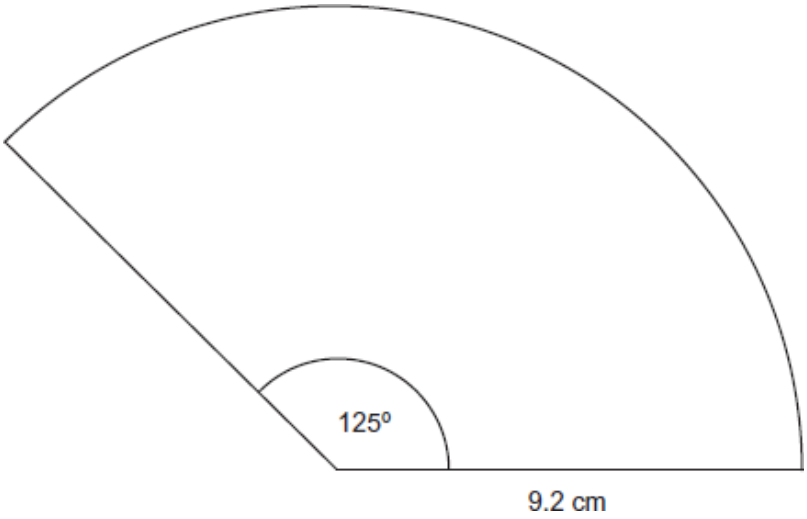
_____

_____

Answer _____ cm

(Total 3 marks)

Q7. The diagram shows a sector of a circle with radius 9.2 cm



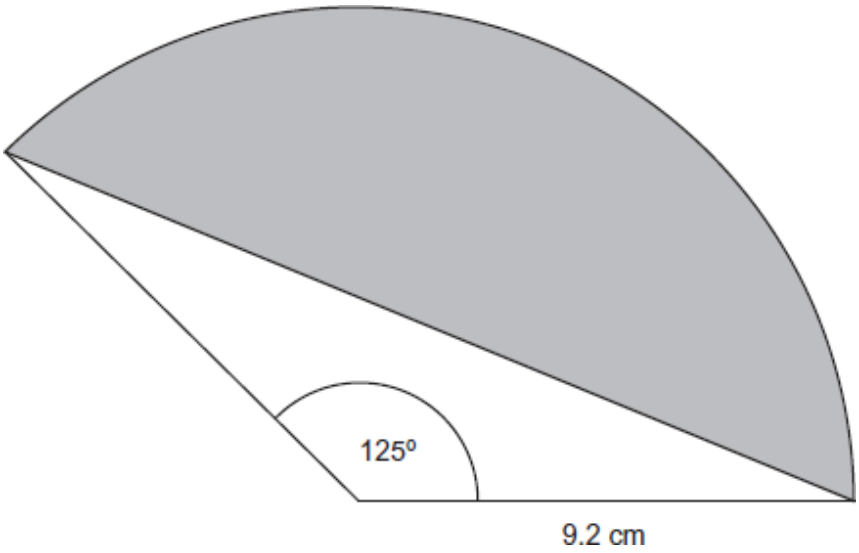
(a) Work out the area of the sector.

Answer _____ cm^2

(3)

(b) Work out the area of the shaded segment.

Hint: Find the area of the sector, then find the area of the triangle

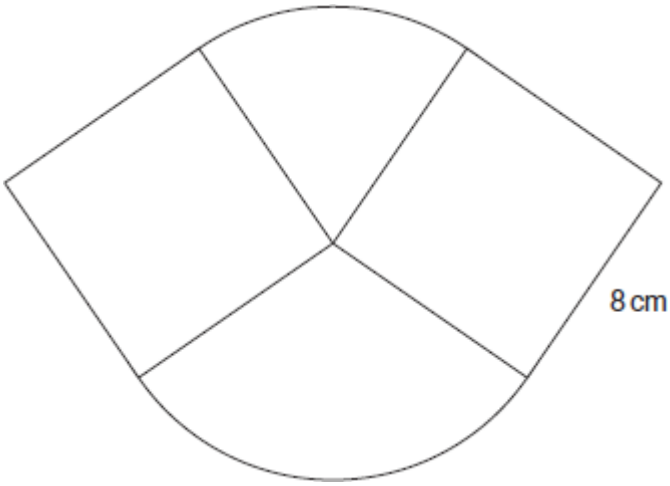


Answer _____ cm^2

(3)

(Total 6 marks)

Q8. This shape is made from two sectors and two squares of side 8 cm.
The radius of each sector is also 8 cm.



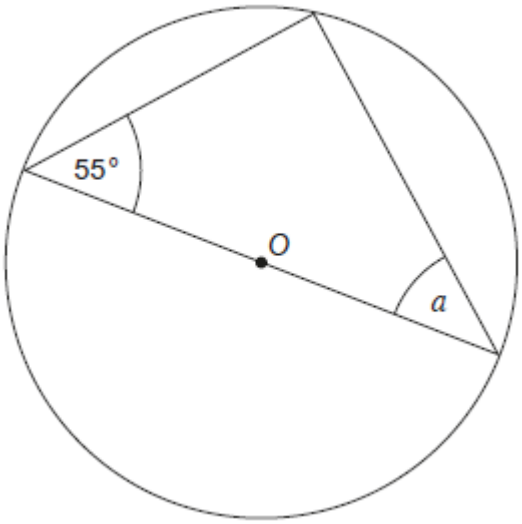
Work out the total area of the shape.

Answer _____ cm^2

(Total 4 marks)

Circle Theorems

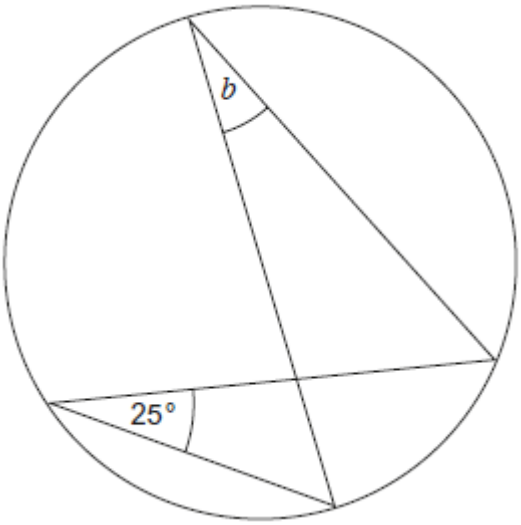
Q1.(a) *O* is the centre of the circle. Work out the size of angle a.



Answer _____ degrees

(1)

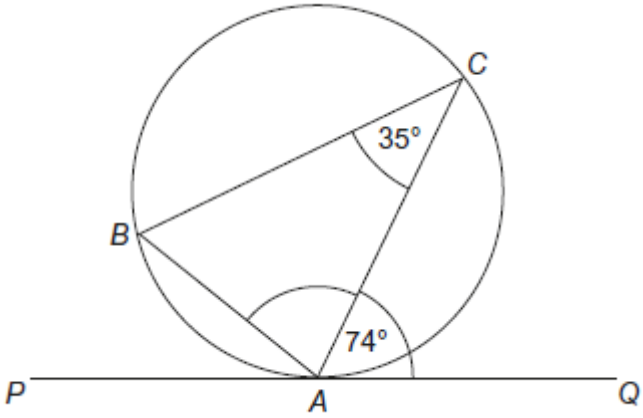
(b) Write down the size of angle b.



Answer _____ degrees

(1)

Q2. *A*, *B* and *C* are points on a circle. *PAQ* is a tangent to the circle.



Work out the size of angle *CAB*.

_____

_____

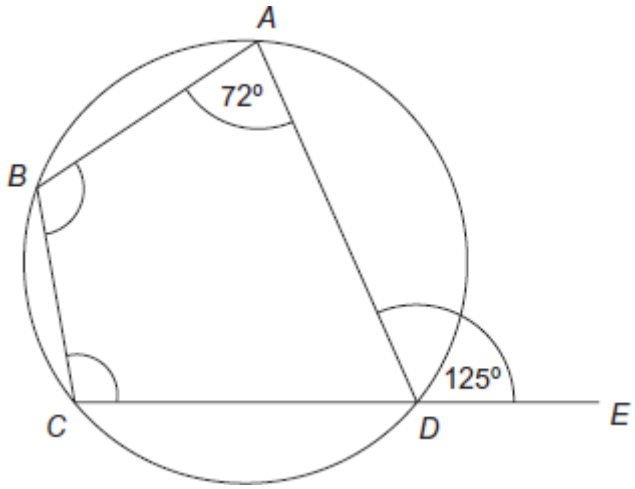
_____

_____

Answer _____ degrees

(Total 2 marks)

Q3. Points *A*, *B*, *C* and *D* are on the circumference of the circle. *CDE* is a straight line.



(a) Work out the size of angle *BCD*.
Give a reason for your answer.

Answer _____ degrees

Reason _____

(2)

(b) Work out the size of angle *ABC*.

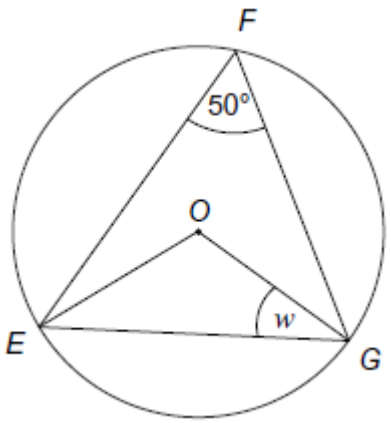
_____

Answer _____ degrees

(1)

(Total 3 marks)

Q4. (a) *E, F* and *G* are points on a circle, centre *O*.



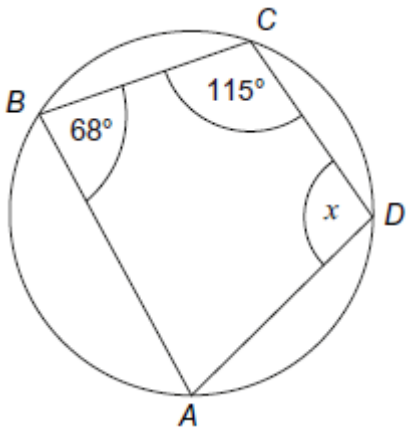
Work out the size of angle *w*.

_____

Answer _____ degrees

(2)

(b) *A, B, C* and *D* are points on the circumference of the circle.



Work out the size of angle *x*. Give a reason for your answer.

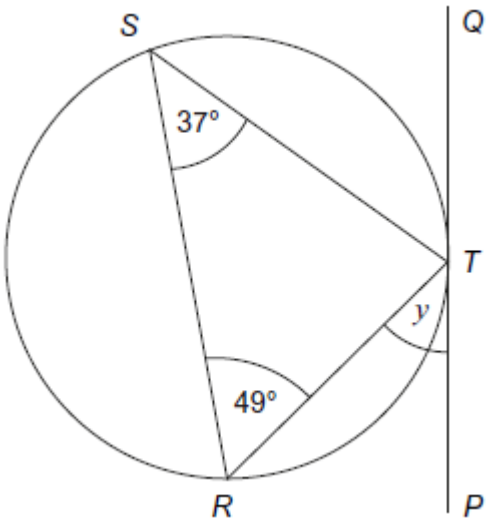
Answer _____ degrees

Reason _____

_____

(2)

(c) *PTQ* is a tangent to the circle. *R, S* and *T* are points on the circle.



Write down the size of angle *y*. Give a reason for your answer.

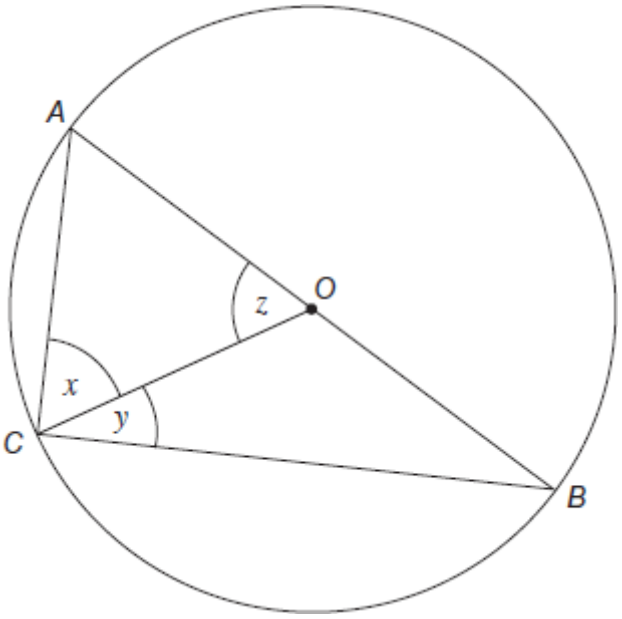
Answer _____ degrees

Reason _____

_____

(2)
(Total 6 marks)

Q5.(a) *A*, *B* and *C* are points on a circle, centre *O*.



AB is a diameter. The ratio of the size of angle *x* to the size of angle *y* is

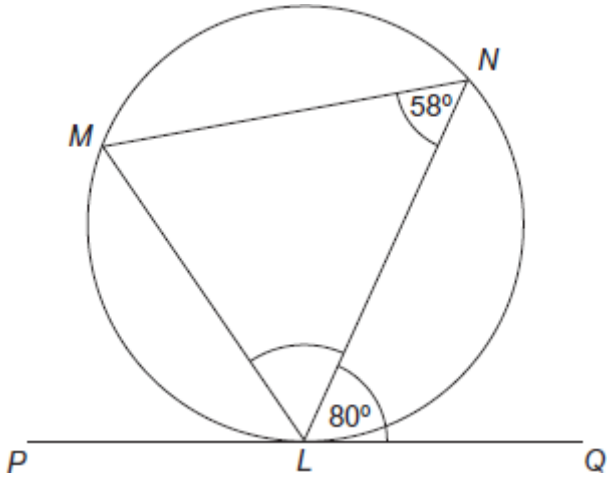
$x : y = 5 : 1$

Work out the size of angle z.

Answer _____ degrees

(3)

(b) L, M and N are points on a circle. PLQ is a tangent.



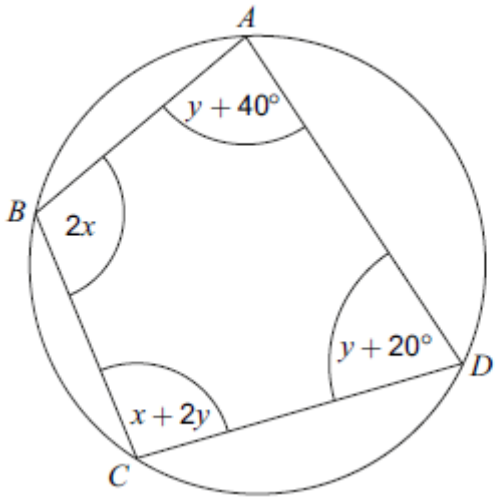
Work out angle MLN.

Answer _____ degrees

(3)

(Total 6 marks)

Q6. $ABCD$ is a cyclic quadrilateral.



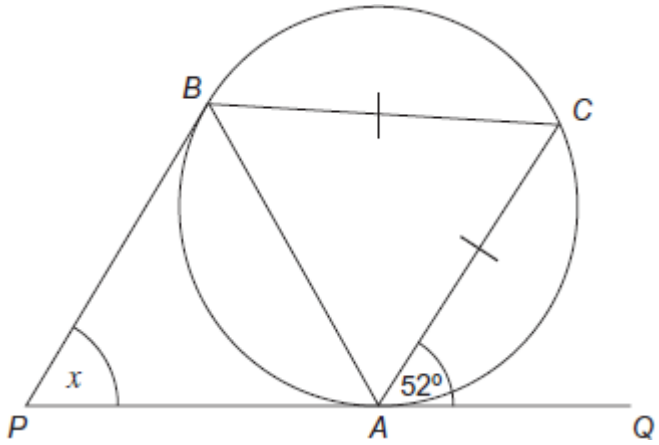
Not drawn accurately

Work out the values of x and y.

x = _____ , y = _____

(Total 5 marks)

Q7. *PAQ* and *PB* are tangents to the circle. *AC* = *BC*

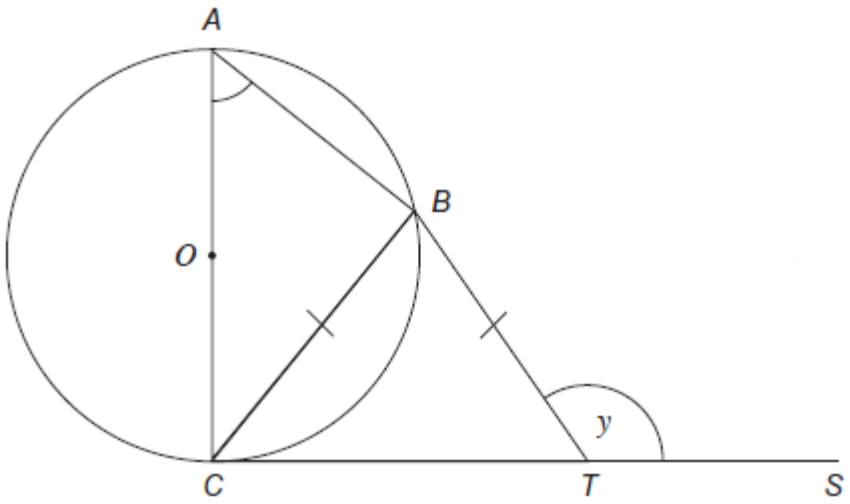


Work out the size of angle x.
You **must** show your working which may be on the diagram.

Answer _____ degrees

(Total 4 marks)

Q8. *AC* is a diameter of a circle, centre *O*.
CTS is a tangent to the circle.
B is a point on the circumference of the circle such that *BC* = *BT*
Angle *BTS* = y



(a) Prove that angle *CAB* = 180° – y
Give reasons for any angles you write down or calculate.

_____

_____

_____

_____

_____

_____

(3)

(b) You are given that angle *ACB* = 20°

Work out the value of y.
You **must** show your working which may be on the diagram.

_____

_____

_____

_____

Answer _____ degrees

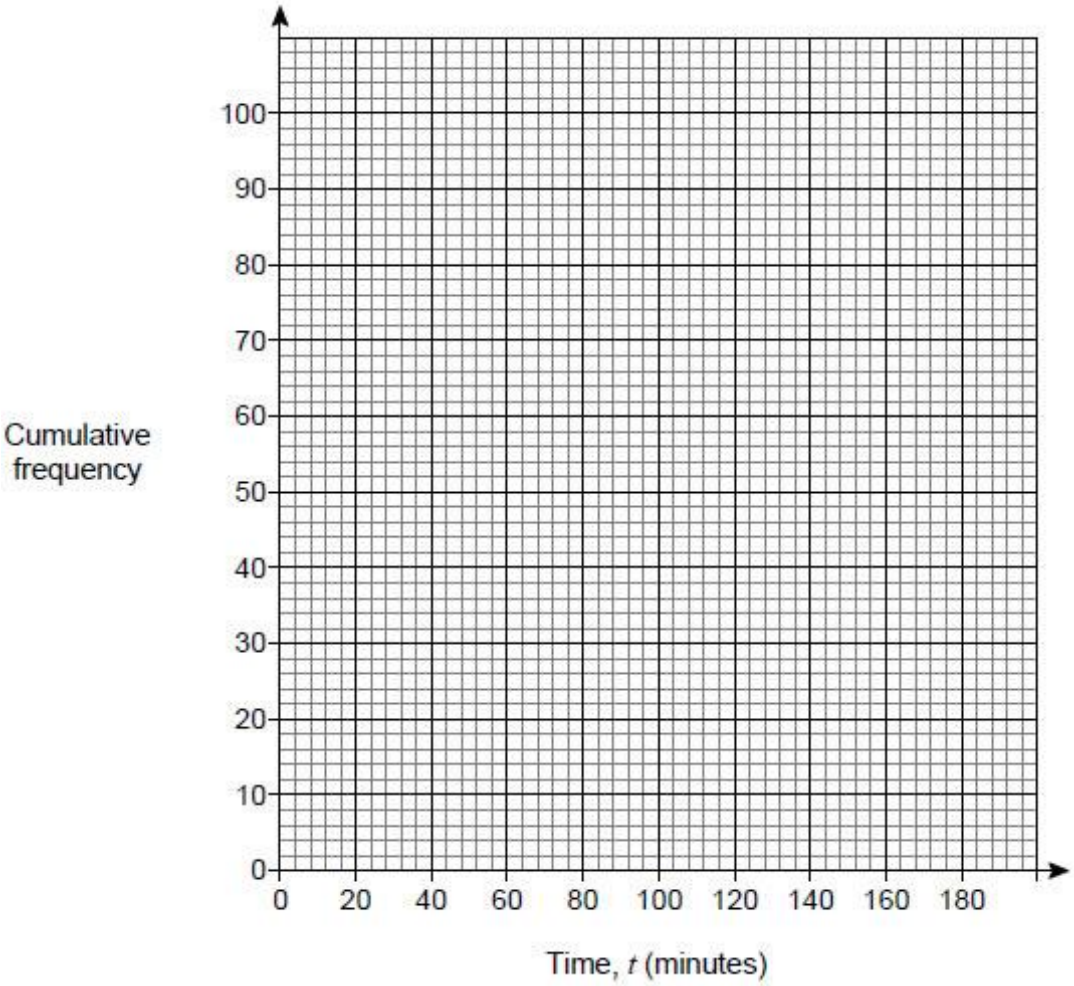
(2)

(Total 5 marks)

Cumulative Frequency

Q1. The table shows the running times of some films. Draw a cumulative frequency graph on the grid opposite to represent the data.

Time, *t* (minutes)	Number of films	
$0 \le t < 80$	0	
$80 \le t < 100$	9	
$100 \le t < 120$	35	
$120 \le t < 140$	30	
$140 \le t < 160$	18	
$160 \le t < 180$	8	

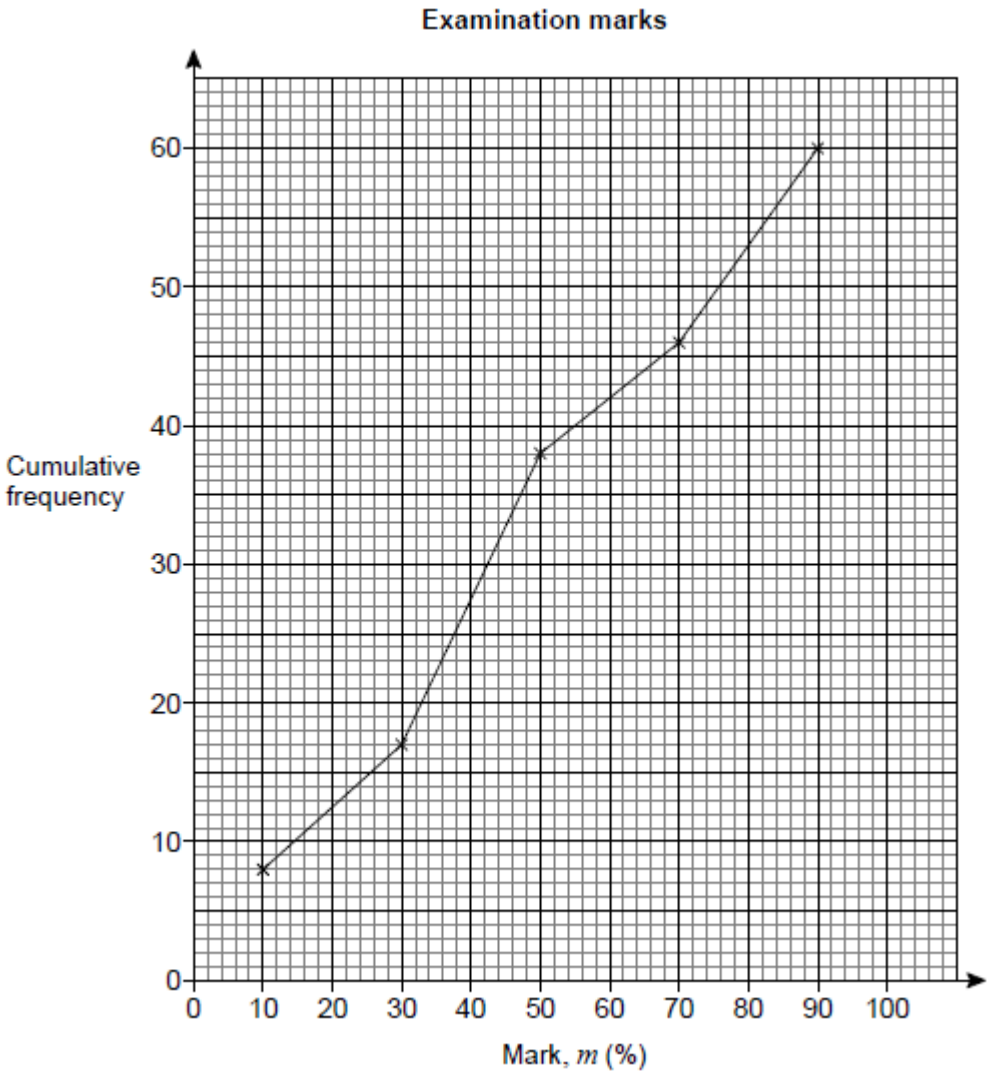


(b) Estimate the number of these films with a running time of less than 2.5 hours.

Q2. Here are the examination marks for 60 pupils.

mark, m (%)	Frequency
$0 \le m < 20$	8
$20 \le m < 40$	9
$40 \le m < 60$	21
$60 \le m < 60$	10
$80 \le m < 100$	12

Molly drew this cumulative frequency graph to show the data.



Make **two** criticisms of Molly's graph.

_____

_____

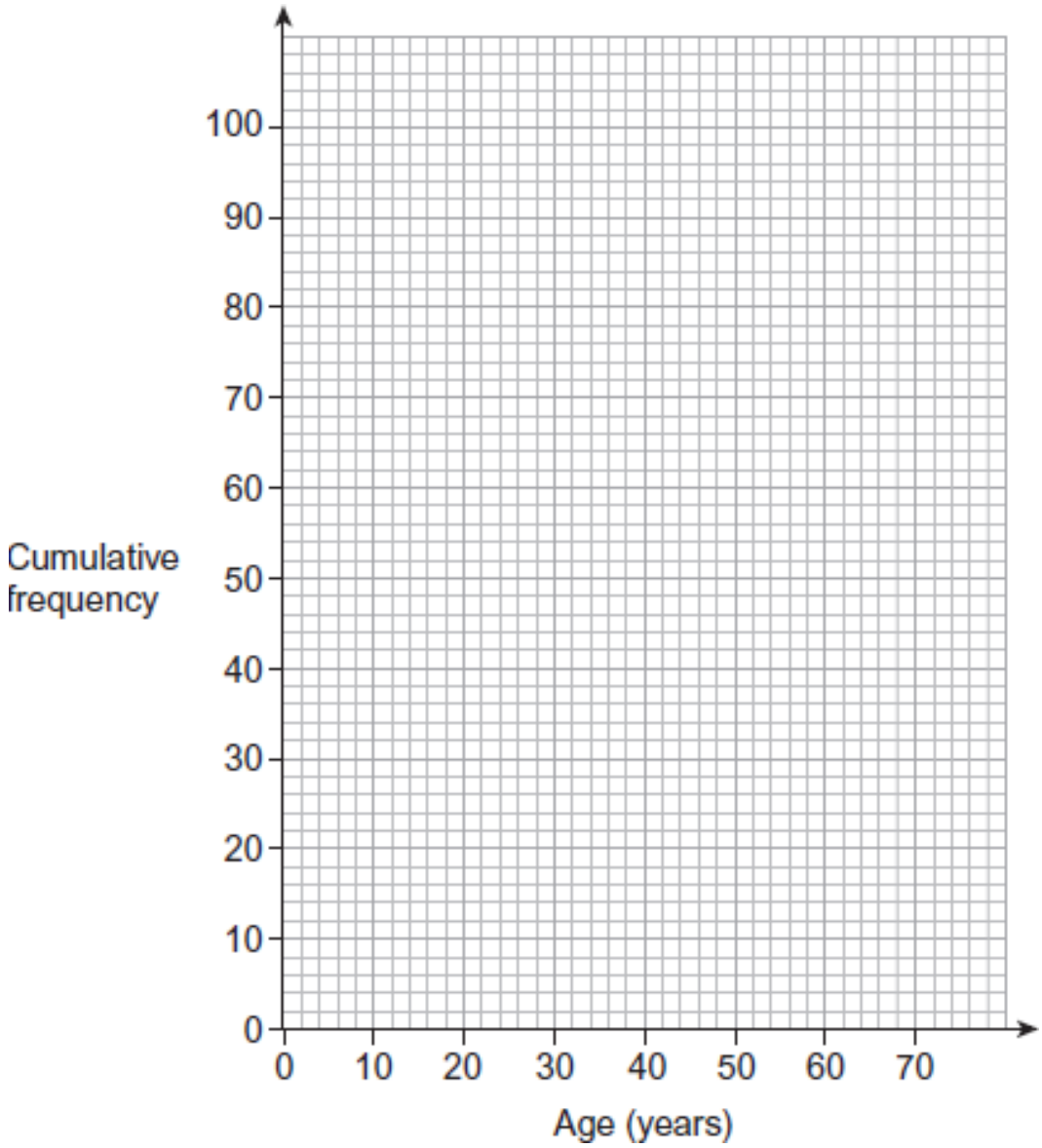
_____

(Total 2 marks)

Q3. The table shows information about the ages of 100 rugby supporters.

Age, a (years)	Frequency	
$5 \leq a < 15$	12	
$15 \leq a < 20$	11	
$20 \leq a < 40$	25	
$40 \leq a < 55$	39	
$55 \leq a < 70$	13	

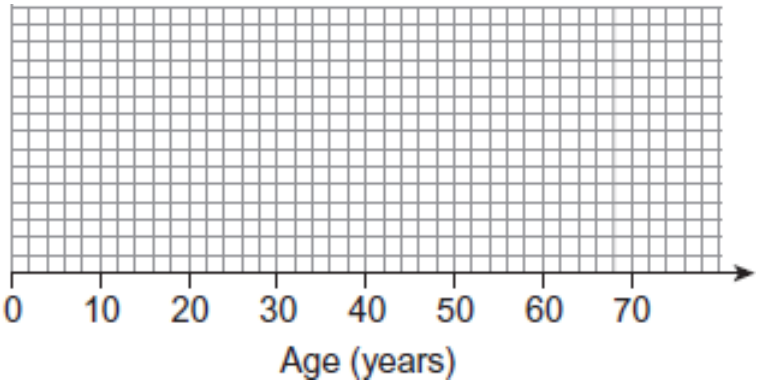
(a) Plot a cumulative frequency diagram for the data.



(4)

(b) The youngest supporter is 8 years old.
The oldest supporter is 69 years old.

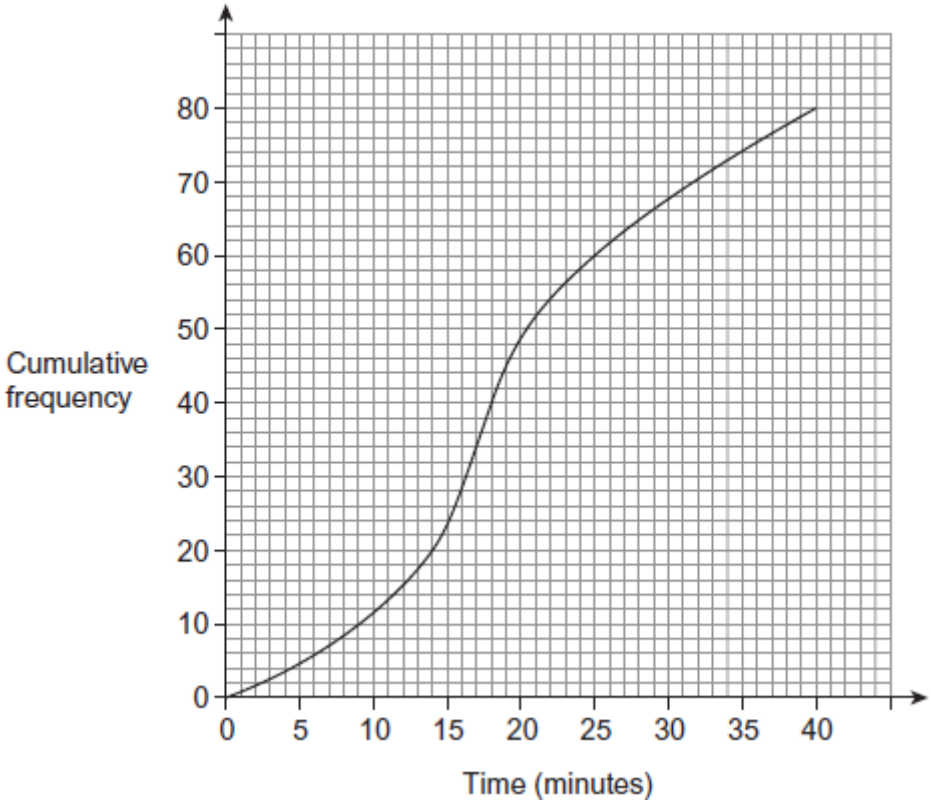
Draw a box plot for the data.



(3)
(Total 7 marks)

Q4. 80 women were timed solving a puzzle.

Women



80 men were also timed solving the puzzle.

Men

Median	16 minutes
Interquartile range	17 minutes

(a) Jack says,

"The data shows that the men were faster on average."

Is he correct?
You **must** show your working, which may be on the diagram.

_____

_____

(1)

(b) Ellie says,

"The data shows that the women were more consistent."

Is she correct?
You **must** show your working.

_____

_____

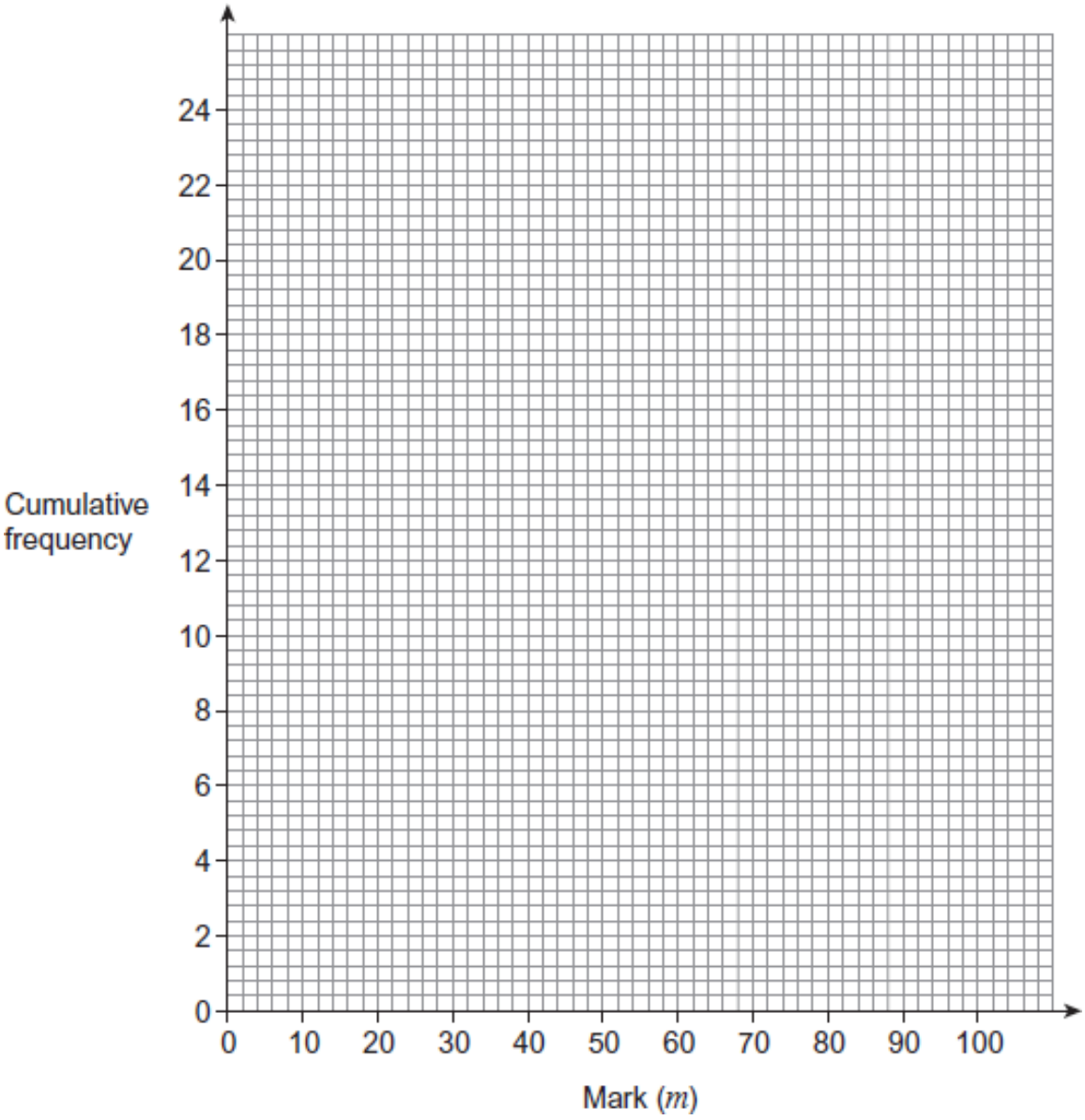
(2)

(Total 3 marks)

Q5. 24 students took a test.
The table shows information about their marks.

Mark (m)	**Frequency**
$20 < m \leq 40$	3
$40 < m \leq 60$	5
$60 < m \leq 80$	12
$80 < m \leq 100$	4

(a) Draw a cumulative frequency diagram for their marks.



(3)

(b) Use the cumulative frequency diagram to estimate the interquartile range.

_____

_____

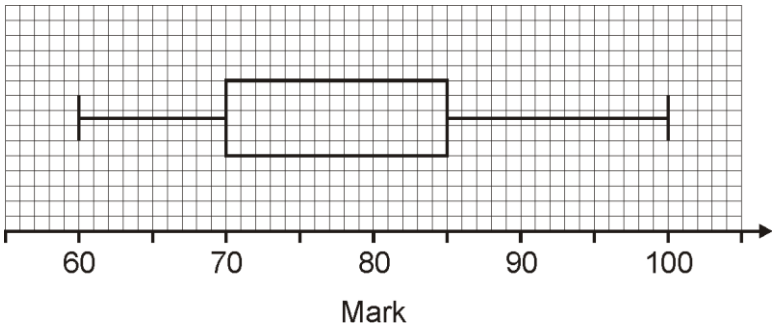
Answer _____

(2)

(Total 5 marks)

Q6. The box plot shows information about the marks of a Y11 class in a test.

Y11

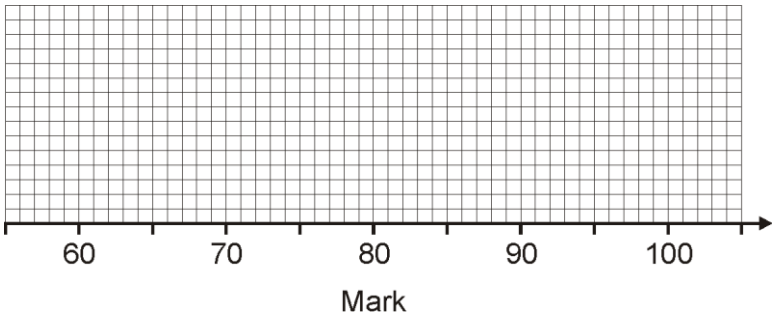


(a) The table shows information about the marks of the **boys** in the class.

Minimum	Lower quartile	Median	Upper quartile	Maximum
65	70	80	85	95

Draw a box plot for the marks of the **boys**.

Boys

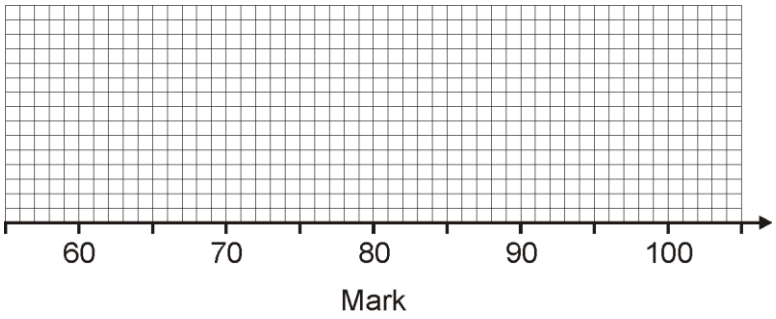


(2)

(b) One-quarter of the girls in the class scored 75 or less.
The inter-quartile range for the girls is the same as for the boys.

Draw a box plot for the marks of the girls.

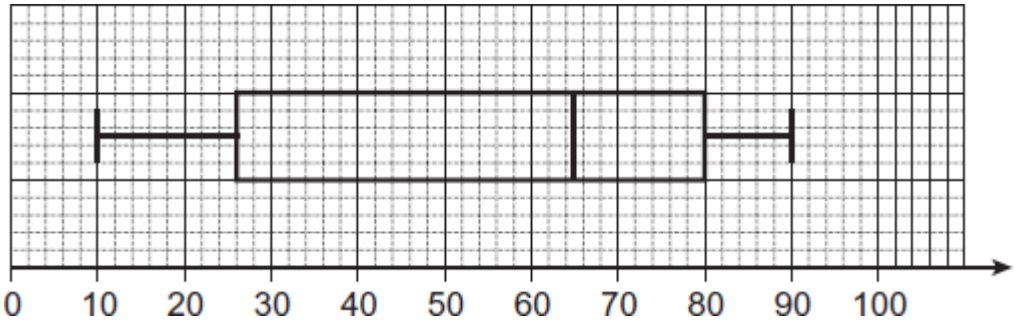
Girls



(4)

(Total 6 marks)

Q7. The diagram shows a box plot.



(a) Write down the median.

Answer _____

(1)

(b) Work out the interquartile range.

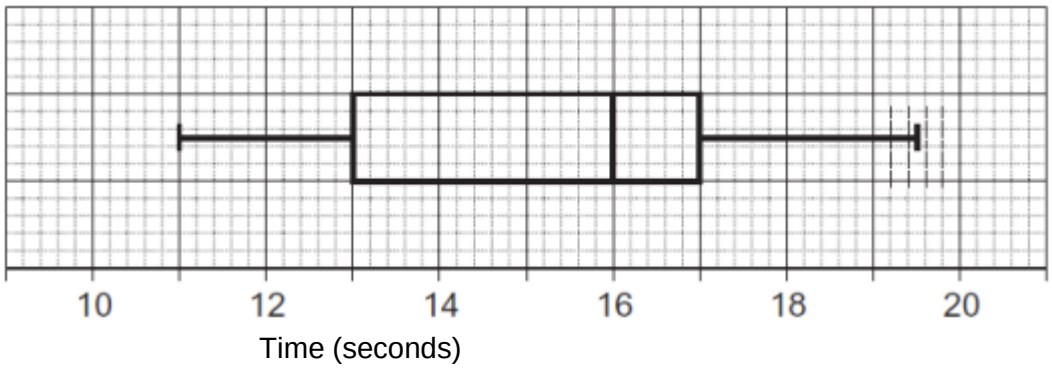
_____

Answer _____

(1)

(Total 2 marks)

Q8. Girls and boys are timed in a race.
The box plot shows information about the times for the girls.



(a) What fraction of the children ran the race in less than 13 seconds.

Answer _____

(1)

(b) Work out the interquartile range.

_____

Answer _____

(1)

(Total 2 marks)

Simultaneous Equations

Q1. Solve the simultaneous equations

$$5x + 6y = 3$$

$$2x - 3y = 12$$

Do **not** use trial and improvement. You **must** show your working.

Answer _____

(Total 3 marks)

Q2. Solve the simultaneous equations

$$2x - 3y = 24$$

$$6x + 2y = -5$$

Do **not** use trial and improvement. You **must** show your working.

Answer _____

(Total 3 marks)

Q3.(a) Solve the simultaneous equations

$$2x + 6y = 16$$

$$3x + 8y = 19$$

Do **not** use trial and improvement. You **must** show your working.

Answer _____

(4)

(b) Write down two simultaneous equations whose only solution is

$$x = 6,\ y = -5$$

Answer _____

and

_____

(2)

(Total 6 marks)

Q4. Solve the simultaneous equations

$$3x - 4y = 20$$

$$4x - 2y = 25$$

Answer _____

(Total 3 marks)

Q5. Use algebra to work out the x-coordinates of the points of intersection of

$$y = 3x^2$$

and $$y = 4x + 2$$

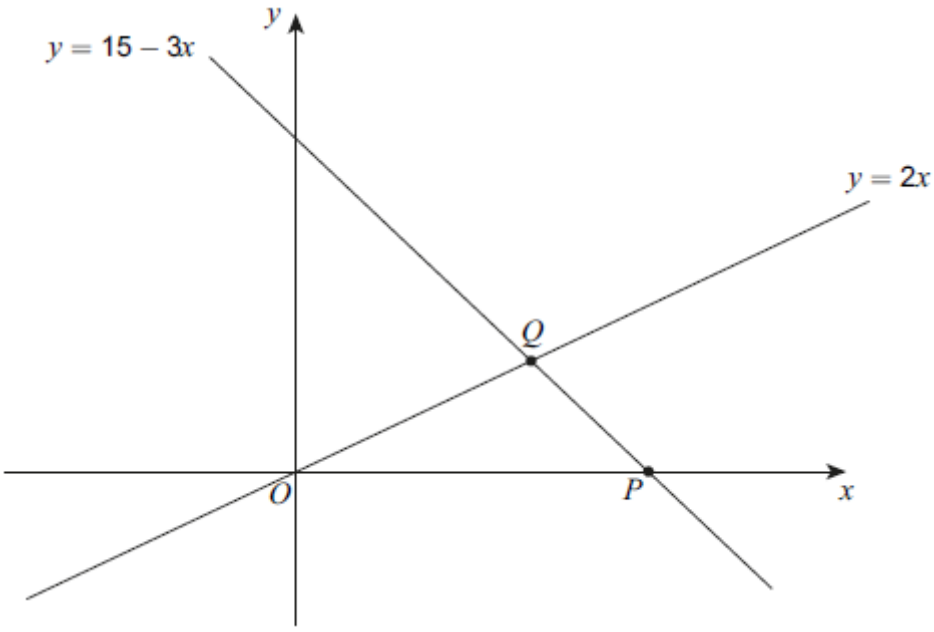
Give your answers to 1 decimal place.

Answer _____

(Total 5 marks)

Q6.

The sketch graphs of two straight lines are shown.



(a) Work out the coordinates of P.

Answer (_____ , _____)

(1)

(b) Work out the coordinates of Q.

_____

_____

_____

_____

Answer (_____ , _____)

(3)

(c) Use your answers to parts (a) and (b) to work out the area of triangle OPQ.

_____

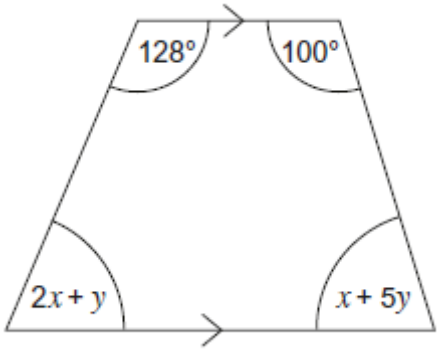
_____

Answer_____

(2)

(Total 6 marks)

Q7. The diagram shows a trapezium.



Work out the values of x and y.

_____

_____

_____

_____

_____

_____

_____

x = _____ degrees

y = _____ degrees

(Total 5 marks)

Q8. Solve the simultaneous equations

$$y = x^2 - 6x - 20$$

$$y = 4 - x$$

You **must** show your working.

Answer _____

(Total 5 marks)

Expanding Brackets

Q1.(a) Multiply out $3(2x - 7)$

Answer _____

(1)

(b) Factorise $x^2 + 8x$

Answer _____

(1)

Q2.(a) Expand and simplify $(x + 5)(x + 9)$

Answer _____

(2)

(b) Factorise fully $5x^2 - 10xy$

Answer _____

(2)

(Total 4 marks)

Q3.(a) Expand and simplify $(2x + 1)(x - 3)$

Answer _____

(2)

(b) Factorise $y^2 + 2y - 24$

Answer _____

(2)

(c) Simplify $(2xy^3)^6$

_____

_____

Answer _____

(2)

(Total 6 marks)

Q4. Expand and simplify $6(x - 3) - 4(x - 5)$

_____

_____

_____

_____

_____

_____

Answer _____

(Total 3 marks)

Q5. Expand and simplify $(2x + 5y)(3x - 8y)$

_____

_____

_____

Answer _____

(Total 3 marks)

Q6. You are given that $(2x + 1)(ax + b) \equiv 6x^2 - 5x + c$

Work out the values of a, b and c.

_____

_____

_____

_____

_____

a = _____ b = _____ c = _____

(Total 4 marks)

Q7. Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

Answer _____

(Total 3 mark)

Q8.

Expand and simplify $(t + 4)^3$

Answer _____

(Total 3 marks)

Factorising

Q1.(a) Factorise $3x - 15$

Answer _____

(1)

(b) Multiply out $5(y + 4t - 2)$

_____

Answer _____

(2)

Q2.(a) Expand $w(w - 4)$

_____

Answer _____

(2)

(b) Factorise $8t + 24$

_____

Answer _____

(1)

Q3.(a) Factorise $x^2 - 100$

_____

_____

Answer _____

(b) Factorise $x^2 + 7x - 30$

_____

_____

_____

Answer _____

(1)

Q4. Factorise $x^2 + 9x + 14$

Answer _____

(Total 2 marks)

Q5. Factorise $3x^2 + 14x + 8$

Answer _____

(Total 2 marks)

Q6. (a) Factorise fully $3x^2 - 12$

Answer _____

(2)

(b) Factorise $5x^2 + 4xy - 12y^2$

Answer _____

(3)

(Total 5 marks)

Q7.

Simplify $\dfrac{5x^2 + 11x - 12}{x^2 + 3x}$

Answer _____

(Total 3 marks)

Q8.(a) Factorise $3x^2 - 13x - 10$

Answer _____

(2)

(b) Simplify $\dfrac{3x^2 - 15x}{3x^2 - 13x - 10}$

Answer _____

(2)

(Total 4 marks)

Solving Quadratics

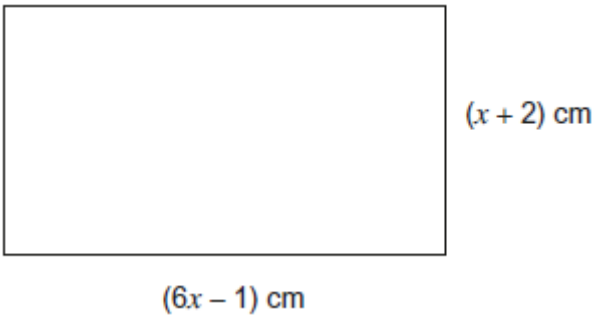
Q1. Circle the equation with roots 4 and –8

$4x(x - 8) = 0$ $\qquad$ $(x - 4)(x + 8) = 0$

$x^2 - 32 = 0$ $\qquad$ $(x + 4)(x - 8) = 0$

(Total 1 mark)

Q2. The area of this rectangle is 28 cm^2

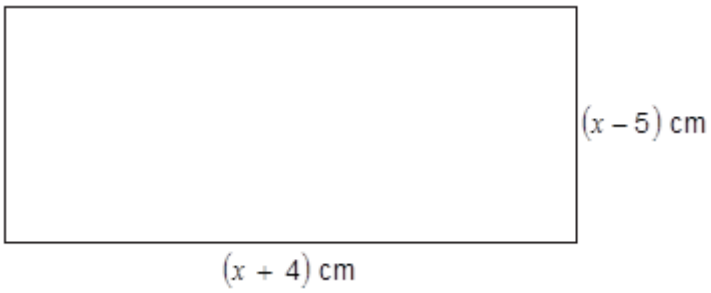


Work out the perimeter of the rectangle.

Answer _____ cm

(Total 7 marks)

Q3. The diagram shows a rectangle.



The area of the rectangle is 90 cm^2.

Set up and solve a quadratic equation to work out the value of x.

_____

_____

_____

_____

_____

x = _____ cm

(Total 5 marks)

Q4. Solve $2x^2 + 3x - 6 = 0$

Give your answers to 2 decimal places.

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ and _____

(Total 3 marks)

Q5. Solve the quadratic equation $5x^2 + 8x + 2 = 0$

Give your answers to 1 decimal place.

Answer _____

(Total 3 marks)

Q6. Solve $5x^2 + 3x - 4 = 0$

Give your answers to 2 decimal places.

Answer _____ and _____

(Total 3 marks)

Q7. Solve the quadratic equation $3x^2 - 12x - 5 = 0$

Give your answers to 2 decimal places.

Answer _____

(Total 3 marks)

Q8.

Show that $x(2x + 5) = \frac{x}{3} + 4$

can be arranged as the quadratic equation $3x^2 + 7x - 6 = 0$

(Total 3 marks)

Linear and Quadratic Graphs

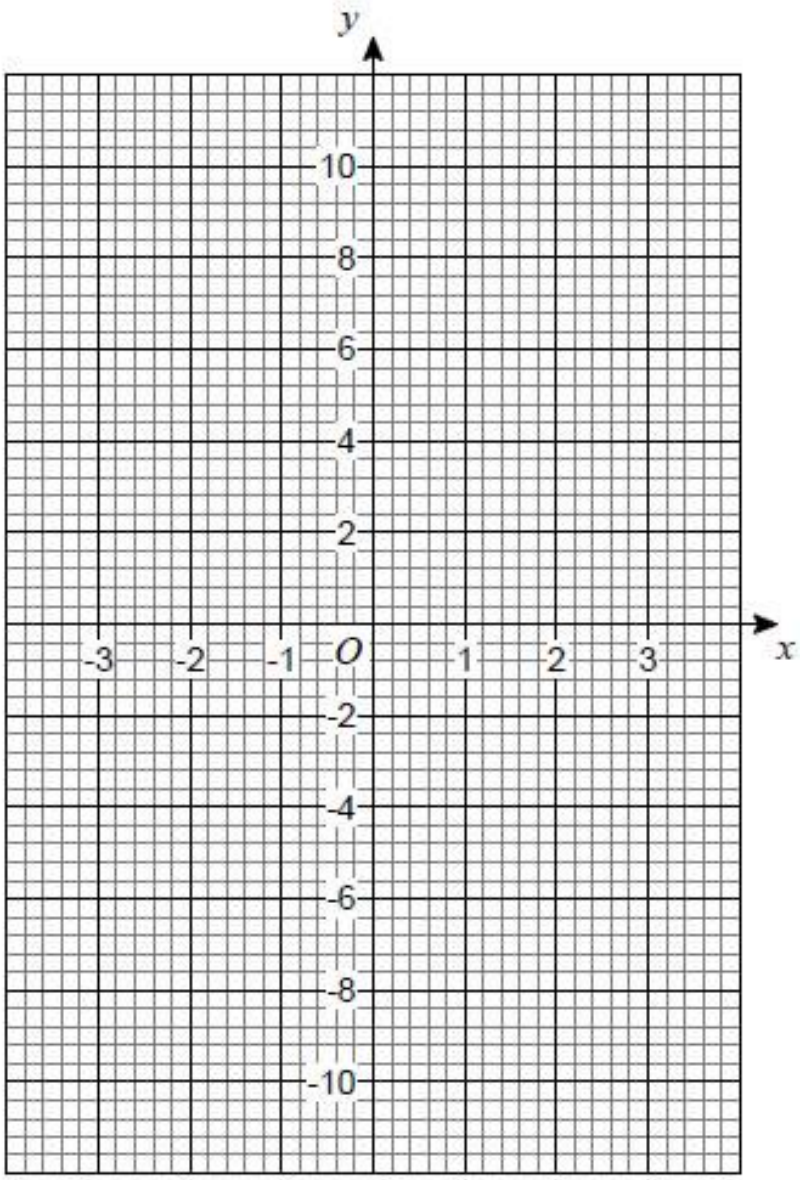
Q1.

(a) Complete the table for $y = 3x + 1$

x	−3	−2	−1	0	1	2	3
y	−8		−2		4		

(2)

(b) On the grid draw the graph of $y = 3x + 1$ for values of x from −3 to 3



(2)

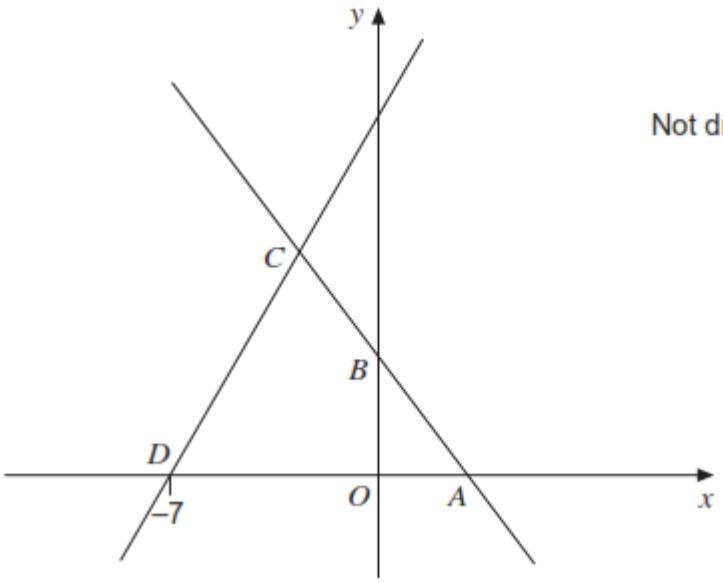
(c) Solve $x = 3x + 1$

$x =$ _____

(2)

(Total 6 marks)

Q2. In the diagram, points A, B and C lie on the line $2x + y = 6$
B is the midpoint of AC.
D is the point $(-7, 0)$.



Not drawn accurately

Work out the equation of the line through C and D.

Answer _____

(Total 5 marks)

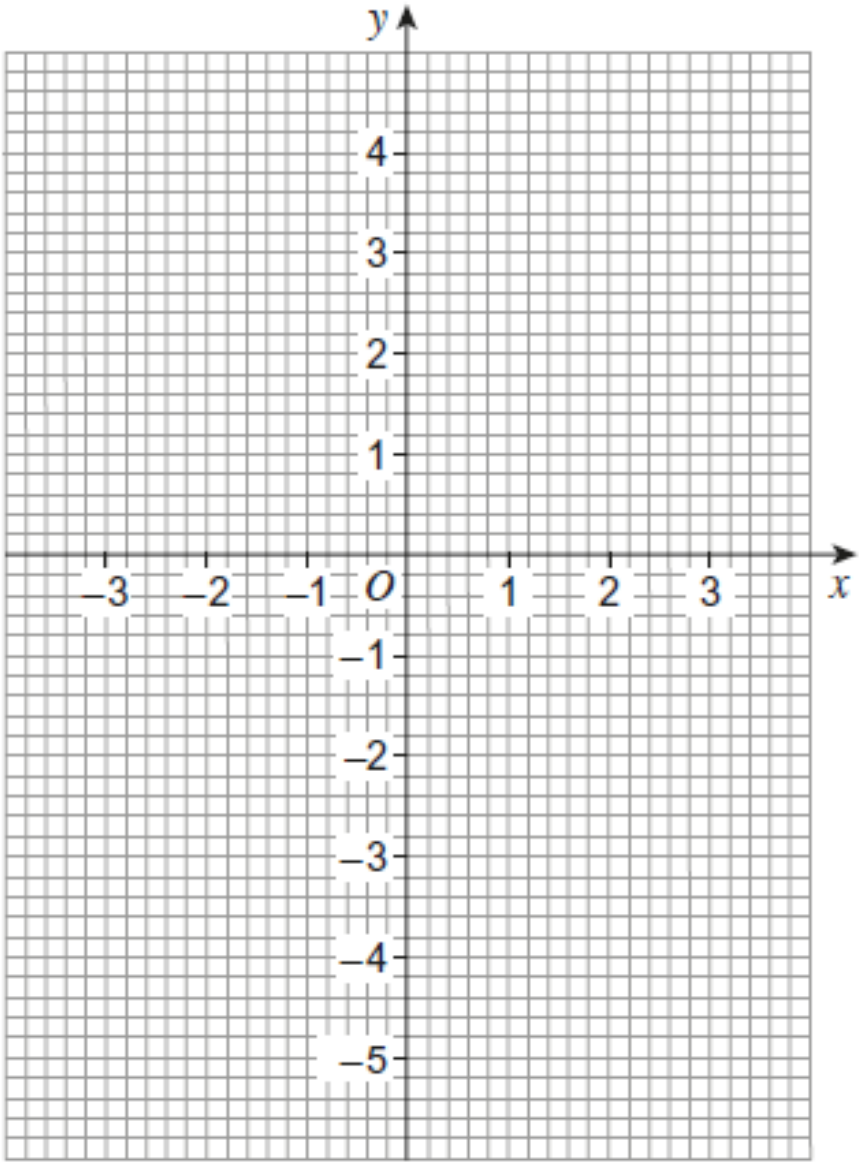
Q3.

(a) Complete the table of values for $y = x^2 - 5$ for values of x from –3 to 3

x	–3	–2	–1	0	1	2	3
y	4		–4			–1	4

(2)

(b) Draw the graph of $y = x^2 - 5$ for values of x from –3 to 3



(2)

(c) Use the graph of $y = x^2 - 5$ to write down the values of x when $y = 0$

Answer _____ and _____

(1)

(Total 5 marks)

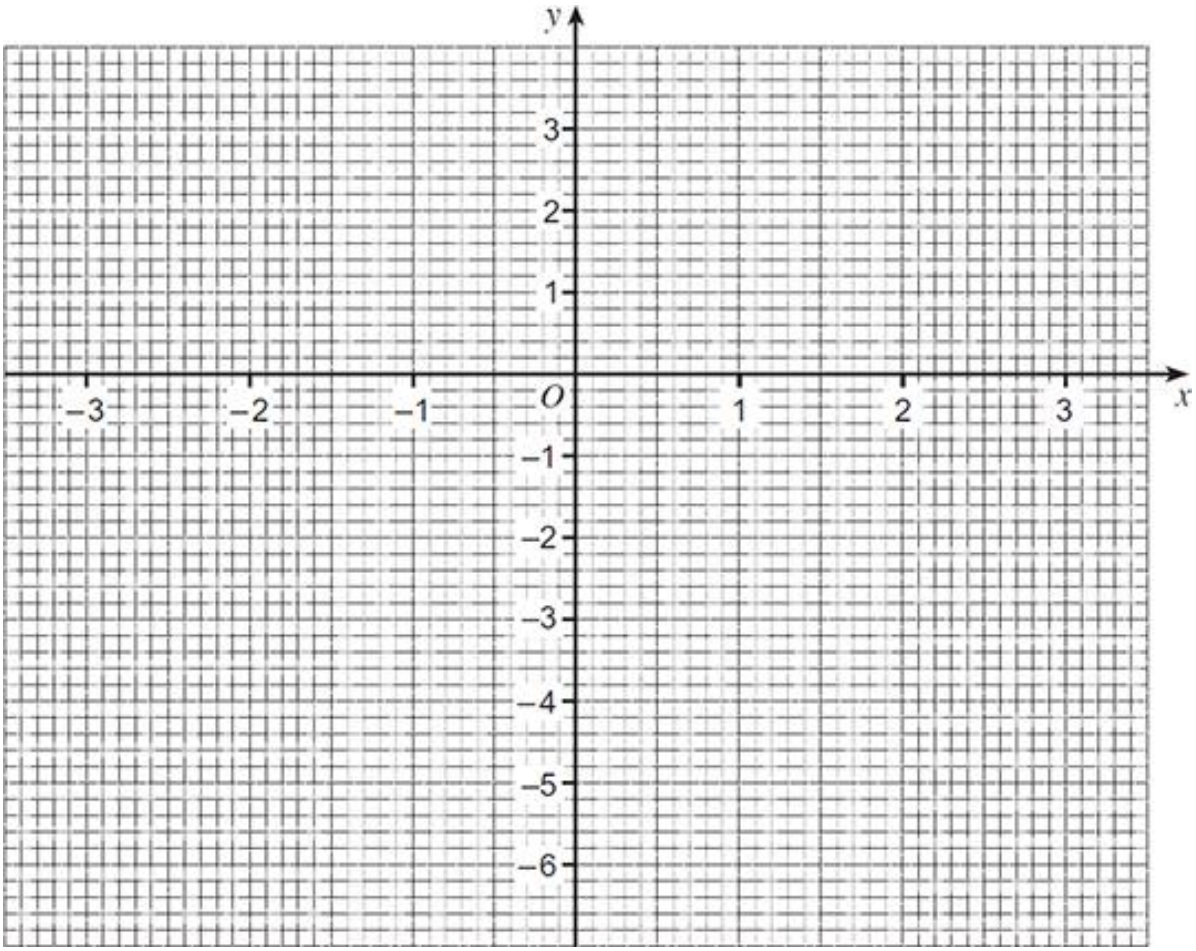
Q4.

(a) Complete the table of values for $y = 3 - x^2$

x	−3	−2	−1	0	1	2	3
y		−1	2		2		−6

(2)

(b) Draw the graph of $y = 3 - x^2$ for values of x from − 3 to 3



(2)

(c) Use the graph to work out the values of x when $y = -1.5$

_____

_____

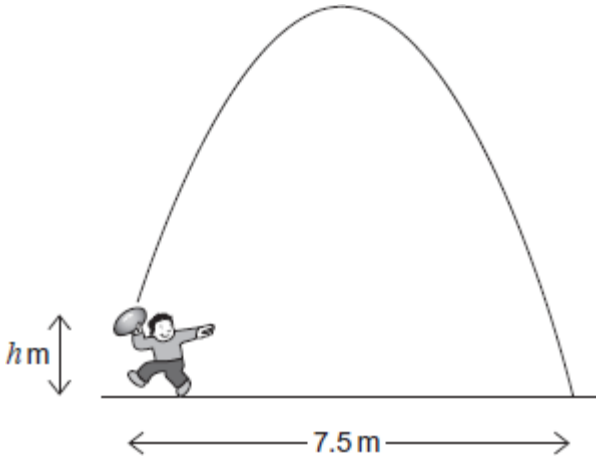
Answer _____ and _____

(2)

(Total 6 marks)

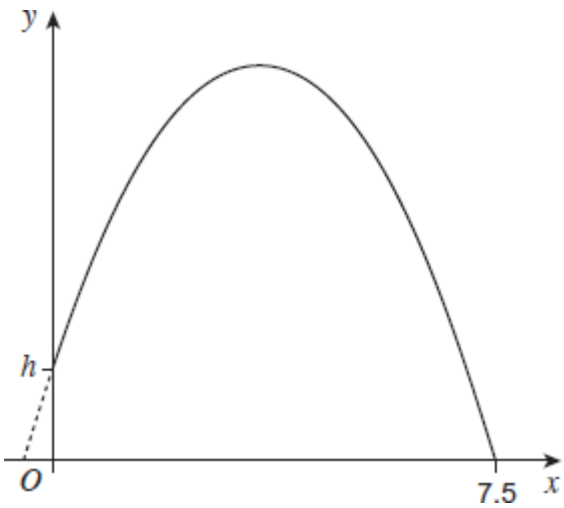
Q5.

The diagram shows a ball being thrown.
It is thrown from a height h metres above level ground.
It lands 7.5 metres from where it was thrown.



The path of the ball can be modelled by the equation $y = \frac{1}{15}(2x + 1)(2x - 15)$

The sketch shows the graph of the equation.



(a) Work out the value of h. You **must** show your working.

Answer _____

(2)

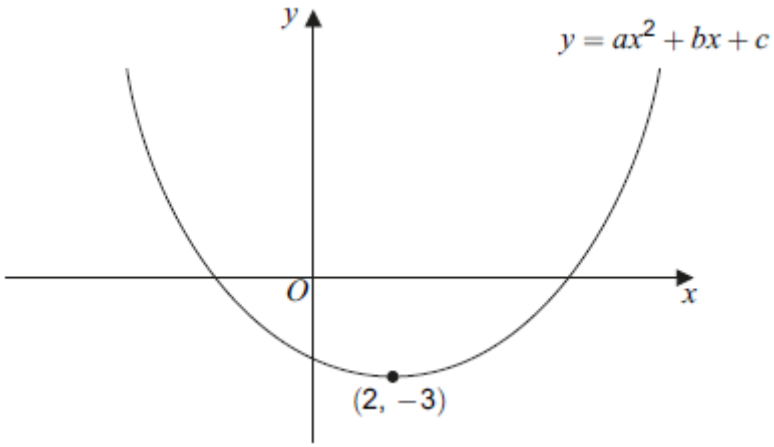
(b) Show that the maximum height reached by the ball is $4\frac{4}{15}$ metres.

Use the symmetry of the graph to help you. You **must** show your working.

(2)

(Total 4 marks)

Q6. A sketch of $y = ax^2 + bx + c$ is shown. The minimum point is (2, −3).



For the sketch shown, circle the correct answer in each of the following.

(a) The value of a is

zero	positive	negative

(1)

(b) The value of c is

zero	positive	negative

(1)

(c) The solutions of $ax^2 + bx + c = 0$ are

both zero	both positive	both negative	one positive and one negative

(1)

(d) The **number** solutions of $ax^2 + bx + c = -6$ is

0	1	2	3

(1)

(e) The equation of the tangent to $y = ax^2 + bx + c$ at (2, −3) is

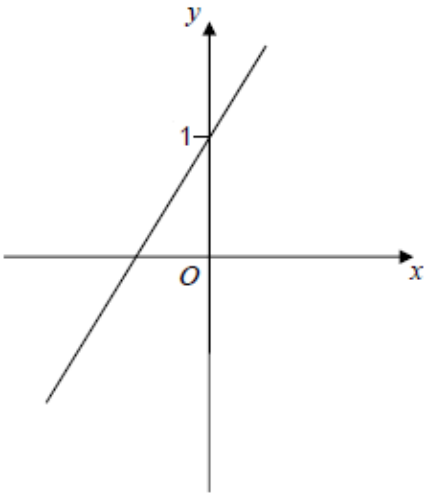
$x = 2$	$y = 2$	$x = -3$	$y = -3$

(1)
(Total 5 marks)

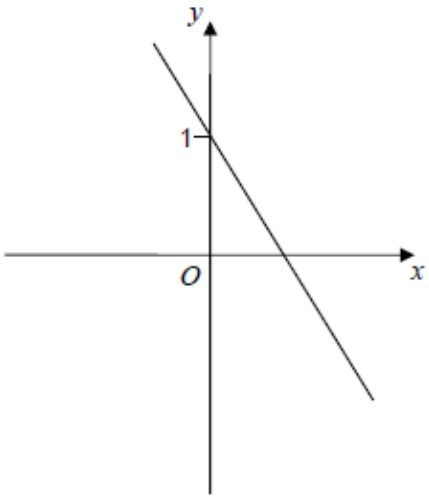
Q7. One of these graphs is a sketch of $y = 1 - 2x$

Which one? Circle the correct letter.

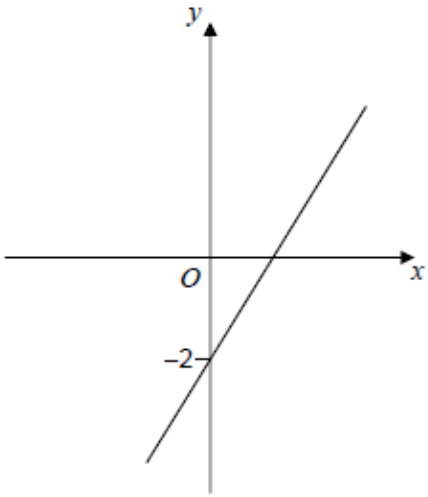
A



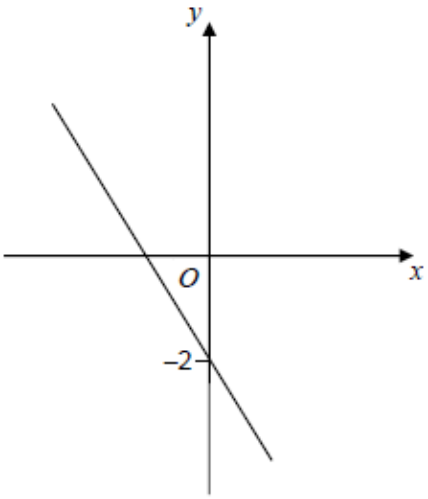
B



C



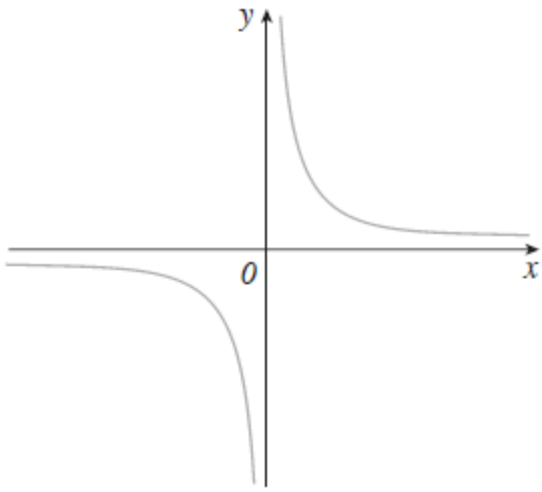
D



(Total 1 mark)

Q8.

(a) Circle a possible equation for the graph shown below.

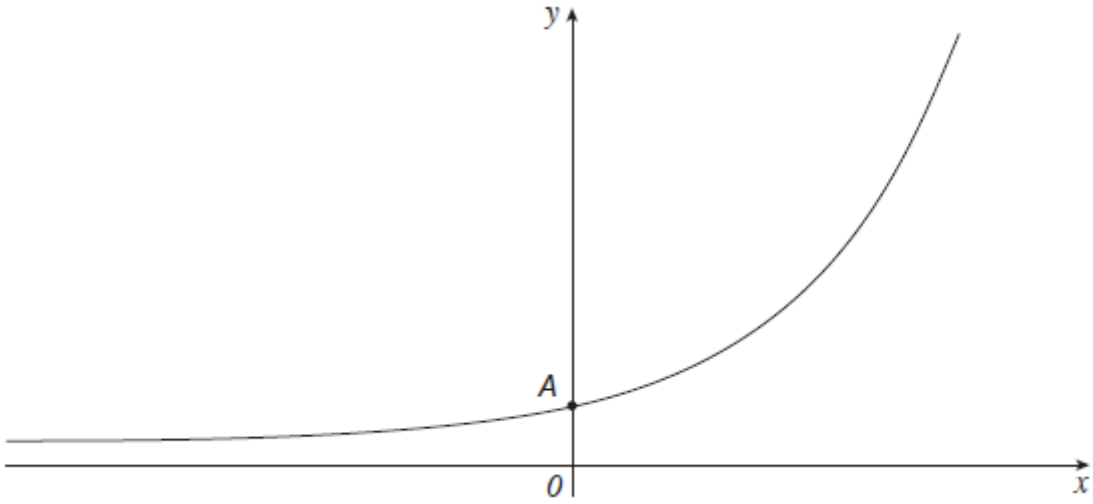


$y = x^3$ $\quad$ $y = \frac{1}{x}$ $\quad$ $y = \cos x$ $\quad$ $y = \sin x$

(1)

(b) This is the graph of $y = 2^x$

Write down the co-ordinates of A.



Answer (_____ , _____)

(1)

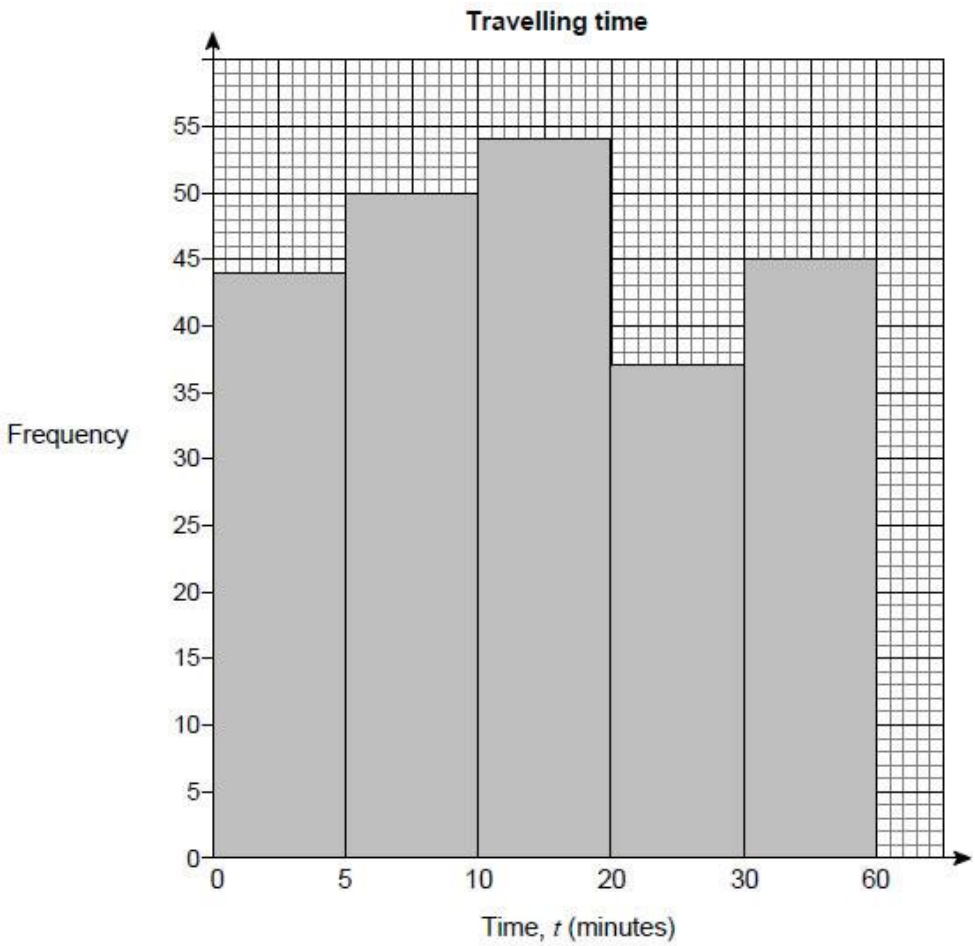
(Total 2 marks)

Histograms

Q1. Joe asked 230 students how long it took them to travel to school.

Travelling time, *t* (minutes)	**Number of students**
$0 < t \leq 5$	44
$5 < t \leq 10$	50
$10 < t \leq 20$	54
$20 < t \leq 30$	37
$30 < t \leq 60$	45

This is Joe's attempt to draw a histogram to show the data.



Make **two** criticisms of his histogram.

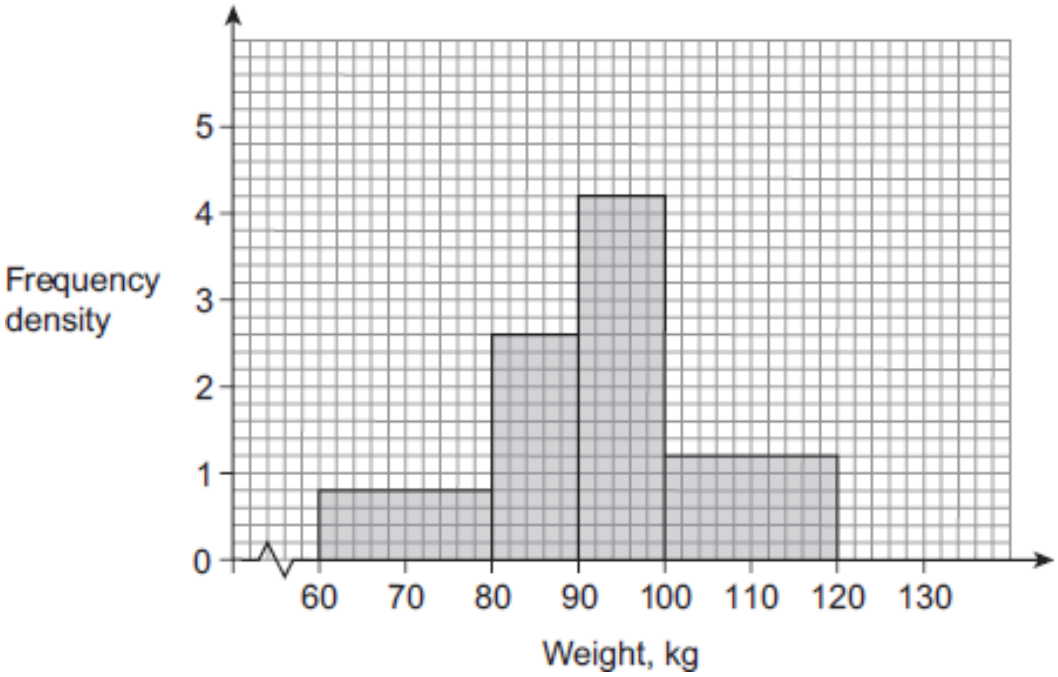
Criticism 1 _____

_____

Criticism 2 _____

_____

Q2. The histogram represents the weights, in kilograms, of the people on a fitness course.



(a) Work out the total number of people on the fitness course.

Answer _____

(3)

(b) Six more people join the course.
They each weigh between 120 kilograms and 130 kilograms.

Complete the histogram.

(1)

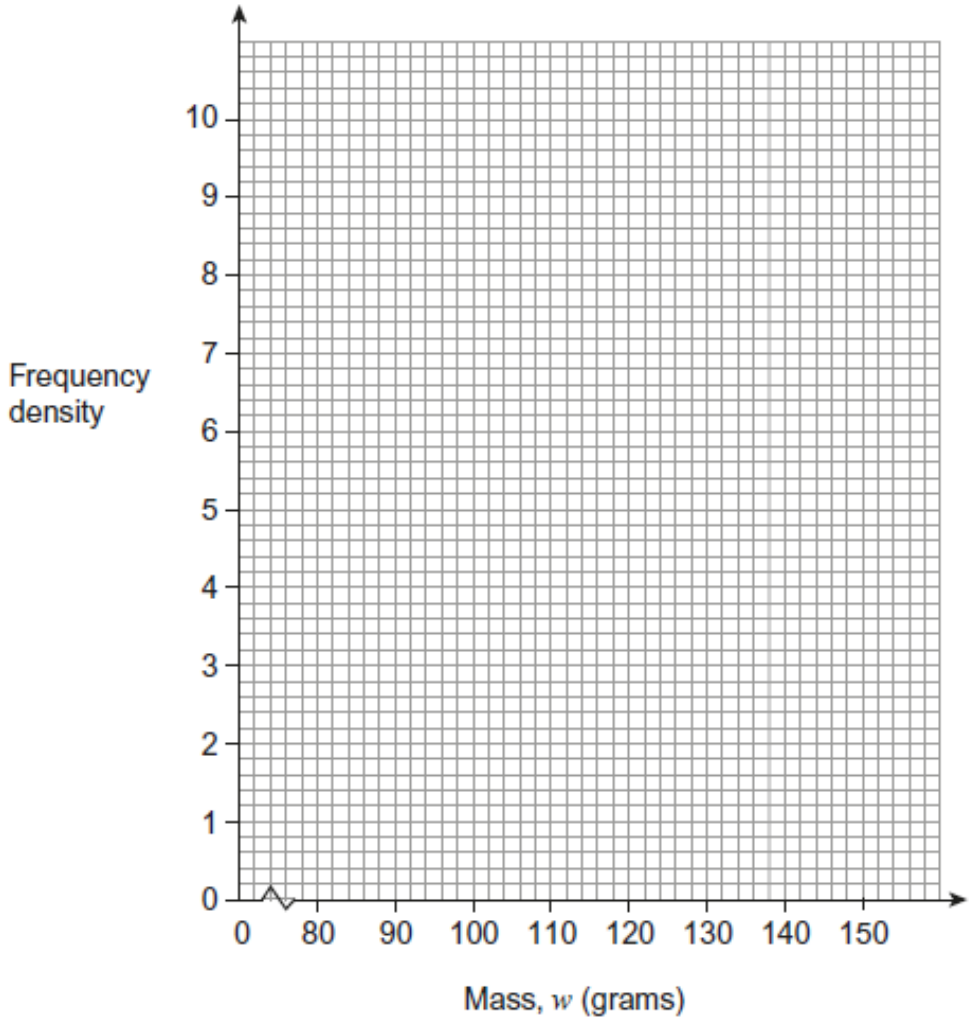
(Total 4 marks)

Q3. The table shows information about the masses of 400 hamsters.

Mass, w (grams)	Frequency
$80 < w \leq 100$	100
$100 < w \leq 115$	150
$115 < w \leq 125$	90
$125 < w \leq 150$	60

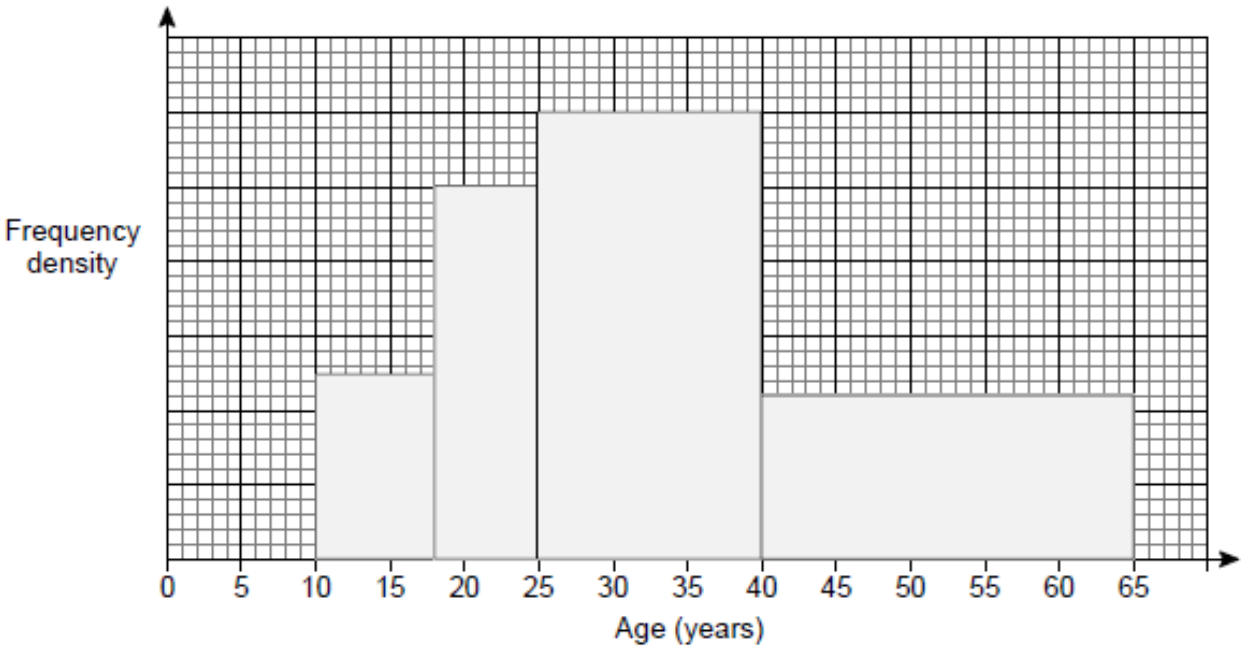
Draw a histogram for the data. You may use the table to help you.

Mass, w (grams)	Frequency		
$80 < w \leq 100$	100		
$100 < w \leq 115$	150		
$115 < w \leq 125$	90		
$125 < w \leq 150$	60		



(Total 4 marks)

Q4. The histogram shows the ages, in years, of members of a chess club.



There are 22 members with ages in the range 40 ≤ age < 65

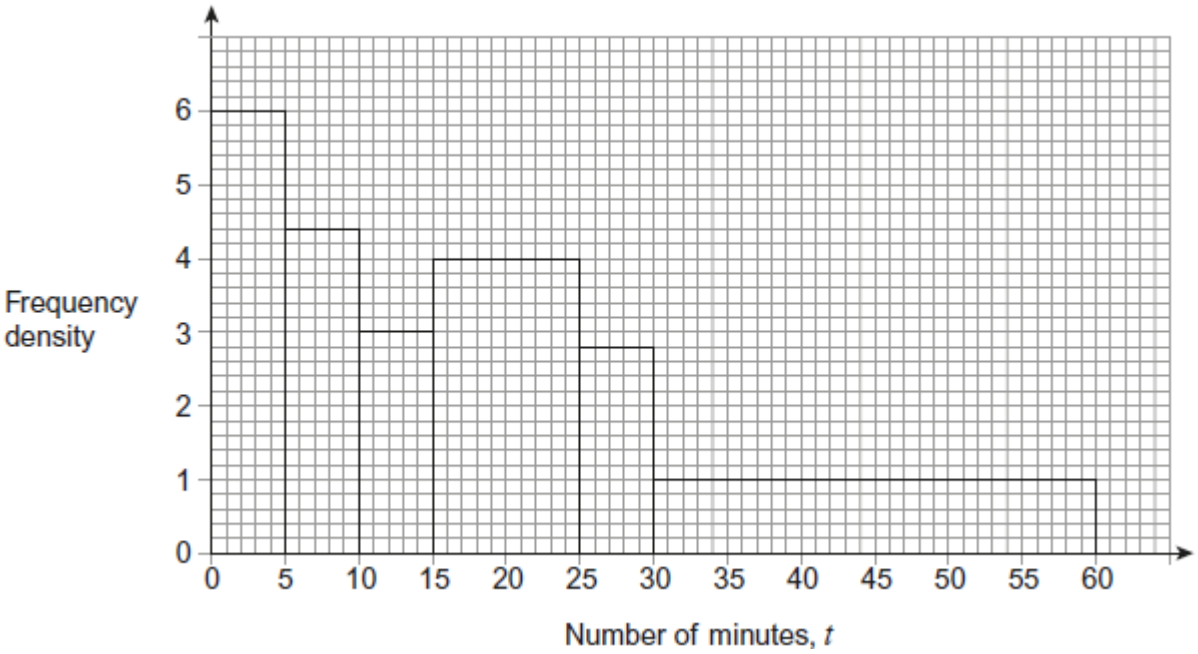
Work out the number of members with ages in the range 25 ≤ age < 40

Answer _____

(Total 4 marks)

Q5. A train company records the number of minutes, *t*, some trains were late in one month.

The histogram summarises the results.



(a) How many trains were **more** than 15 minutes late?

_____

_____

_____

_____

_____

Answer _____

(3)

(b) Which is the modal class?

Circle your answer.

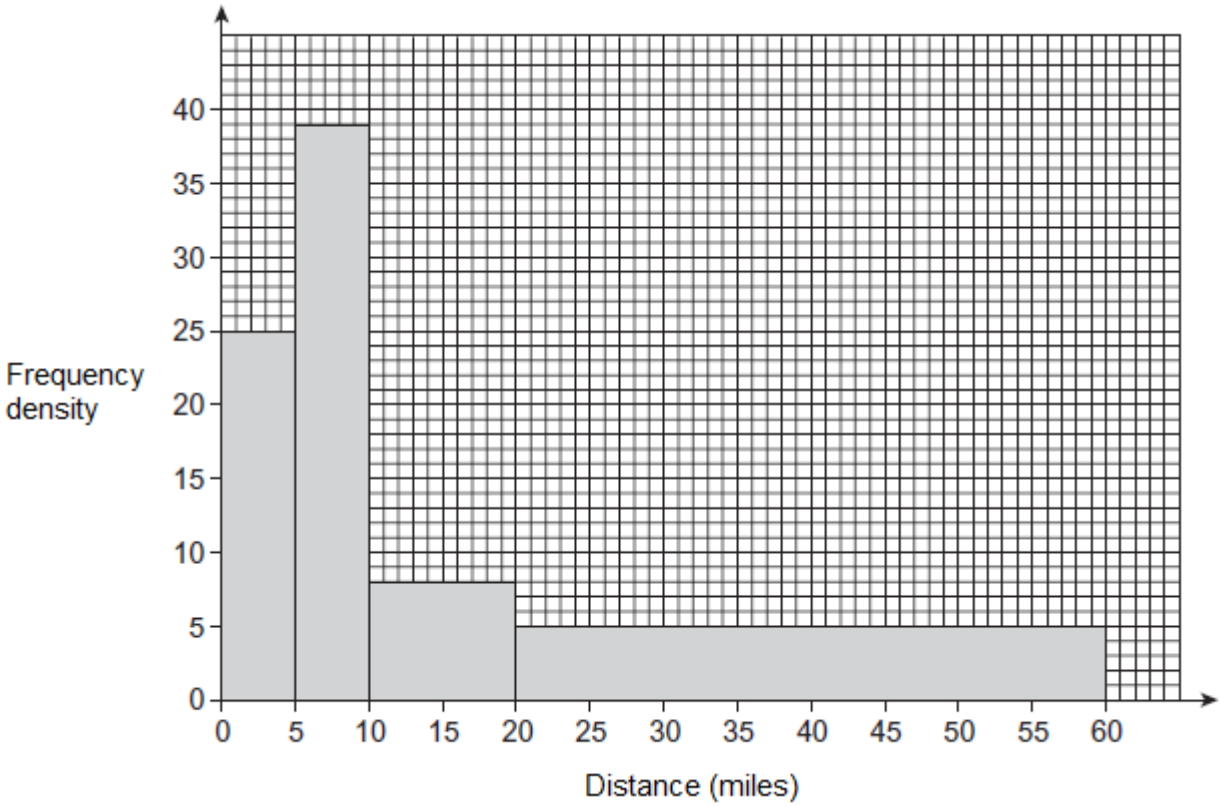
$0 < t \leq 5$ $\quad$ $15 < t \leq 25$ $\quad$ $25 < t \leq 30$ $\quad$ $30 < t \leq 60$

(1)

(Total 4 marks)

Q6.

The histogram shows information about the distances 600 people travel to work.



(a) How many people travel more than 20 miles to work?

_____

_____

Answer _____

(2)

(b) 224 of these people travel further to work than I do.

Estimate the distance I travel to work.

_____

_____

_____

_____

Answer _____ miles

(4)

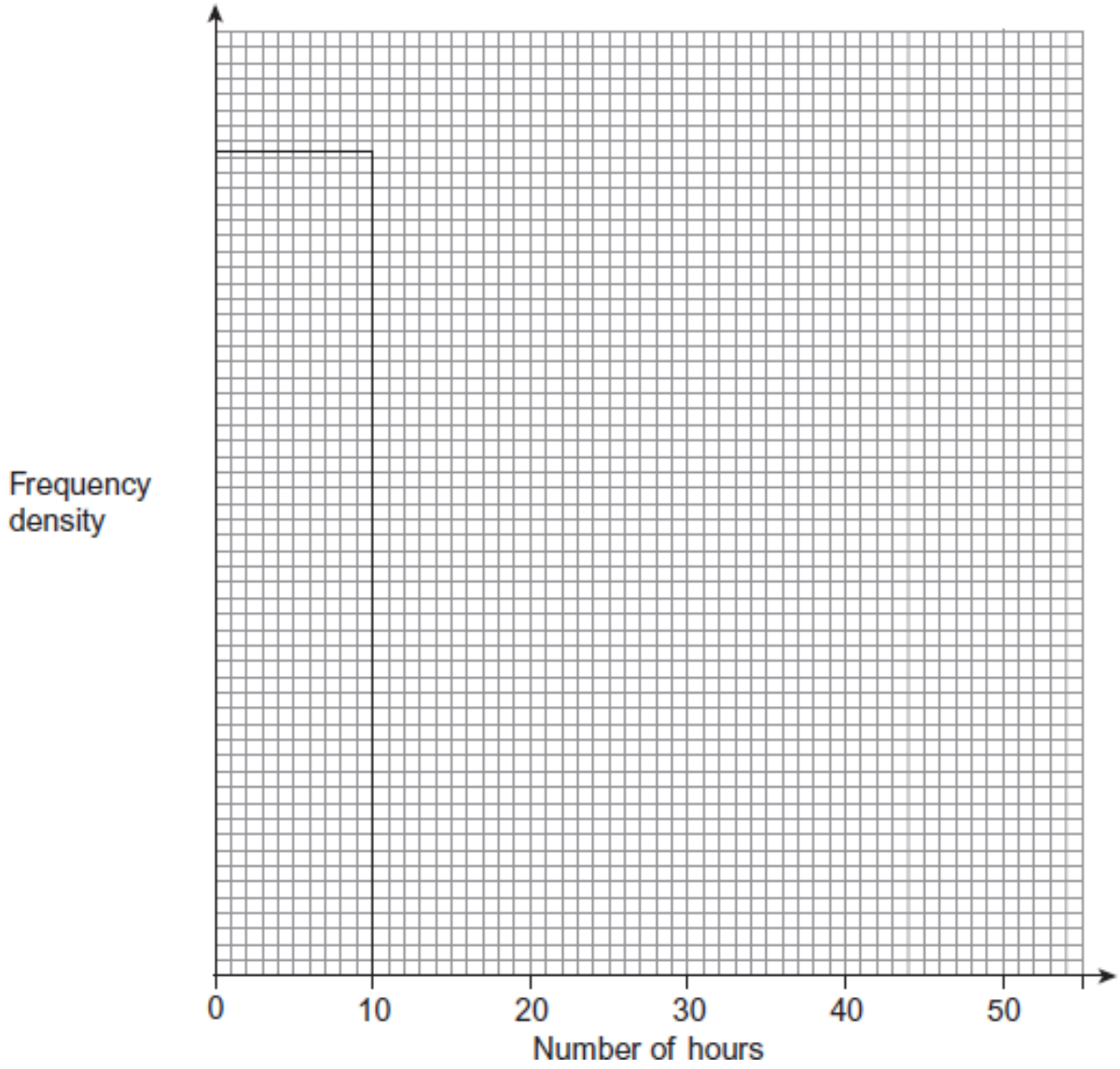
(Total 6 marks)

Q7. 70 people gave information about the number of hours they worked in one week.
The table and histogram show some of that information.

Number of hours, n	Frequency
$0 < n \leq 10$	21
$10 < n \leq 20$	x
$20 < n \leq 40$	y
$40 < n \leq 50$	17

$x : y = 3 : 5$

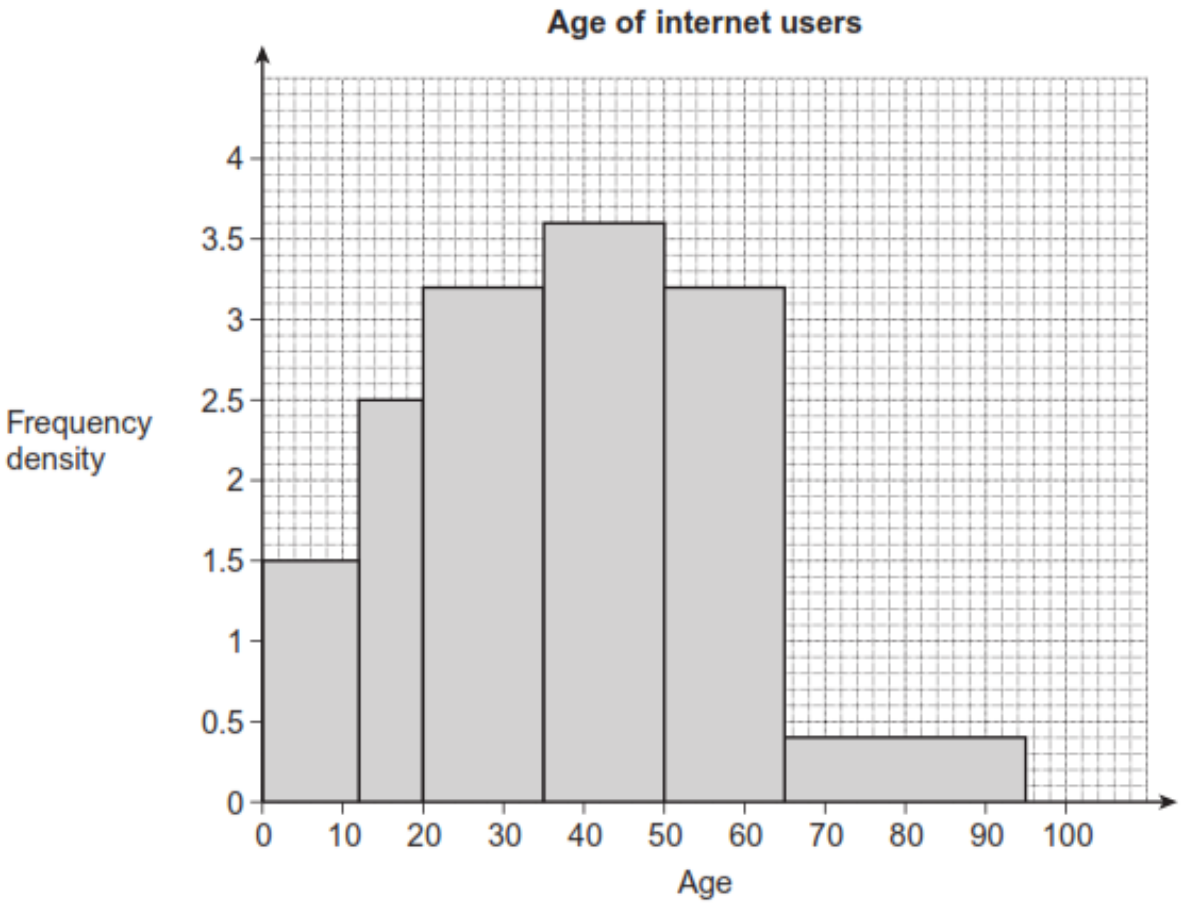
Complete the histogram.
Remember to label the **scale** on the frequency density axis.



(Total 6 marks)

Q8.

(a) The histogram shows information about 200 internet users.



How many of these internet users are aged under 20?

_____

_____

_____

_____

Answer _____

(3)

Sequences

Q1.(a) The numbers in this sequence decrease by the same amount each time.

74 __ 58 50 42 __

What are the **two** missing numbers?

_____

Answer _____ and _____

(2)

(b) The numbers in this different sequence decrease by the same amount each time.

26 __ __ __ 6

What are the **three** missing numbers?

_____

_____

_____

Answer _____ , _____ , _____

(2)

Q2. Here are the first five terms of a linear sequence.

9 15 21 27 33 ...

Work out the *n*th term.

_____

_____

Answer _____

(Total 2 marks)

Q3. Here is a linear sequence.

46 40 34 28 22 ___

Work out the *n*th term of the sequence.

_____

_____

Answer _____

(Total 2 marks)

Q4. Here is a sequence.

40 35 30 25 20

Circle the expression for the nth term of the sequence.

$5n + 35$ $5n - 45$ $45 - 5n$ $n - 5$

(Total 1 mark)

Q5. (a) A sequence starts 5 13 21 29

Circle the expression for the nth term.

$8 - 3n$ $8n + 5$ $8n - 3$ $5n + 8$

(1)

(b) The term-to-term rule for a different sequence is

Multiply the previous term by 2 then subtract 5

The second term in this sequence is $2x + 7$

The sum of the first three terms is 57

Work out the value of x.

Answer _____

(4)

(Total 5 marks)

Q6. The term-to-term rule for a sequence is

multiply by 2

The sequence starts

a $\quad$ $2a$ $\quad$ ___ $\quad$ ___

The total value of the first three terms is 63

Work out the total value of the first four terms.

_____

_____

_____

_____

_____

_____

Answer _____

(Total 3 marks)

Q7.

(a) The nth term of a sequence is $2^n + 2^{n-1}$

Work out the 10th term of the sequence.

_____

Answer _____

(1)

(b) The nth term of a different sequence is $4(2^n + 2^{n-1})$

Circle the expression that is equivalent to $4(2^n + 2^{n-1})$

$2^{n+2} + 2^{n+1}$ $\qquad$ $2^{2n} + 2^{2(n-1)}$

$8^n + 8^{n-1}$ $\qquad$ $2^{n+2} + 2^{n-1}$

(1)

(Total 2 marks)

Q8.

Work out an expression for the *n*th term of the quadratic sequence

11 15 21 29 39 __

*n*th term = _____

(Total 4 marks)

Percentages

Q1. Circle the calculation that increases 400 by 7%

400 × 0.07 400 × 0.7 400 × 1.07 400 × 1.7

(Total 1 mark)

Q2. In a school, 60% of the students are girls.

50% of the girls walk to school.
20% of the boys walk to school.

What percentage of the students walk to school?

_____

_____

_____

_____

_____

_____

Answer _____ %

(Total 3 marks)

Q3. In 1999 the minimum wage for adults was £3.60 per hour.

In 2013 it was £6.31 per hour.

Work out the percentage increase in the minimum wage.

_____

_____

_____

_____

Answer _____ %

(Total 3 marks)

Q4. Sophie sells birthday cards.

She adds 30% profit to the cost price.
She sells the cards for £2.34 each.
She wants to increase her profit to 40% of the cost price.

How much should she sell each card for?

Answer £ _____

(Total 3 marks)

Q5.

I increase a number by 24%
The answer is 6014.

What number did I start with?

Answer _____

(Total 3 marks)

Q6. £1800 is invested at 4% compound interest per year.

How many years will it take for the investment to be worth £2000?

Answer _____ years

(Total 4 marks)

Q7. David invests £5000 in a savings account.
The account pays 3.2% compound interest per year.

Work out the value of his investment after 3 years.
Give your answer to the nearest penny.

Answer £ _____

(Total 4 marks)

Q8.

Matthew invests some money in a building society.

His money earns 5% compound interest every year.
He wants it to be worth at least £9000 at the end of 3 years.

What is the smallest amount he can invest?

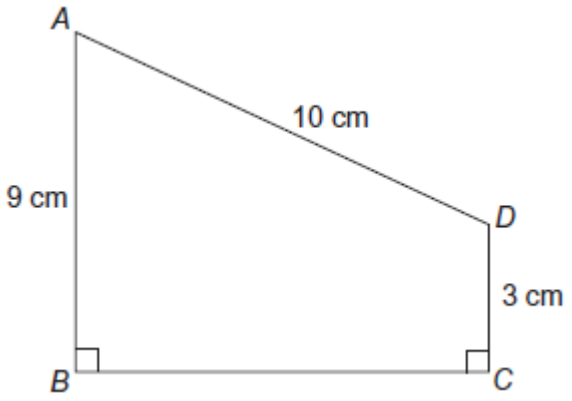
Answer £ _____

(Total 4 marks)

Pythagoras and Trigonometry

Q1.

ABCD is a trapezium.



Work out the length of *BC*. You **must** show your working.

_____

_____

_____

_____

_____

_____

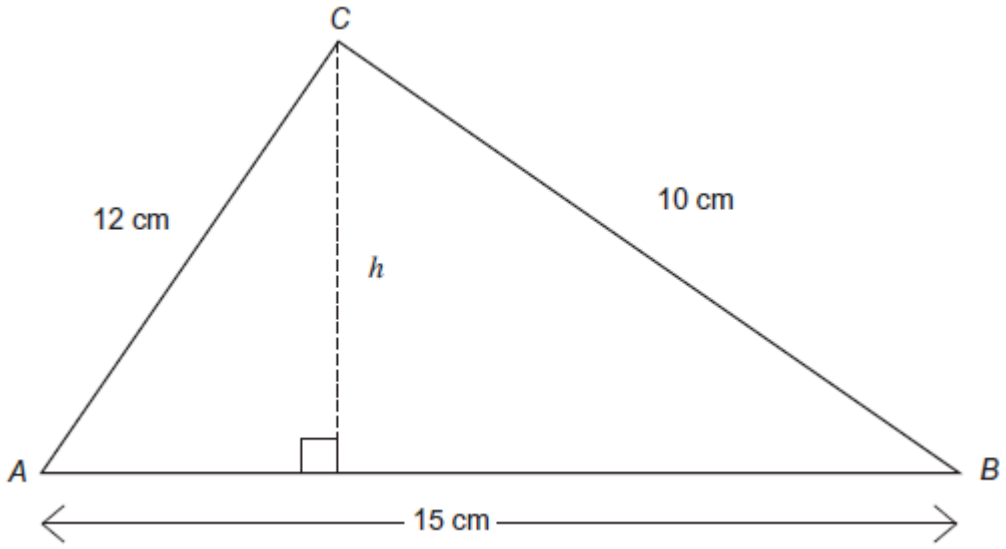
_____

Answer _____ cm

(Total 4 marks)

Q2.

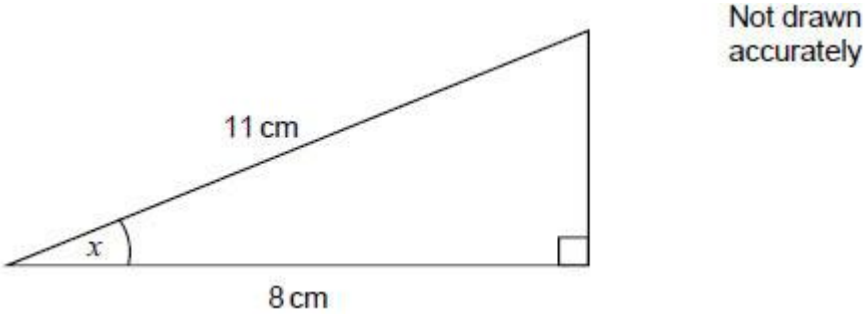
Work out the height h of the triangle ABC.



(Total 5 marks)

Q3.

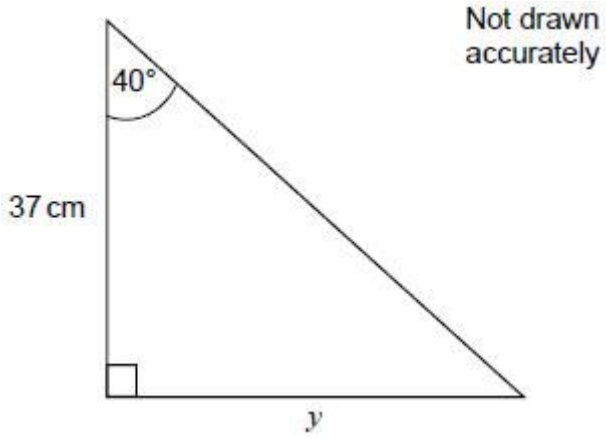
(a) Work out the size of angle x.



Answer _____ degrees

(2)

(b) Work out length y.



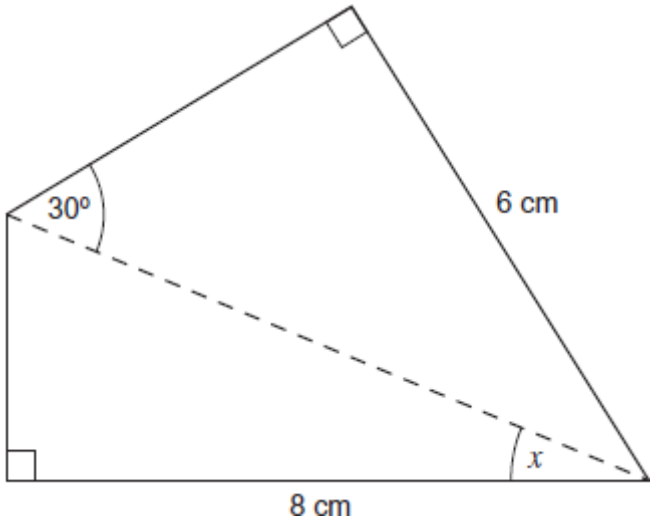
Answer _____ cm

(2)

(Total 4 marks)

Q4.

The diagram shows a quadrilateral.



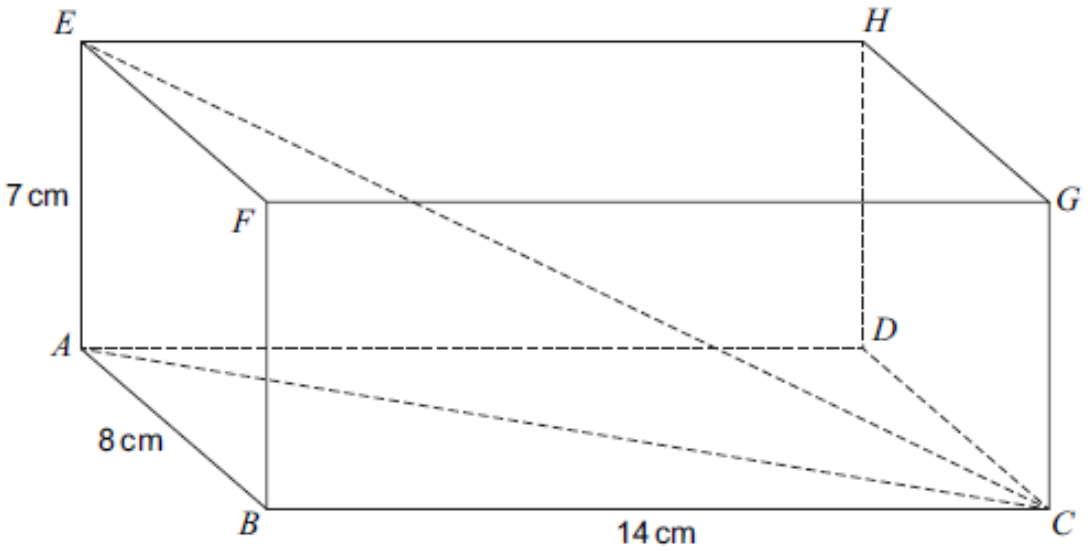
Work out the size of angle x.

Answer _____ degrees

(Total 4 marks)

Q5.

$ABCDEFGH$ is a cuboid.



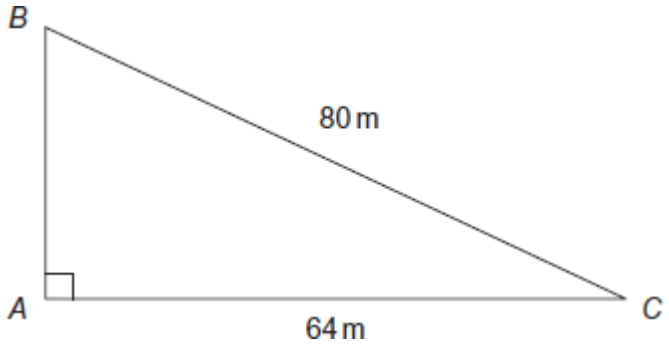
Work out the angle between EC and $ABCD$.

Answer_____ degrees

(Total 3 marks)

Q6.

This triangular plot of land is for sale.



The land is sold for £ 6400 per acre.
1 acre = 4047 m^2

Work out the cost of the land. Give your answer to 2 significant figures.

_____

_____

_____

_____

_____

_____

_____

_____

_____

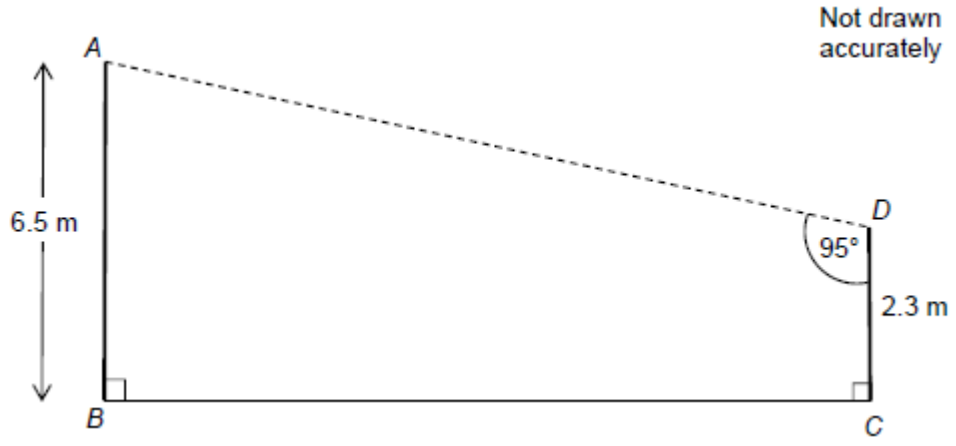
£ _____

(Total 6 marks)

Q7.

The diagram shows a design for a zipwire.

The zipwire will run between the top of two vertical posts, *AB* and *CD*.



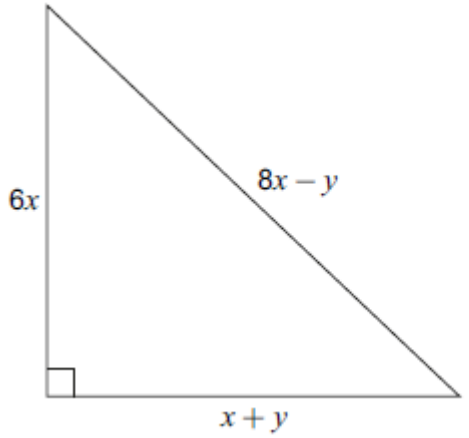
Work out the distance *AD*.

Answer _____ m

(Total 4 marks)

Q8.

The diagram shows a right-angled triangle.



Not drawn accurately

Prove algebraically that $x : y = 2 : 3$

(Total 6 marks)

Vectors

Q1. Here are two column vectors.

$\mathbf{f} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ $\mathbf{g} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Work out $3\mathbf{f} - 2\mathbf{g}$

_____

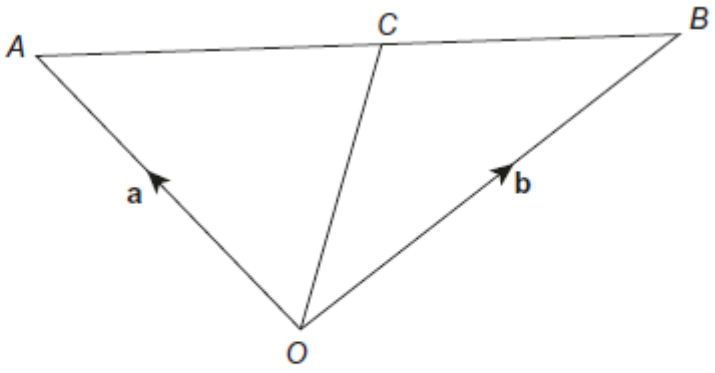
_____

_____

Answer _____

(Total 2 marks)

Q2. *C* is the midpoint of the straight line *AB*.



$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{OB} = \mathbf{b}$

(a) Work out $\overrightarrow{OC}$ in terms of **a** and **b**. Simplify your answer.

_____

_____

_____

_____

(3)

(b) Hence, write down an expression for $\overrightarrow{CO}$ in terms of **a** and **b**.

_____

Answer _____

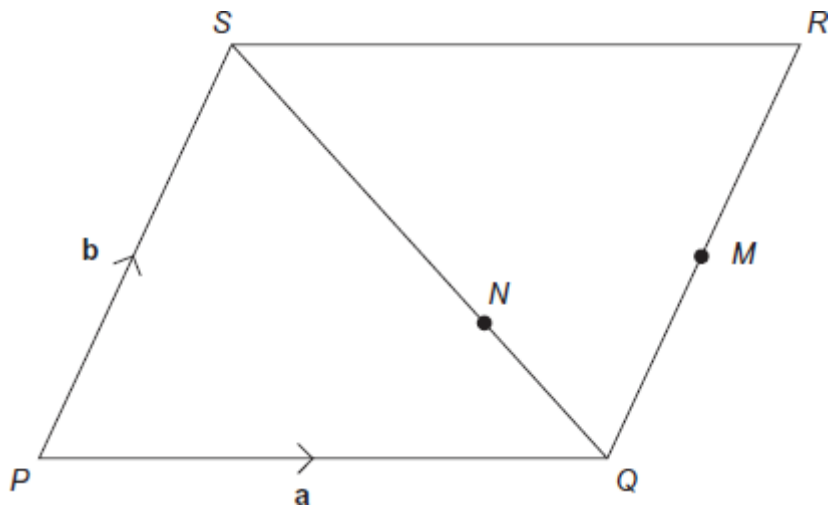
(1)

(Total 4 marks)

Q3. *PQRS* is a parallelogram.
M is the midpoint of *QR*.
QN : *NS* = 1 : 2

$\overrightarrow{PQ}$ = **a**

$\overrightarrow{PS}$ = **b**



(a) Write the vector $\overrightarrow{PM}$ in terms of **a** and **b**.

Answer _____

(1)

(b) Prove that *PNM* is a straight line.

_____

_____

_____

_____

_____

_____

_____

_____

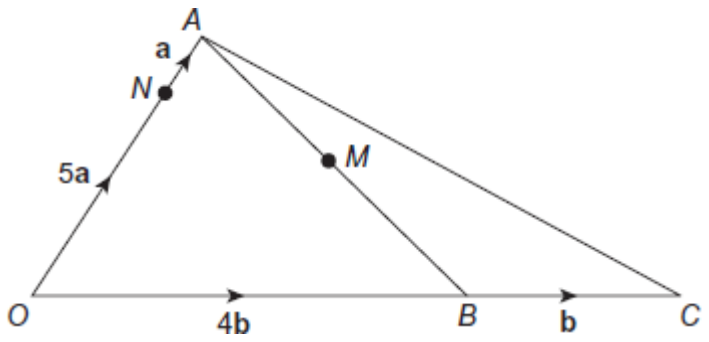
_____

_____

(4)

(Total 5 marks)

Q4.



$\overrightarrow{ON} = 5\mathbf{a}$ $\overrightarrow{NA} = \mathbf{a}$

$\overrightarrow{OB} = 4\mathbf{b}$ $\overrightarrow{BC} = \mathbf{b}$

M is the midpoint of *AB*.

(a) Show that $\overrightarrow{NM} = 2(\mathbf{b} - \mathbf{a})$

_____

_____

_____

(2)

(b) Work out the ratio *NM* : *NC*

_____

_____

_____

_____

_____

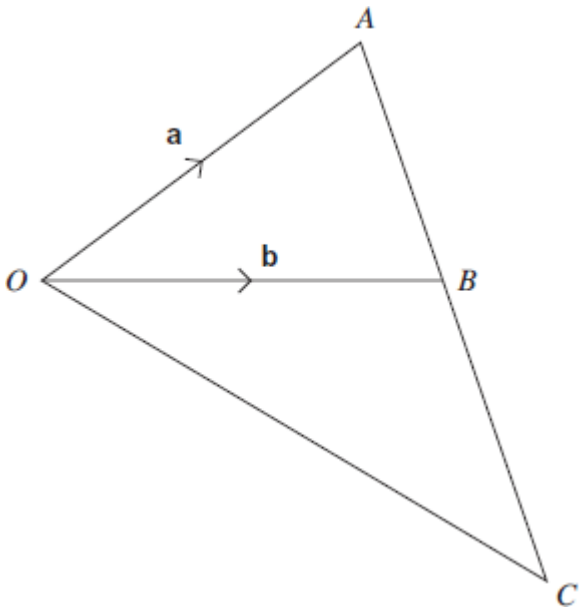
Answer _____ : _____

(2)

(Total 4 marks)

Q5.

The diagram shows vectors $\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**



(a) Write vector $\overrightarrow{AB}$ in terms of **a** and **b**.

_____

Answer _____

(1)

(b) The point *B* divides $\overrightarrow{AC}$ in the ratio 2 : 3

Work out vector $\overrightarrow{OC}$ in terms of **a** and **b**.

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____

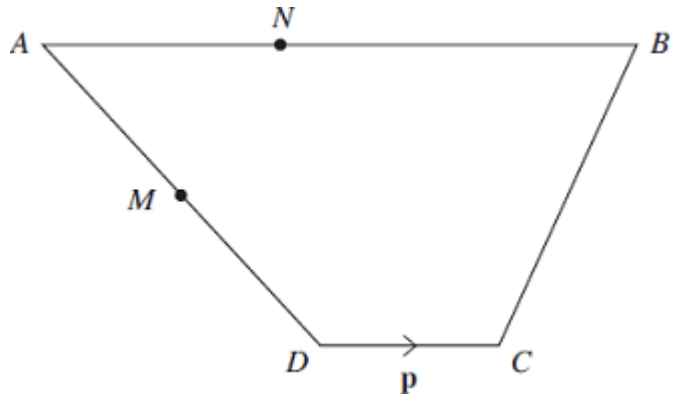
(3)

(Total 4 marks)

Q6.

AB is parallel to DC.

Not drawn accurately



$\overrightarrow{AB} = 5\mathbf{p}$

$\overrightarrow{DC} = \mathbf{p}$

$\overrightarrow{DA} = 2\mathbf{q} - \mathbf{p}$

(a) Show that $\overrightarrow{CB} = 2\mathbf{q} + 3\mathbf{p}$

(1)

(b) M is the midpoint of AD.

$\overrightarrow{AN} : \overrightarrow{NB} = 2 : 3$

Show that MN is parallel to CB.

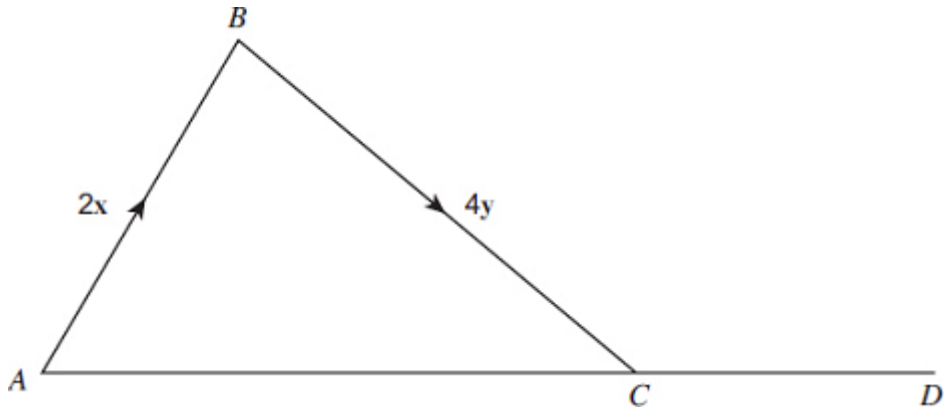
(4)

(Total 5 marks)

Q7.

$\overrightarrow{AB} = 2x$ and $\overrightarrow{BC} = 4y$

ACD is a straight line.



(a) Write down the vector $\overrightarrow{AC}$ in terms of x and y.

Answer _____

(1)

(b) *AC* : *CD* = 2 : 1

Work out the vector $\overrightarrow{AD}$ in terms of x and y,
Give your answer as simply as possible.

_____

_____

Answer _____

(2)

(Total 3 marks)

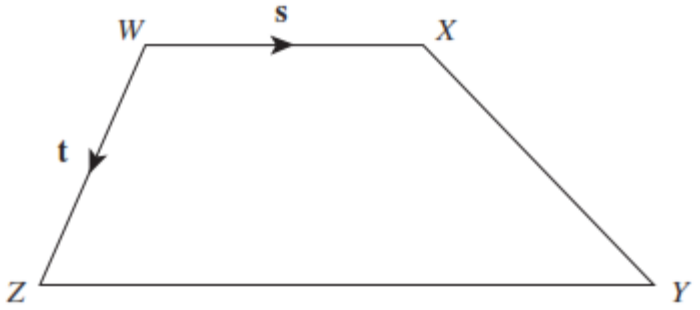
Q8.

$WXYZ$ is a trapezium.

$\overrightarrow{WX}$ = **s**

$\overrightarrow{WZ}$ = **t**

$ZY : WX$ = 3 : 2



(a) Write vector $\overrightarrow{ZY}$ in terms of **s**

Answer _____

(1)

(b) Work out vector $\overrightarrow{XY}$ in terms of **s** and **t**
Give your answer in its simplest form.

Answer _____

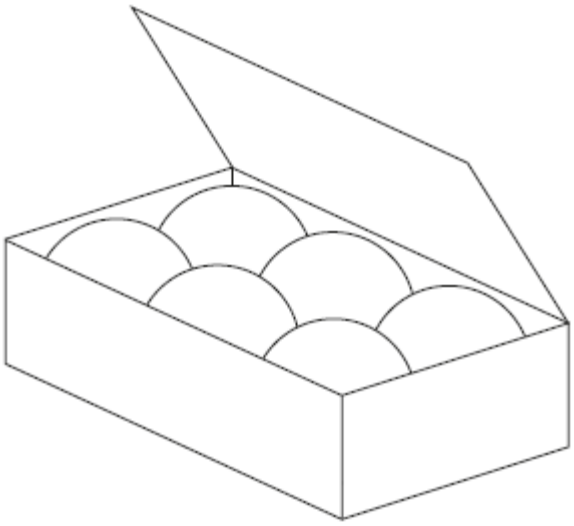
(2)

(Total 3 marks)

Volume

Q1. Six balls just fit inside a box as shown.

The balls each have a diameter of 5 cm. The box is a cuboid.



Work out the volume of the box.

_____

_____

_____

_____

_____

_____

_____

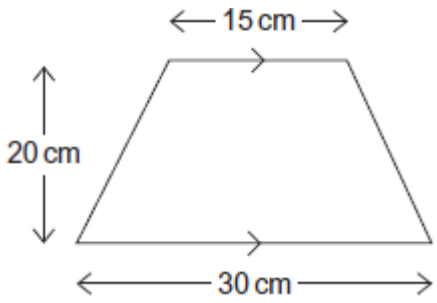
_____

_____

Answer _____ cm^3

(Total 3 marks)

Q2. The diagram shows a trapezium.



(a) Work out the area of the trapezium.

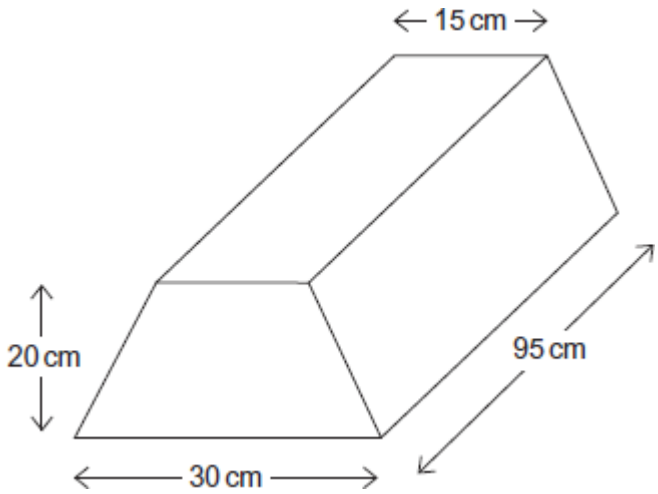
_____

_____

Answer _____ cm^2

(2)

(b) The trapezium is the cross-section of this prism.



Work out the volume of the prism.

_____

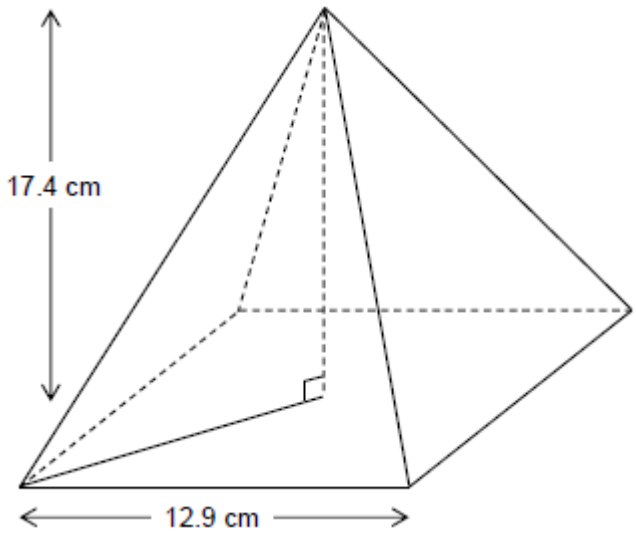
_____

Answer _____ cm^3

(2)

(Total 4 marks)

Q3. This pyramid has a square base.



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

Work out the volume of the pyramid.

_____

_____

_____

_____

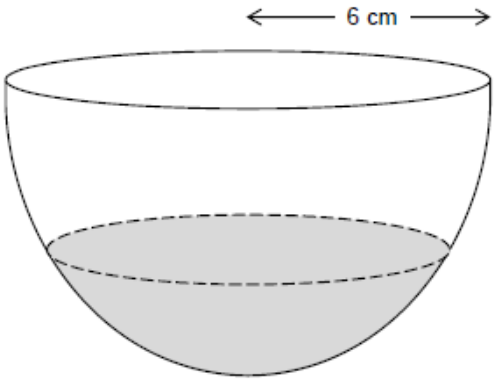
_____

_____

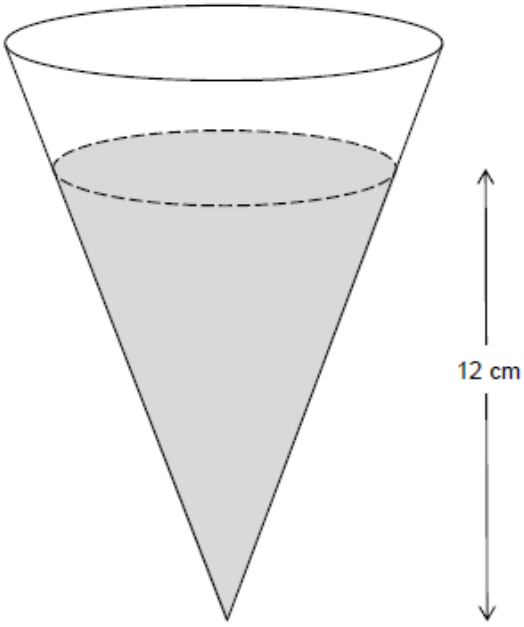
Answer _____ cm^2

(Total 3 marks)

Q4. A bowl is a hemisphere with radius 6 cm. Water fills two-fifths of the volume of the bowl.



The water is poured into a hollow cone. The depth of the water in the cone is 12 cm

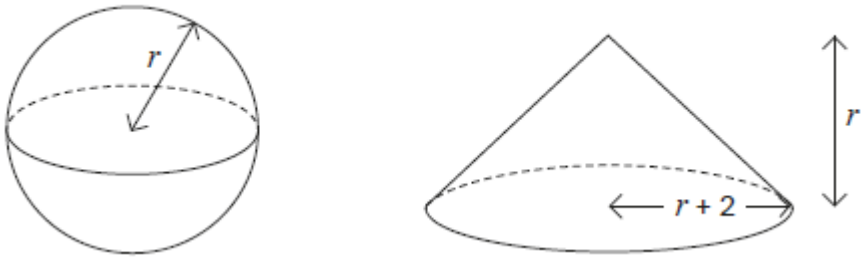


Volume of a sphere = $\frac{4}{3}\pi r^3$	where r is the radius.
Volume of a cone = $\frac{1}{3}\pi r^2 h$	where r is the radius and h is the perpendicular height

Work out the radius of the surface of the water in the cone.

Answer _____ cm

Q5. The volume of the sphere is equal to the volume of the cone.

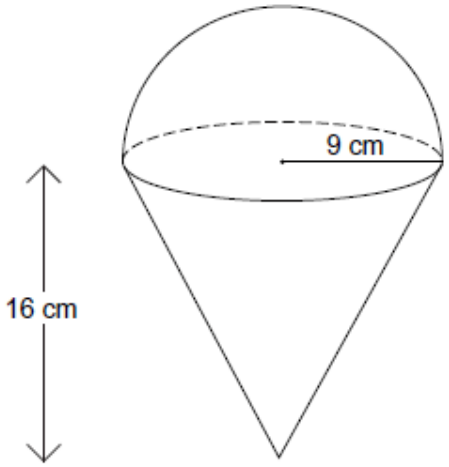


Work out the value of r. Do **not** use trial and improvement. You **must** show your working.

Answer _____ units

(Total 5 marks)

Q6. A hemisphere and a cone each have radius 9 cm. They are joined together to make a toy.



Work out the total volume of the toy.

_____

_____

_____

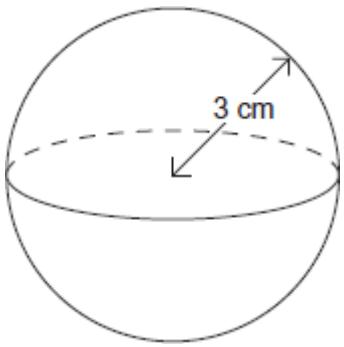
_____

_____

Answer _____ cm^3

(Total 4 marks)

Q7. The diagram shows a sphere made of wood. The radius of the sphere is 3 cm. The mass of the sphere is 85 grams.



Work out the density of the wood.

_____

_____

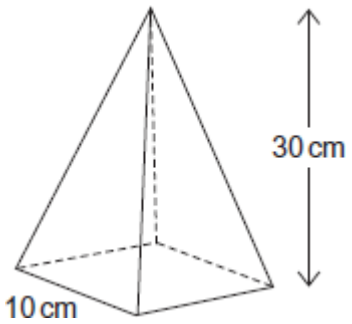
_____

Answer _____ grams / cm^3

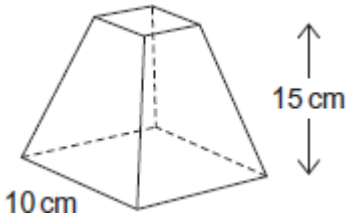
(Total 3 marks)

Q8. A pyramid has

a square base of side 10 cm
a height of 30 cm



It is cut horizontally at a height of 15 cm
The top pyramid is removed to leave this frustum.



You are given the formula

Volume of pyramid = $\frac{1}{3}$ × area of base × vertical height

Calculate the volume of the frustum.

_____

_____

_____

_____

_____

_____

_____

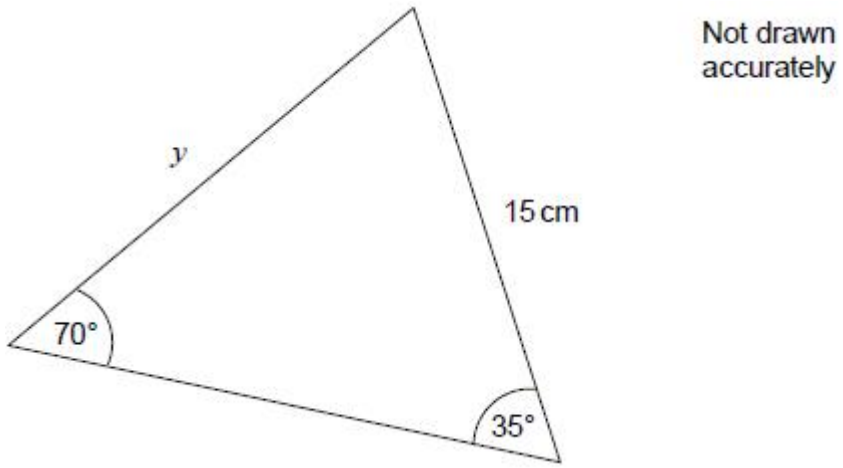
_____

Answer _____ cm^3

(Total 3 marks)

Sine Rule / Cosine Rule / Area of a Triangle

Q1.



Work out the value of y.

_____

_____

_____

_____

_____

_____

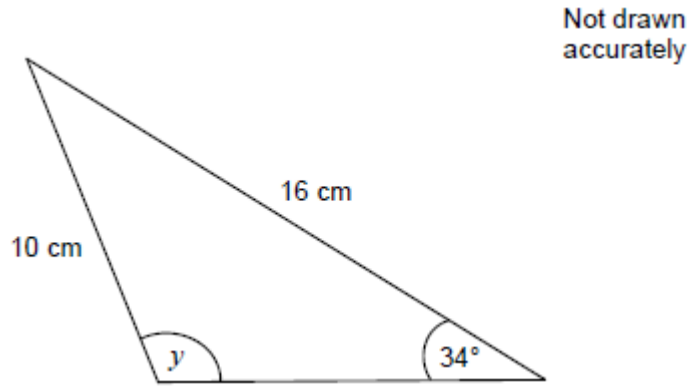
_____

_____

Answer _____ cm

(Total 2 marks)

Q2. In the triangle, angle y is obtuse.

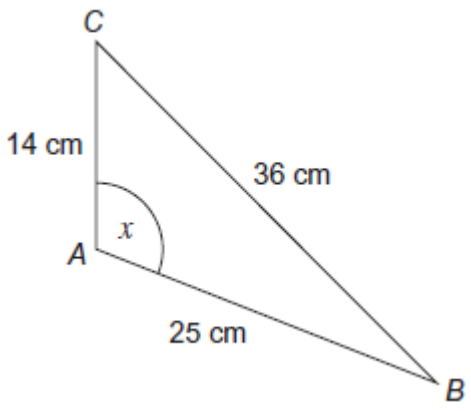


Work out the size of angle y

Answer _____ degrees

(Total 3 marks)

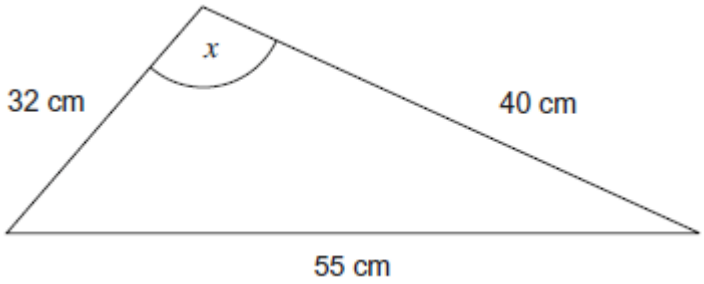
Q3. Work out the size of angle x.



Answer _____ degrees

(Total 3 marks)

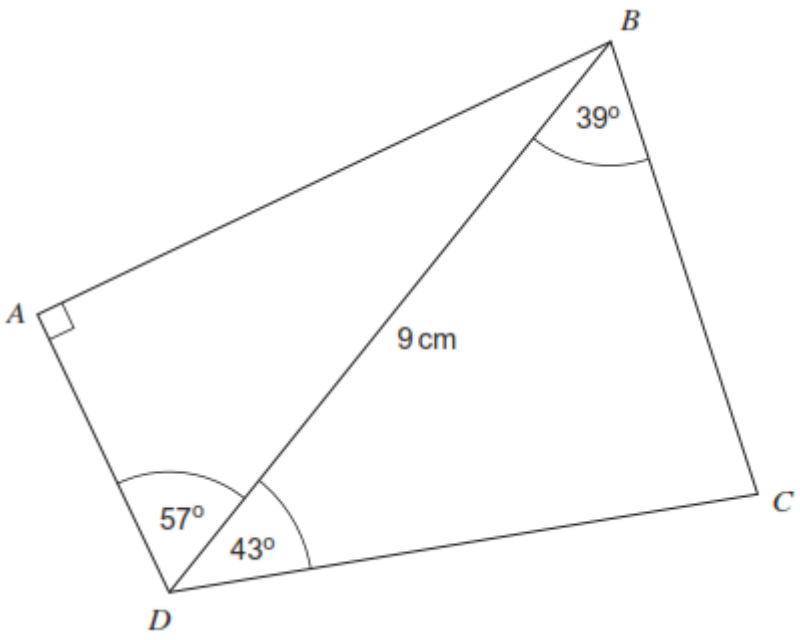
Q4. Work out the size of angle x.



Answer _____ degrees

(Total 3 marks)

Q5. Work out the area of $ABCD$.

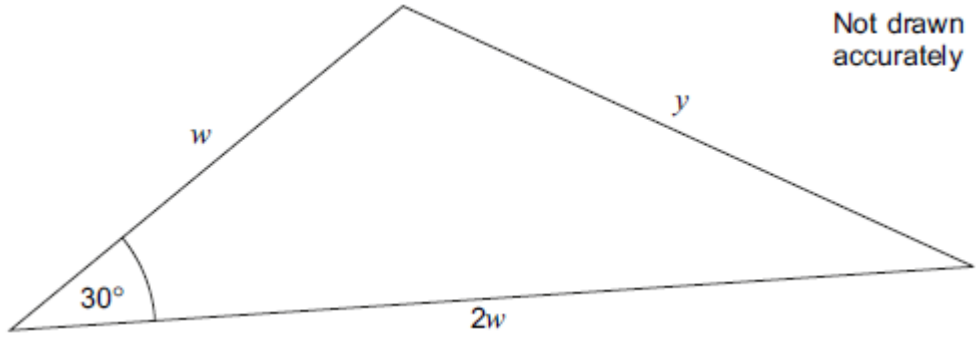


Not drawn accurately

Answer _____ cm^2

(Total 7 marks)

Q6. The area of this triangle is 18cm²



Work out y.

y = _____ cm

(Total 5 marks)