NAME: _____

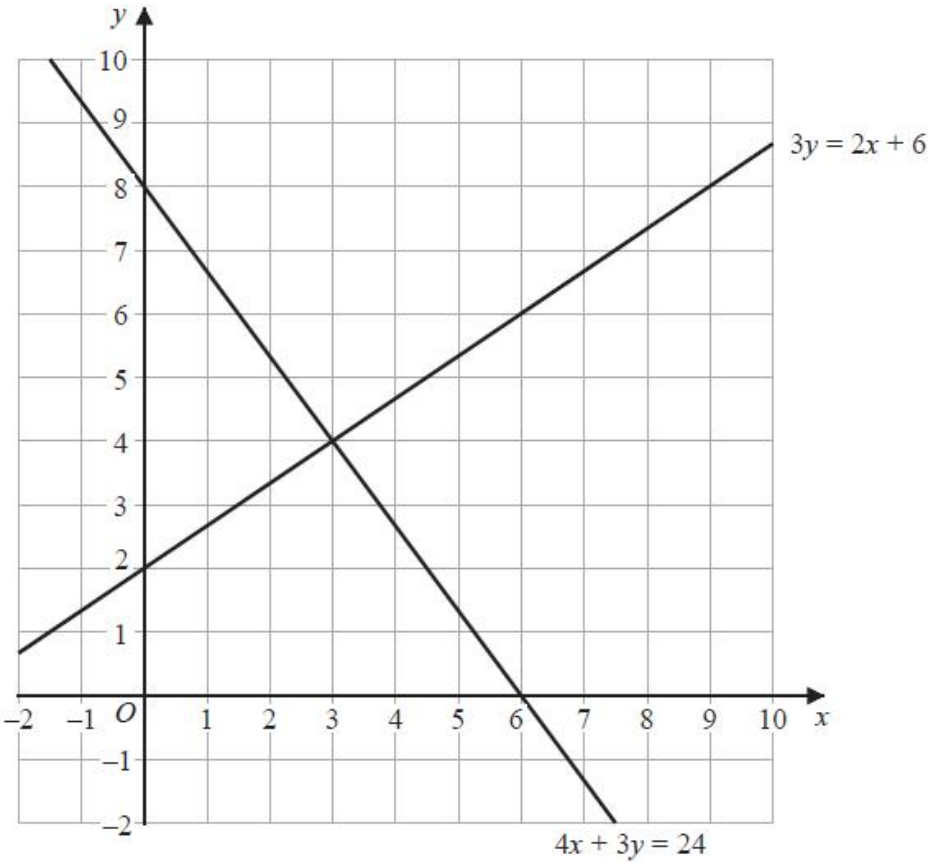
Transition Booklet – Part 2

More Simultaneous Equations

- Circled questions are compulsory
- Remaining questions are optional

Q1.

The diagram shows two straight lines drawn on a grid.



(a) Write down the solution of the simultaneous equations

$3y = 2x + 6$

$4x + 3y = 24$

$x =$ .....

$y =$ .....

(1)

(b) Show, by shading on the grid, the region defined by all five of the inequalities

$x \geq 0$ $y \geq 0$ $x + y \geq 4$ $3y \leq 2x + 6$ $4x + 3y \leq 24$

Label the region **R**.

(3)

(Total for question = 4 marks)

Q2.

Solve the simultaneous equations

$$y = 2x^2$$

$$y = 20 - 3x$$

Show clear algebraic working.

.....

(Total for question = 5 marks)

Q3.

Solve the simultaneous equations

$$2y^2 + x^2 = -6x + 42$$
$$2x + y = -3$$

Show clear algebraic working.

.....

(Total for question = 5 marks)

Q4.

The straight line **L** has equation $x - y = 3$
The curve **C** has equation $3x^2 - y^2 + xy = 9$

L and **C** intersect at the points P and Q.

Find the coordinates of the midpoint of PQ.
Show clear algebraic working.

(..... , ...)

(Total for question = 6 marks)

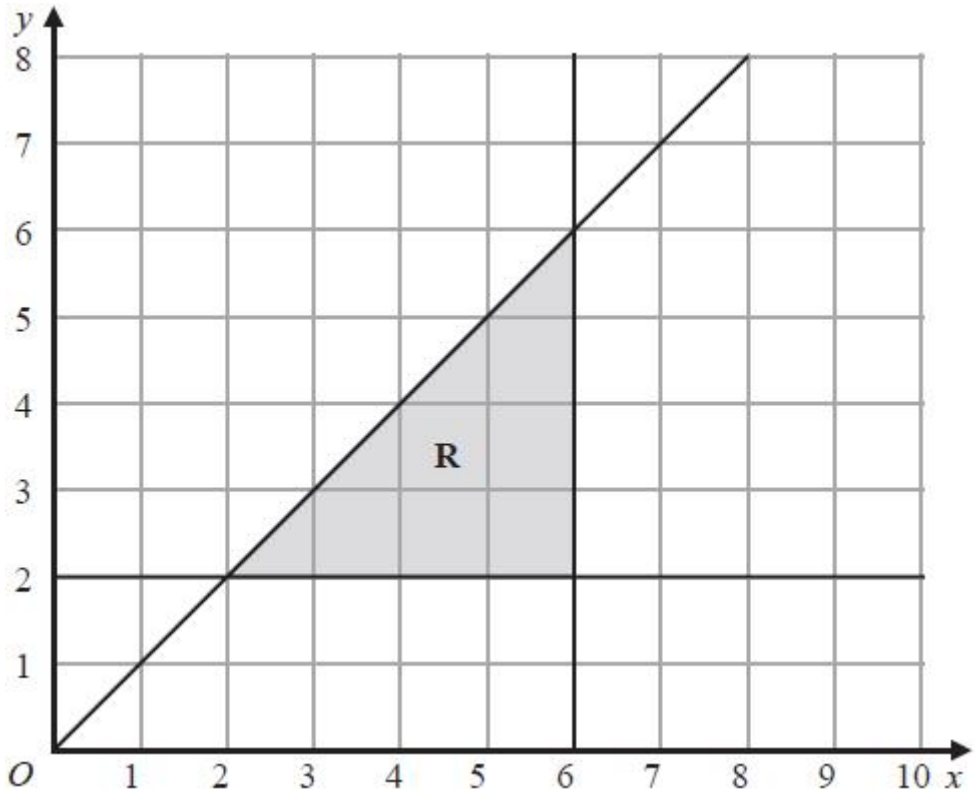
Inequalities

Q5.

(a) Solve $9 - 4x > 17$

.....

(2)



(b) Write down the three inequalities that represent the shaded region **R**

.....

.....

.....

(3)

(Total for question = 5 marks)

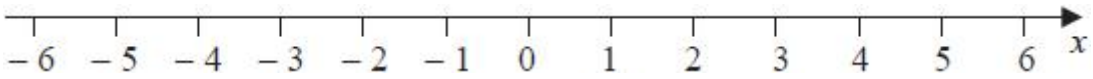
Q6.

(i) Solve the inequalities $-7 \leq 2x - 3 < 5$

.....

(3)

(ii) On the number line, represent the solution set to part (i)



(2)

(Total for question = 5 marks)

Q7.

Solve the inequality $10x^2 + 11x - 21 < 0$
Show clear algebraic working.

.....

(Total for question = 3 marks)

Q8.

Solve the inequality $2x^2 - 7x - 15 > 0$

Show clear algebraic working.

.....

(Total for question = 3 marks)

Q9.

Here is a rectangle.

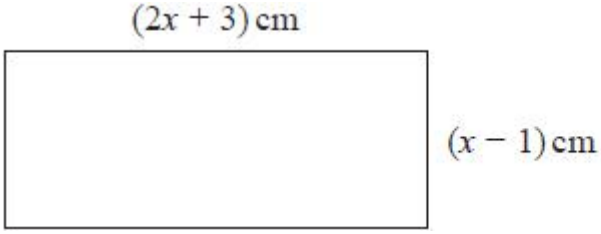


Diagram **NOT** accurately drawn

Given that the area of the rectangle is less than 75 cm^2

find the range of possible values of x

.....

(Total for question = 5 marks)

Mixed Questions

Q10.

(a) Simplify n^0

(1)

(b) Simplify $(3x^2y^5)^3$

(2)

(c) Factorise fully $2e^2 - 18$

(2)

(d) Make r the subject of $m = \sqrt{\frac{6a + r}{5r}}$

(4)

(Total for question = 9 marks)

Q11.

Given that $\left(\sqrt[3]{\frac{1}{x}}\right)^4 = x^m$

(a) find the value of m

m = ...

(1)

Given that a, b and c are integers,

(b) express $3x^2 + 12x + 19$ in the form $a(x + b)^2 + c$

.....

(2)

(Total for question = 3 marks)

Q12.

(a) Solve $\frac{5a + 8}{3} - \frac{2a + 5}{4} = 23$

Show clear algebraic working.

a = ...

(4)

(b) Express $\left(\frac{\sqrt{y}}{3}\right)^{-1}$ in the form cy^n where c and n are numbers to be found.

.....

(2)

(Total for question = 6 marks)

Q13.

(a) Expand and simplify $5x(x + 2)(3x – 4)$

.....

(3)

(b) Simplify completely $\left(\frac{16w^8}{y^{20}}\right)^{-\frac{3}{4}}$

.....

(3)

(Total for question = 6 marks)

Q14.

(a) Simplify $(6m)^0$

.....

(1)

(b) Solve $5y + 20 < 7y + 1$

.....

(2)

(c) Factorise fully $15w^2x^5 + 25w^3x^2$

.....

(2)

(d) Simplify fully $\frac{36a^5c^7}{12a^2c^3}$

.....

(2)

(Total for question = 7 marks)

Q15.

Solve $2^{-4x} = 32$

$x =$ .....

(Total for question = 2 marks)

Q16.

Make t the subject of the formula $c = \dfrac{t^2 + 3}{7 - 8t^2}$

.....

(Total for question = 4 marks)

Q17.

Prove that when the sum of the squares of any two consecutive odd numbers is divided by 8, the remainder is always 2
Show clear algebraic working.

(Total for question = 3 marks)

Q18.

Prove that the difference between two consecutive square numbers is always an odd number.
Show clear algebraic working.

(Total for question = 3 marks)

Q19.

T is directly proportional to $\sqrt{x}$
$T = 400$ when $x = 625$

(a) Find a formula for T in terms of x.

.....

(3)

(b) Calculate the value of T when $x = 56.25$

.....

(1)

(Total for question = 4 marks)

Q20.

P is inversely proportional to the square of q.
When $q = 2$, $P = 12.8$

(a) Find a formula for P in terms of q.

.....

(3)

(b) Find the value of P when $q = 8$

.....

(1)

(Total for question = 4 marks)

Q21

The length of a ship is 142.8 m, correct to 1 decimal place.

(i) Write down the lower bound of the length of the ship.

..... m

(1)

(ii) Write down the upper bound of the length of the ship.

..... m

(1)

(Total for question = 2 marks)

Q22.

The weight of a bag of apples is 475 g correct to the nearest g

(a) Write down the lower bound of the weight.

..... g

(1)

The height of a box is 120 cm correct to the nearest 10 cm

(b) Write down the upper bound for the height.

..... cm

(1)

(Total for question = 2 marks)

Q23.

The weight of a cake is 2.75 kg, correct to 2 decimal places.

(a) Write down the lower bound of the weight of the cake.

..... kg

(1)

(b) Write down the upper bound of the weight of the cake.

..... kg

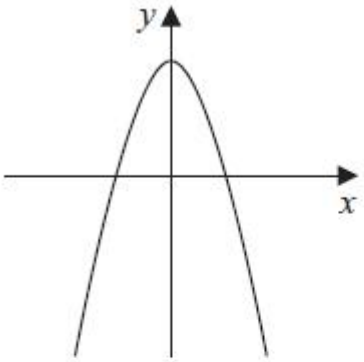
(1)

(Total for question = 4 marks)

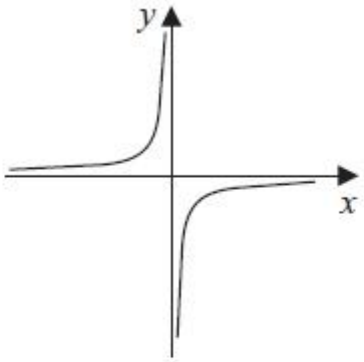
Q24.

Here are six graphs.

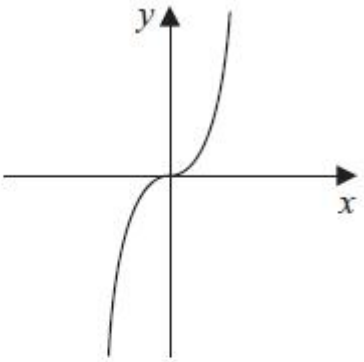
Graph A



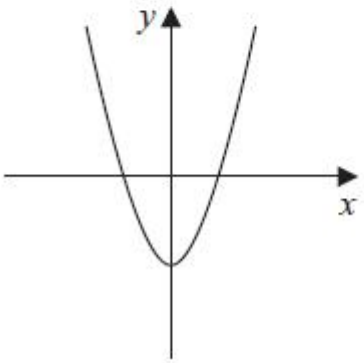
Graph B



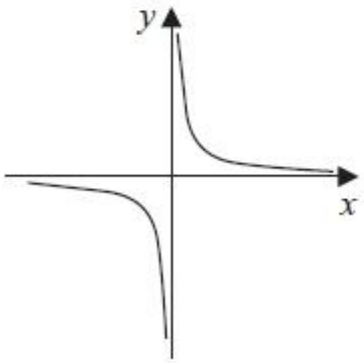
Graph C



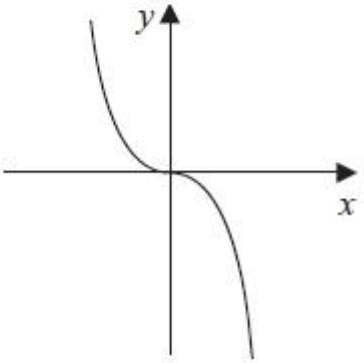
Graph D



Graph E



Graph F



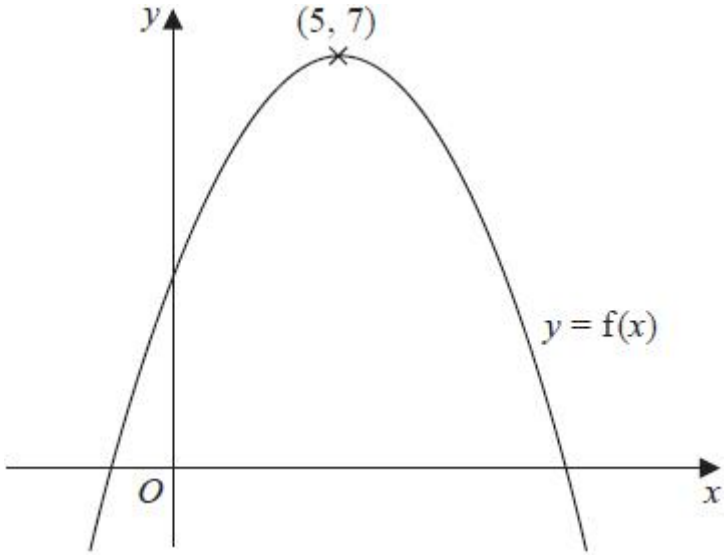
Complete the table below with the letter of the graph that could represent each given equation.
Write your answers on the dotted lines.

Equation	Graph
$y = -\frac{2}{x}$	.....
$y = 5 - x^2$	.....
$y = -2x^3$	.....

(Total for question = 3 marks)

Q25.

The diagram shows a sketch of the curve with equation $y = f(x)$



There is only one maximum point on the curve.
The coordinates of this maximum point are (5, 7)

Write down the coordinates of the maximum point on the curve with equation

(i) $y = f(x + 9)$

(..... , ...)

(ii) $y = f(x) + 3$

(..... , ...)

(Total for question = 2 marks)

Q26.

A, *B* and *C* are points on a circle with centre *O*.

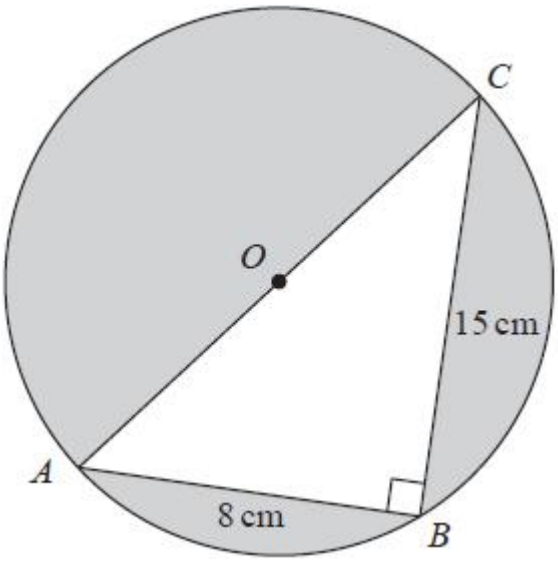


Diagram **NOT** accurately drawn

AOC is a diameter of the circle.

AB = 8 cm *BC* = 15 cm

Angle *ABC* = 90°

Work out the total area of the regions shown shaded in the diagram.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for question = 5 marks)

Q27.

The diagram shows a shaded shape *ABCD* made from a semicircle *ABC* and a right-angled triangle *ACD*.

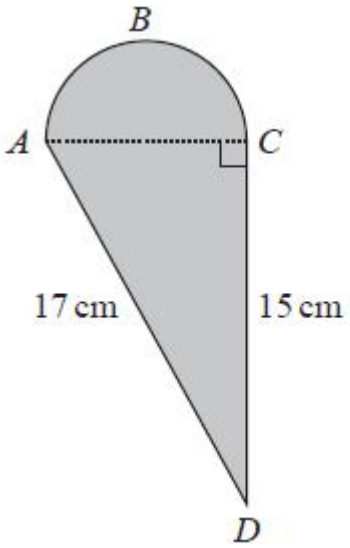


Diagram **NOT** accurately drawn

AC is the diameter of the semicircle *ABC*.

Work out the perimeter of the shaded shape.
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 5 marks)

Q28.

The diagram shows a solid triangular prism.

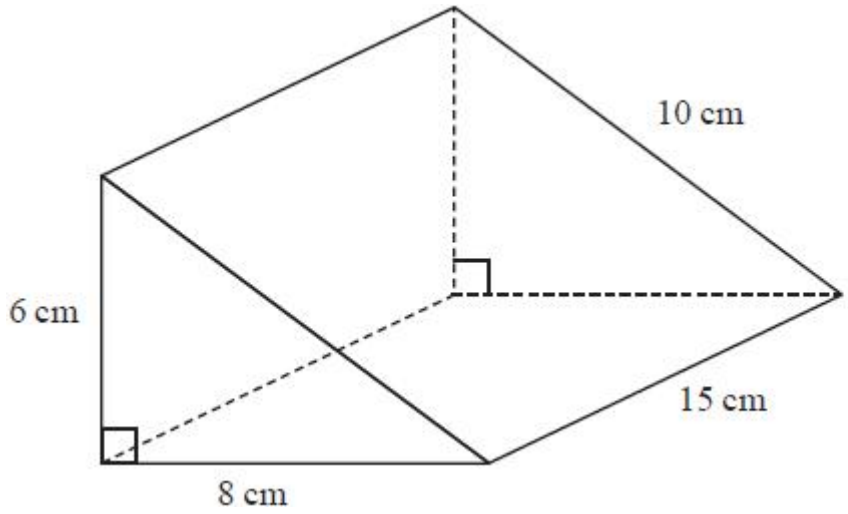


Diagram **NOT** accurately drawn

Work out the **total** surface area of the triangular prism.

..... cm^2

(Total for question = 3 marks)

Q29.

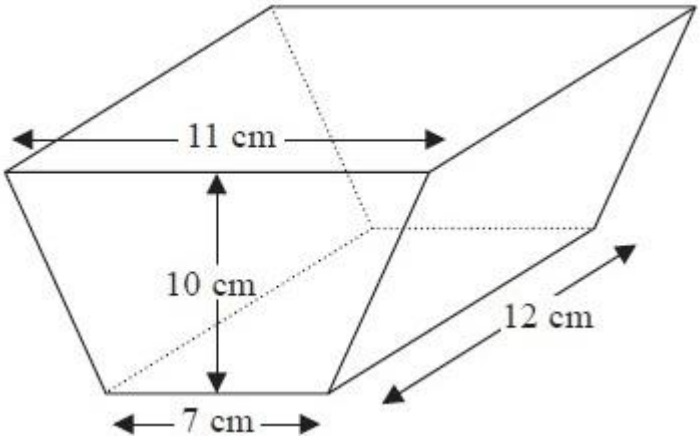


Diagram **NOT** accurately drawn

The diagram shows a solid prism.
The cross section of the prism is a trapezium.
The lengths of the parallel sides of the trapezium are 11 cm and 7 cm.
The perpendicular distance between the parallel sides of the trapezium is 10 cm.
The length of the prism is 12 cm.

(a) Work out the area of the trapezium.

..... cm^2

(2)

(b) Work out the volume of the prism.

..... cm^3

(2)

(Total for Question is 4 marks)

Q30.

The diagram shows a solid cylinder with radius 3 m.

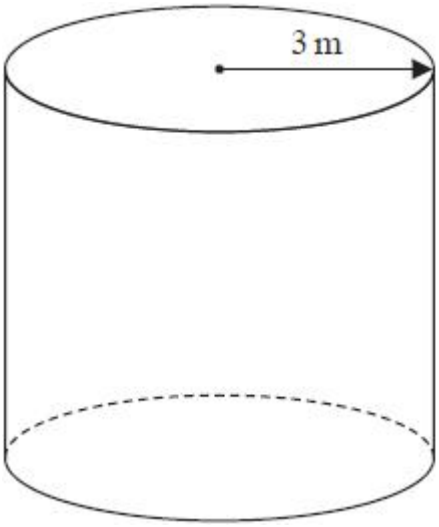


Diagram **NOT** accurately drawn

The volume of the cylinder is 72π m^3

Calculate the **total** surface area of the cylinder.
Give your answer correct to 3 significant figures.

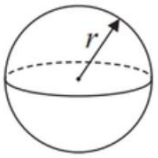
..... m^2

(Total for question = 5 marks)

Q31.

Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



The diagram shows a solid hemisphere.

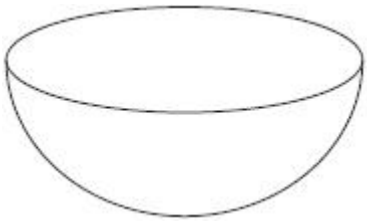


Diagram **NOT** accurately drawn

The hemisphere has a **total** surface area of $\frac{16}{3}\pi$ cm^2

The hemisphere has a volume of $k\pi$ cm^3

Find the value of k.

.....

(Total for question = 4 marks)

Q32.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 3, 5, 7\}$
$B = \{1, 3, 5, 7, 9\}$

(a) List the members of the set

(i) A $\cap$ B

.....

(ii) A $\cup$ B

.....

(2)

(b) Find the number of values in the set (A')

.....

(1)

(Total for question = 3 marks)

Q33.

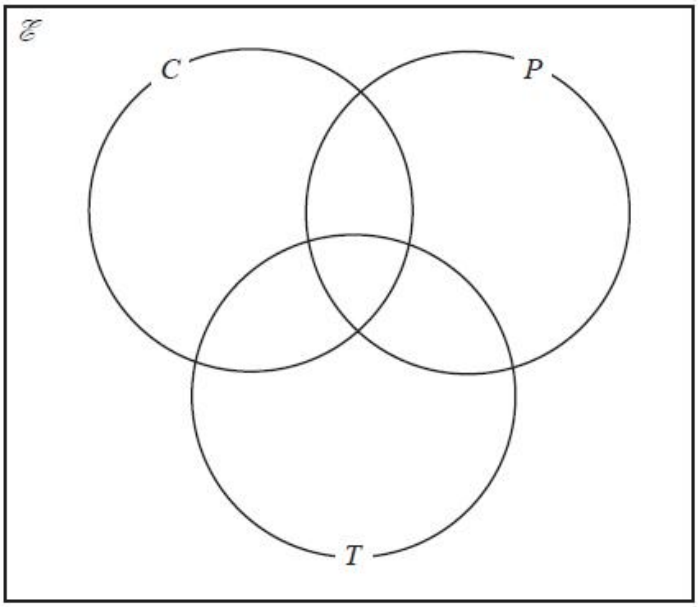
120 gardeners were asked if they grow carrots (C) or potatoes (P) or tomatoes (T)

Of these gardeners

43 grow carrots
12 grow carrots and potatoes and tomatoes
18 grow carrots and potatoes
27 grow carrots and tomatoes
32 grow potatoes and tomatoes
29 do not grow carrots or potatoes or tomatoes

The number of these gardeners who grow only potatoes is equal to the number of these gardeners who grow only tomatoes.

(a) Complete the Venn diagram to show this information.



(3)

One of the gardeners who grows carrots is chosen at random.

(c) Calculate the probability that this gardener also grows potatoes.

.....

(2)

(Total for question = 6 marks)

Q34.

The frequency table shows information about the distances 60 office workers travel to work each day.

Distance travelled (d km)	Frequency
$0 < d \leqslant 10$	5
$10 < d \leqslant 20$	12
$20 < d \leqslant 30$	17
$30 < d \leqslant 40$	20
$40 < d \leqslant 50$	6

(a) Write down the modal class.

.....

(1)

(b) Work out an estimate for the mean distance travelled to work by these office workers.

Give your answer correct to 1 decimal place.

..... km

(4)

(Total for question = 5 marks)

Q35.

The incomplete table shows information about the times, in minutes, that runners took to complete a race.

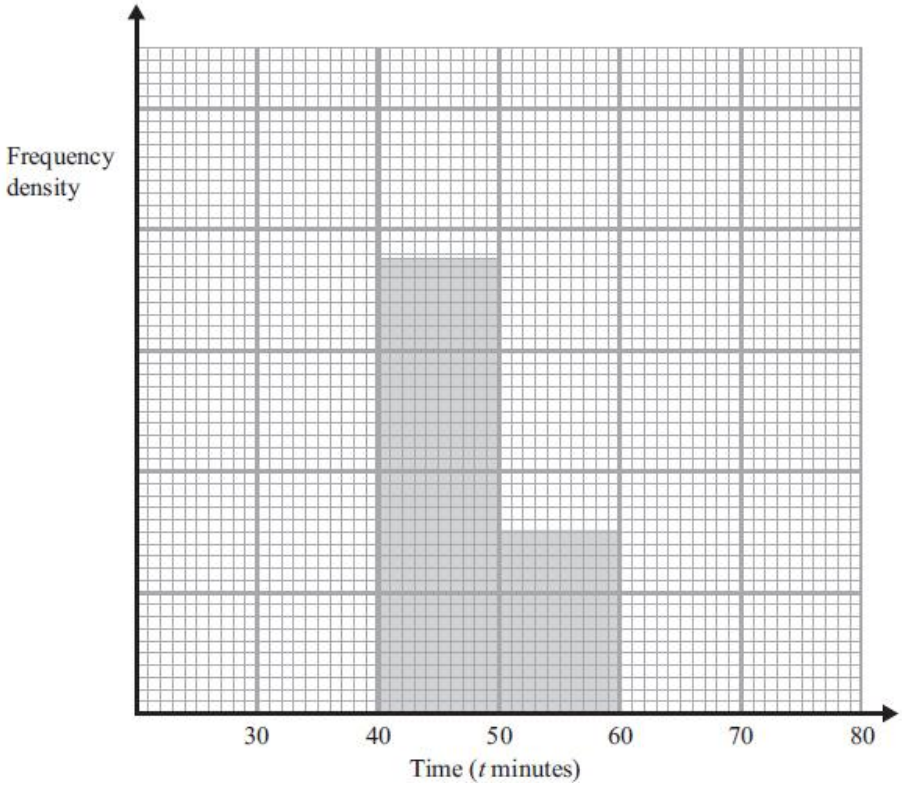
Time (t minutes)	$30 \leqslant t < 35$	$35 \leqslant t < 40$	$40 \leqslant t < 50$	$50 \leqslant t < 60$	$60 \leqslant t < 80$
Number of runners	12	20		12	16

(a) Use the histogram to calculate the number of runners who took between 40 and 50 minutes to complete the race.

.....

(2)

(b) Complete the histogram for the remaining results.



(2)

Runners who achieved a time between 37 and 48 minutes to complete the race were each awarded a silver medal.

(c) Calculate an estimate of the number of runners awarded silver medals.

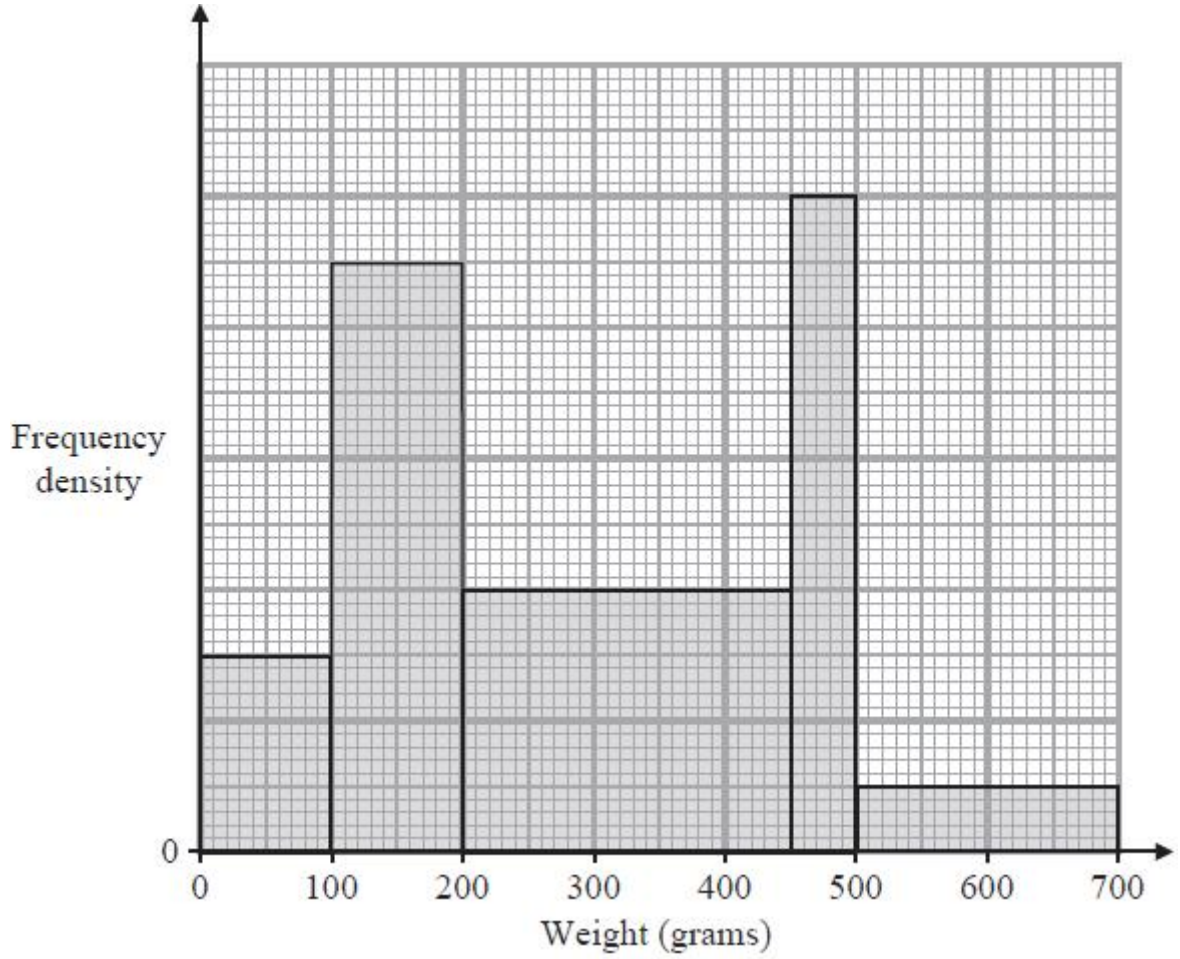
.....

(2)

(Total for question is 6 marks)

Q36.

The histogram gives some information about the weights, in grams, of some books.



75 books weigh less than 100 grams.

A book is chosen at random.

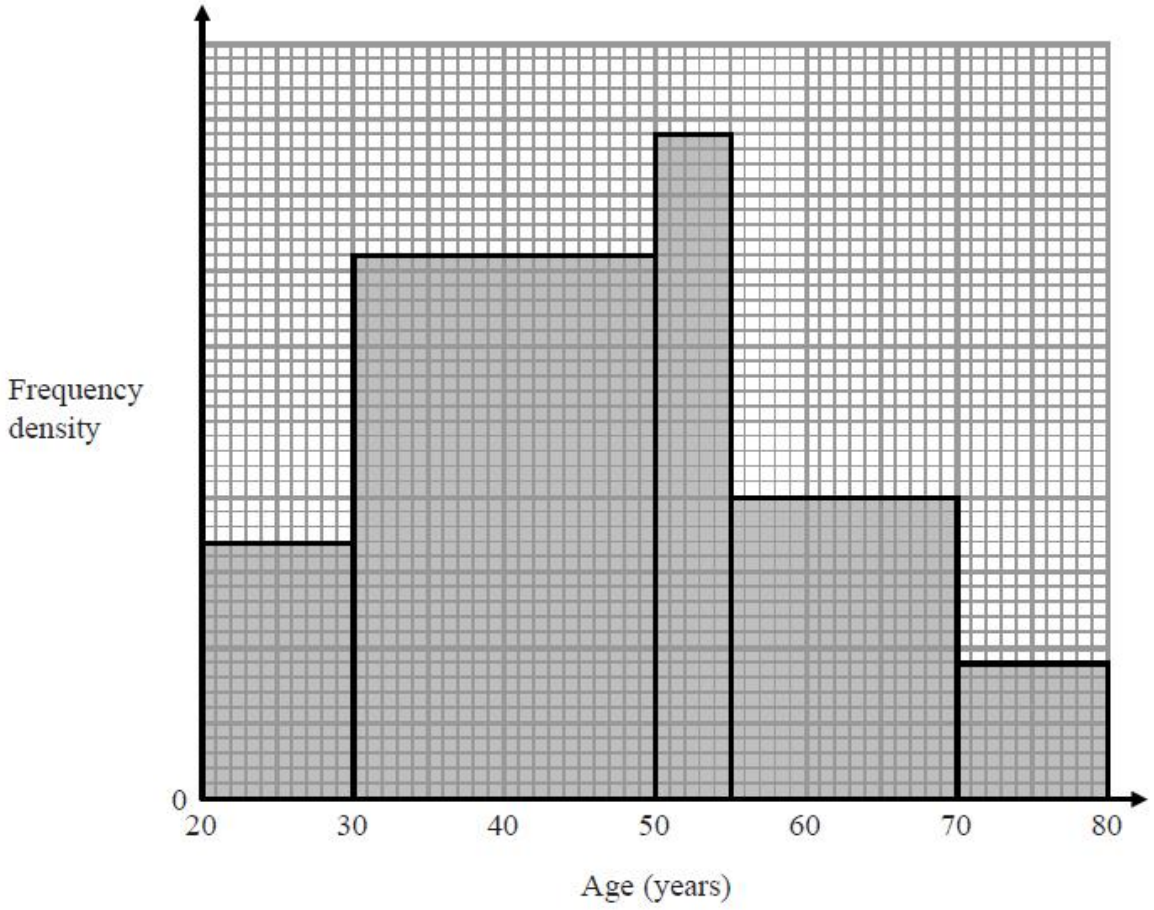
Find an estimate for the probability that this book weighs between 400 grams and 600 grams.

.....

(Total for question = 4 marks)

Q37.

150 people took part in a survey.
The histogram shows information about the ages of these people.



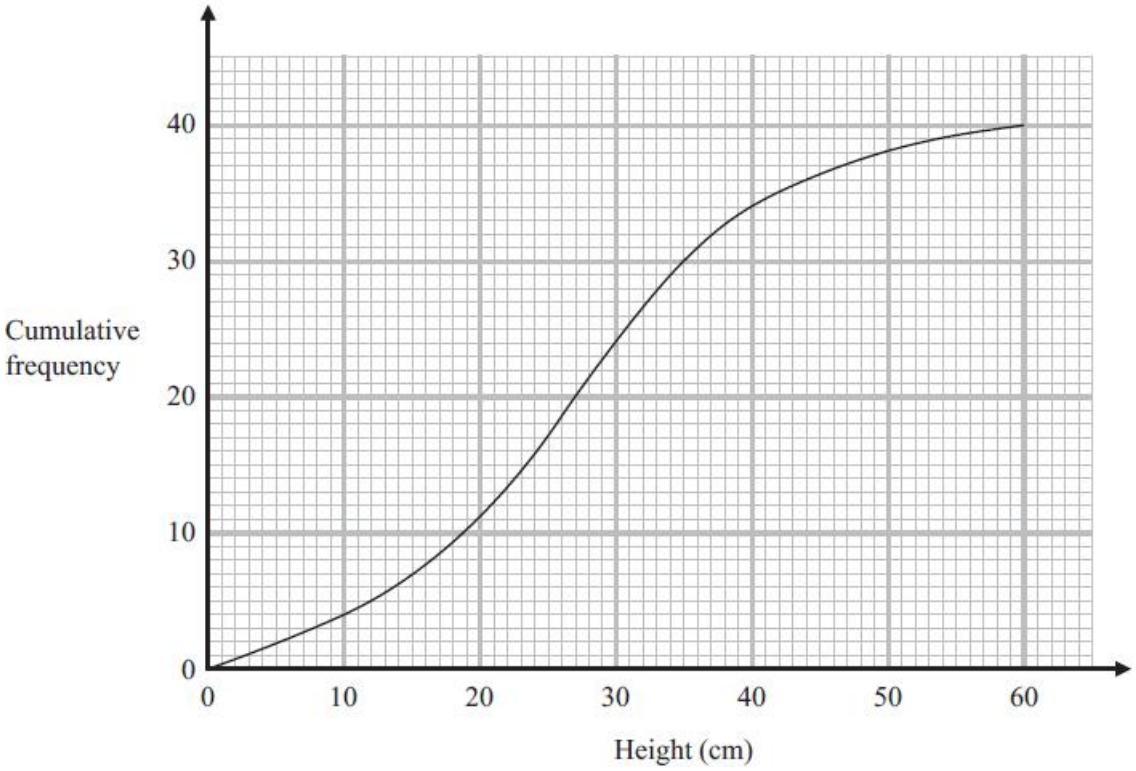
Work out how many of these 150 people are aged between 50 years and 55 years.

.....

(Total for question = 4 marks)

Q38.

The cumulative frequency graph shows information about the heights of 40 plants that Greta has grown.



(a) Use the graph to find an estimate for the median height.

..... cm

(1)

(b) Use the graph to find an estimate for the interquartile range of the heights.

..... cm

(2)

Plants with a height greater than 40 cm are premium plants.
Greta sells all the premium plants for 30 euros each.

(c) Work out the total amount of money Greta receives for the premium plants.

..... euros

(2)

(Total for question = 5 marks)

Q39.

A bag contains only red beads, blue beads, green beads and yellow beads.

The table gives the probabilities that, when a bead is taken at random from the bag, the bead will be blue or the bead will be yellow.

Colour	red	blue	green	yellow
Probability		0.24		0.31

The probability that the bead will be green is twice the probability that the bead will be red.

Sofia takes at random a bead from the bag.
She writes down the colour of the bead and puts the bead back into the bag.

She does this 180 times.

Work out an estimate for the number of times she takes a red bead from the bag.

.....

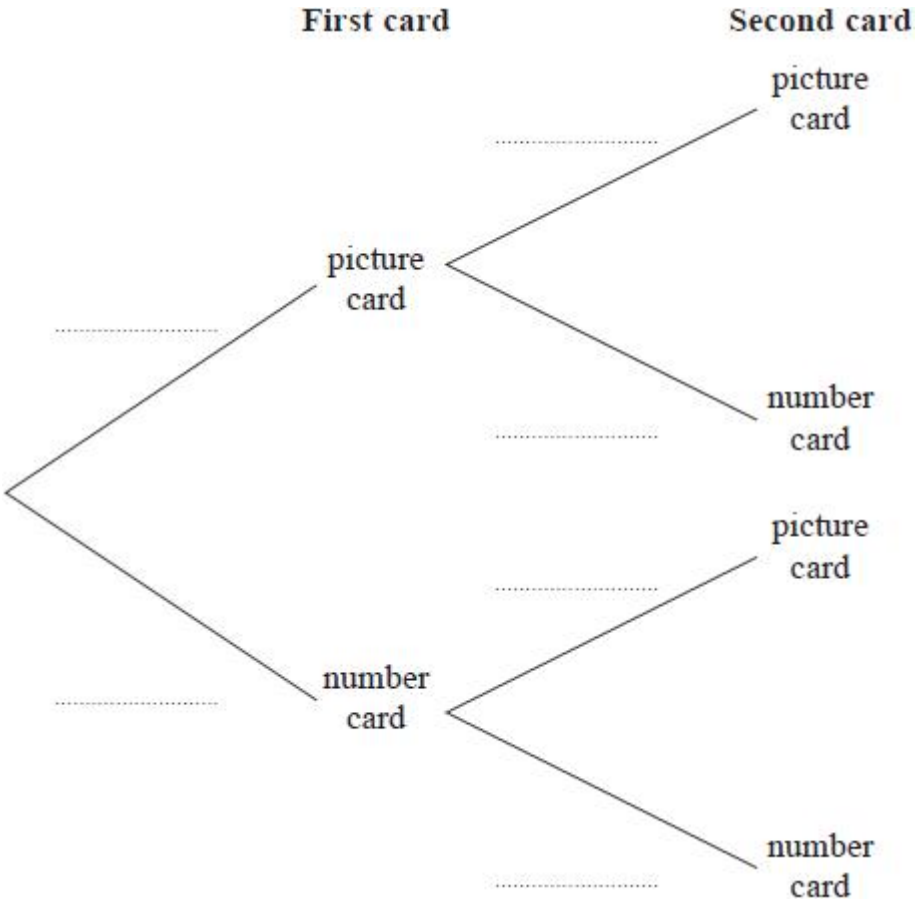
(Total for question = 4 marks)

Q40.

There are 52 cards in a pack.
12 cards are picture cards.
40 cards are number cards.

Melina takes at random a card from the pack.
She keeps the card and then takes at random a second card from the remainder of the pack.

(a) Complete the probability tree diagram.



(3)

(b) Work out the probability that the two cards Melina takes are both picture cards or both number cards.

.....

(3)

(Total for question = 6 marks)

Q41.

A box contains 20 counters.

9 of the counters are red
7 of the counters are yellow
4 of the counters are green

Alex takes at random three counters from the box.

Work out the probability that exactly two of the three counters are the same colour.

.....

(Total for question = 3 marks)

Q42.

There are 12 counters in a bag.

3 of the counters are red
9 of the counters are green

Ameya, Jack and Ella each take at random one counter from the bag.

Work out the probability that at least one red counter is still in the bag.

.....

(Total for question = 3 marks)

Q43.

Boris has a bag that only contains red sweets and green sweets.

Boris takes at random 2 sweets from the bag.

The probability that Boris takes exactly 1 red sweet from the bag is $\frac{12}{35}$

Originally there were 3 red sweets in the bag.

Work out how many green sweets there were originally in the bag.
Show your working clearly.

.....

(Total for question = 5 marks)