Paper 2 Revision

Key topics to practice for 4th June

All the topics listed below are likely to appear in some form in paper 2 or 3.

Give them a go, check your answers with the solutions provided and speak to your teacher.

Very Likely topics

Sequences	**Direct & Inverse Proportion**	**Gradients, intercepts, y=mx+c**	**Speed & compound measures**
Functions	**Volume of 3D shapes**	**Percentage change**	**Trigonometry (SOHCAHTOA)**

Likely topics

Forming & solving equations	**Transformations**	**Bounds**	**Pythagoras**
Expected number of outcomes	**Substitution**	**Compound interest & Reverse percentages**	**Grouped data & Histograms**
Venn diagrams	**Application of ratio**	**Solve quadratic equations**	**Iterative Processes**
Circle Theorems	**Trigonometry (non-right angles triangles)**	**Similar Areas and Volumes**	**Factorise Quadratics**
Circles & Sectors			

Very Likely – Sequences

Q1.

The first four terms of a linear sequence are

6 13 20 27

Write down the expression for the nth term.

Answer _____

(Total 1 mark)

Q2.

Here is the term-to-term rule for a sequence.

Double the previous term and add 3

The first three terms of the sequence are $a + 1$ $2a + 5$ $4a + 13$

Show that the sum of the first **four** terms is a multiple of 3

_____

_____

_____

_____

_____

_____

(Total 3 marks)

Q3.

Which of these is a geometric progression?

Circle your answer.

1 3 5 7 9 1 3 6 10 15

1 4 9 16 25 1 3 9 27 81

(Total 1 mark)

Q4.

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

11 15 21 29 39 ...

*n*th term = _____

(Total 4 marks)

Very Likely – Direct & Inverse Proportion

Q1.

Density = $\frac{\text{mass}}{\text{volume}}$

The mass is divided by 2 and the volume is multiplied by 4

What happens to the density?

Circle your answer.

× 2 ÷ 2 × 8 ÷ 8

(Total 1 mark)

Q2.

An object is dropped from a height h cm.

It takes T seconds to reach the ground.

h is directly proportional to the square of T

When $h = 80$ $T = 4$

Work out the value of h when $T = 7.5$

Answer _____

(Total 5 marks)

Q3.

H is inversely proportional to the cube root of L.

$H = 7$ when $L = 64$

(a) Work out an equation connecting H and L.

Answer _____

(3)

(b) Work out the value of H when $L = 2744$

$H =$ _____

(2)

(Total 5 marks)

Q4.

P, Q and R have positive values.

P is directly proportional to the square of Q.

When P = 1.25, Q = 0.5

Q is inversely proportional to R.

When Q = 0.5, R = 6

Work out the value of R when P = 0.8

Answer _____

(Total 5 marks)

Very Likely – Gradient, Intercepts, y = mx + c

Q1.

A straight line passes through (3, 14) and (12, 32)

Work out the equation of the line.

Give your answer in the form $y = mx + c$

Answer _____

(Total 3 marks)

Q2.

Circle the equation of the line that is parallel to the x-axis.

$y = -5$ $\quad$ $x - y = 0$ $\quad$ $x = 3$ $\quad$ $x + y = 0$

(Total 1 mark)

Q3.

Circle the equation of the line that is parallel to $y = \frac{1}{2}x + 3$

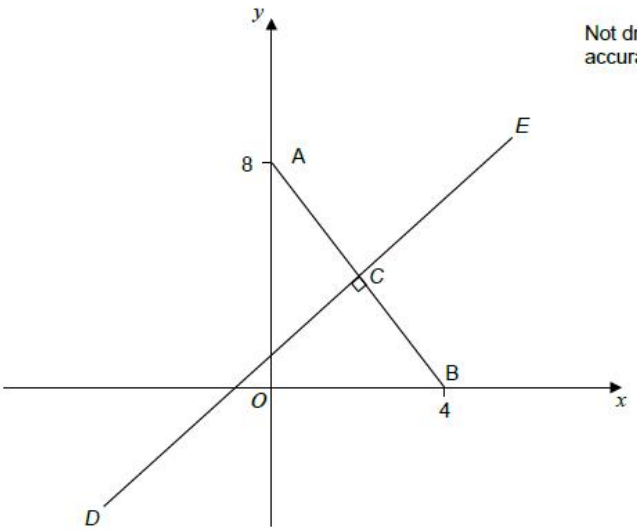
$y = -2x$ $\quad$ $y = 2x$ $\quad$ $y = \frac{1}{2}x$ $\quad$ $y = -\frac{1}{2}x$

(Total 1 mark)

Q4.

ACB is a straight line.
A is the point (0, 8), and *B* is the point (4, 0)
C is the midpoint of *AB*.
Line *DCE* is perpendicular to line *ACB*.

Work out the equation of line *DCE*.



Answer _____

(Total 5 marks)

Very Likely – Speed & compound measures

Q1.

A car journey is in two stages.

Stage 1 The car travels 110 miles in 2 hours.

Stage 2 The car travels 44 miles at the same average speed as Stage 1

Work out the time for Stage 2

Give your answer in minutes.

Answer _____ minutes

(Total 3 marks)

Q2.

An exhibition

was open for 240 hours

and

had 29 760 visitors.

For $\frac{2}{5}$ of the time the exhibition was open, there were 172 visitors per hour.

For the remaining time, how many visitors per hour were there?

Answer _____

(Total 4 marks)

Q3.

Priya and Joe travel the same 16.8 km route.

Priya starts at 9.00 am and walks at a constant speed of 6 km/h

Joe starts at 9.30 am and runs at a constant speed.

Joe overtakes Priya at 10.20 am

At what time does Joe finish the route?

Answer _____

(Total 5 marks)

Very Likely – Functions

Q1.

f(x) = 8x − 5

Work out the value of f(−2)

Answer _____

(Total 1 mark)

Q2.

$f(x) = \frac{1}{2}x$ $\quad g(x) = x - x^2$

Solve $\quad f^{-1}(x) = gf(x)$

Answer _____

(Total 4 marks)

Q3.

$f(x) = 2x - 3$ and $g(x) = x^2$

Show that $f^{-1}(55) = fg(4)$

(Total 4 marks)

Q4.

$f(x) = \frac{2x+3}{x-4}$

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

Answer _____

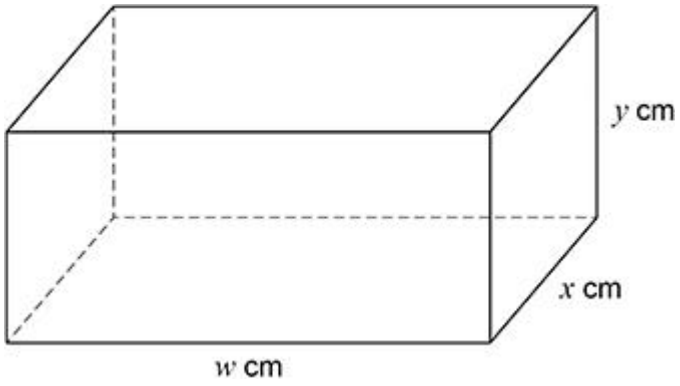
(Total 4 marks)

Very Likely – Volume of 3D shapes

Q1.

Here is a cuboid.

w, x and y are **different** whole numbers.



The total length of **all** the edges of the cuboid is 80 cm

The volume is **greater** than 200 cm^3

Work out one possible set of values for w, x and y.

w = _____ x = _____ y = _____

(Total 2 marks)

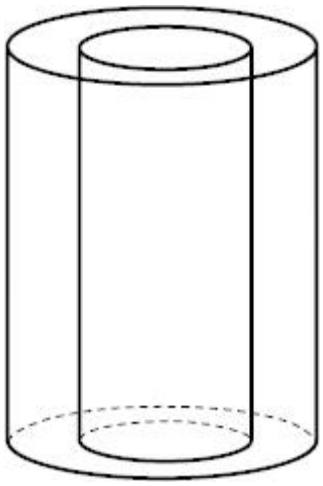
Q2.

The diagram shows a hollow cylinder made from thick glass.

The radius of the **outer** cylinder is 10 cm.

The height of the cylinder is 25 cm.

The radius of the **inner** cylinder is 4 cm.



Work out the **total** surface area of the glass.

Answer _____ cm^2

(Total 5 marks)

Q3.

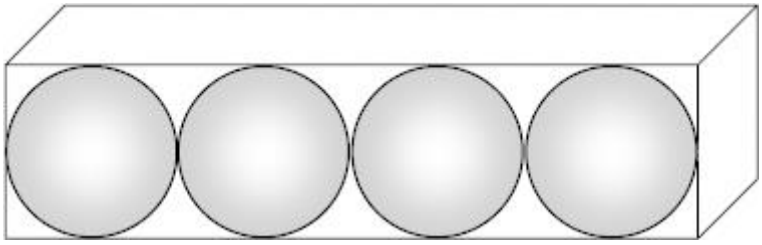
Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius.

(a) Work out the volume of a sphere of radius 6 cm.

Answer _____ cm^3

(2)

(b) Four spheres of radius 6 cm are packed tightly into a cuboid as shown.



Work out the volume of the cuboid.

Answer _____ cm^3

(4)

(Total 6 marks)

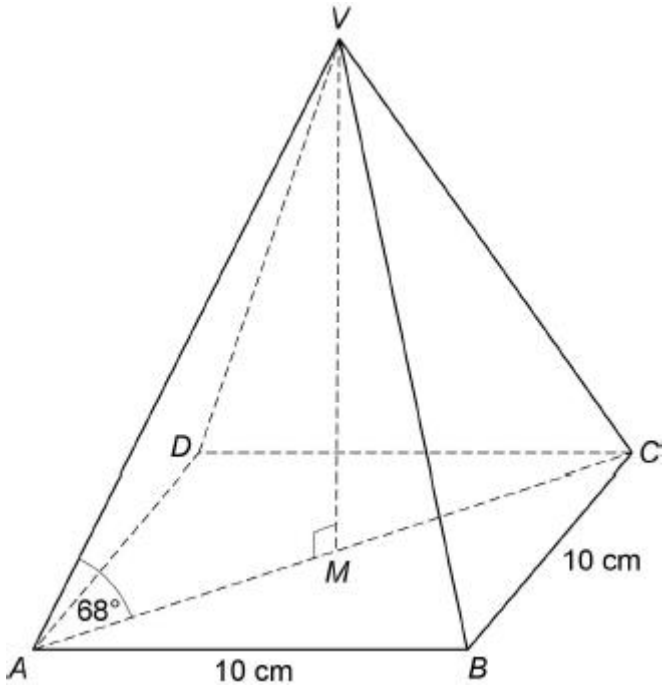
Q4.

VABCD is a square-based pyramid.

The horizontal base *ABCD* has side length 10 cm and centre *M*.

Angle *VMA* is 90°

Angle *VAM* is 68°



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

Work out the volume of the pyramid.

Answer _____ cm^3

(Total 6 marks)

Very Likely – Percentage change

Q1.

Work out 320 as a percentage of 80

Circle your answer.

25% 75% 300% 400%

(Total 1 mark)

Q2.

Carly's total annual pay = salary + bonus

	Salary	**Bonus**
Last year	£26 000	£4000
This year	6% increase	9% decrease

Work out the percentage change in her total annual pay.

State whether it is an increase or a decrease.

Answer _____

(Total 4 marks)

Q3.

w is a positive number.

x is 10% more than w.

y is 10% less than x.

Which statement is true?

Tick **one** box.

$w < x$ and $w < y$ ☐

$w < x$ and $w = y$ ☐

$x > y$ and $w > y$ ☐

$x > y$ and $w = y$ ☐

(Total 1 mark)

Q4.

Paul is competing in a pole vault competition.

His first vault is 4.5 m

His best vault is 12% higher than this.

However, his best vault is 10% lower than the winning vault.

Work out the height of the winning vault.

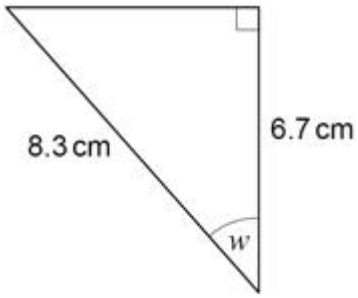
Answer _____ m

(Total 4 marks)

Very Likely – Trigonometry (SOHCAHTOA)

Q1.

Use trigonometry to work out the size of angle w.



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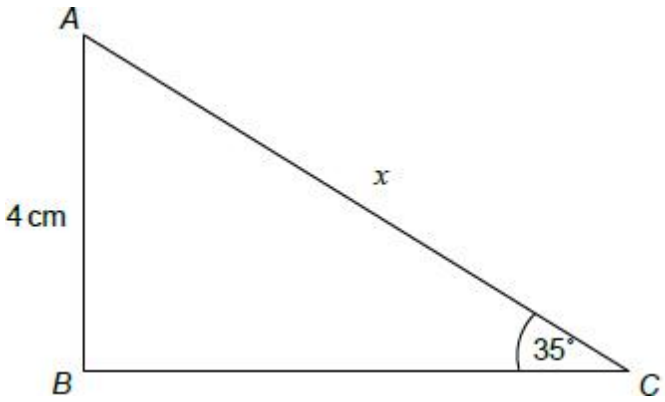
w = _____ °

(Total 3 marks)

Q2.

Nigel is using trigonometry to work out the size of length x

He assumes that angle ABC is a right angle.



(a) Using Nigel's assumption, work out the length x

Answer _____ cm

(2)

(b) In fact, angle ABC is 80°

How inaccurate does this make the answer to part **(a)**?

You **must** show your working.

(3)

(Total 5 marks)

Q3.

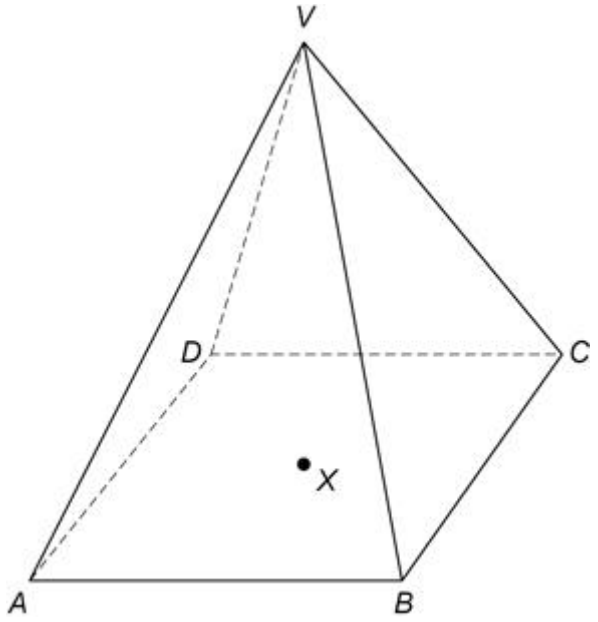
VABCD is a pyramid with a horizontal square base.

X is the centre of the base.

V is vertically above *X*.

BD = 18 cm

Angle *VBX* = 72°



Work out the length of *VB*.

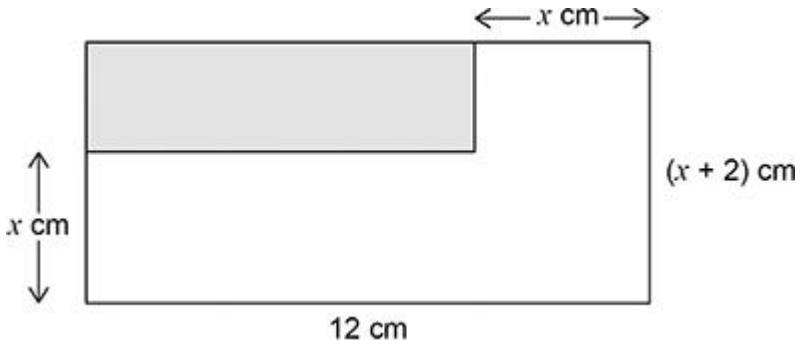
Answer _____ cm

(Total 3 marks)

Likely – Forming and solving equations

Q1.

Here are two rectangles.



The area of the shaded rectangle is $\frac{1}{4}$ the area of the large rectangle.

Work out the value of x.

Answer _____

(Total 4 marks)

Q2.

Here is the rule for a sequence.

After the first two terms, each term is the sum of the previous two terms

The 1st term is 33

The 2nd term is x

The 4th term is 73

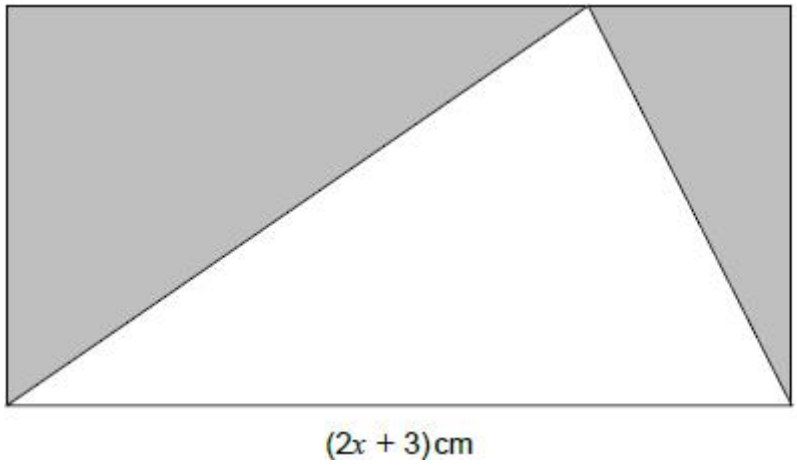
Work out the value of x.

x = _____

(Total 3 marks)

Q3.

The diagram shows a rectangle split into three triangles.



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The **total** shaded area is 8.5 cm^2

Work out the value of x

Give your answer to 1 decimal place.

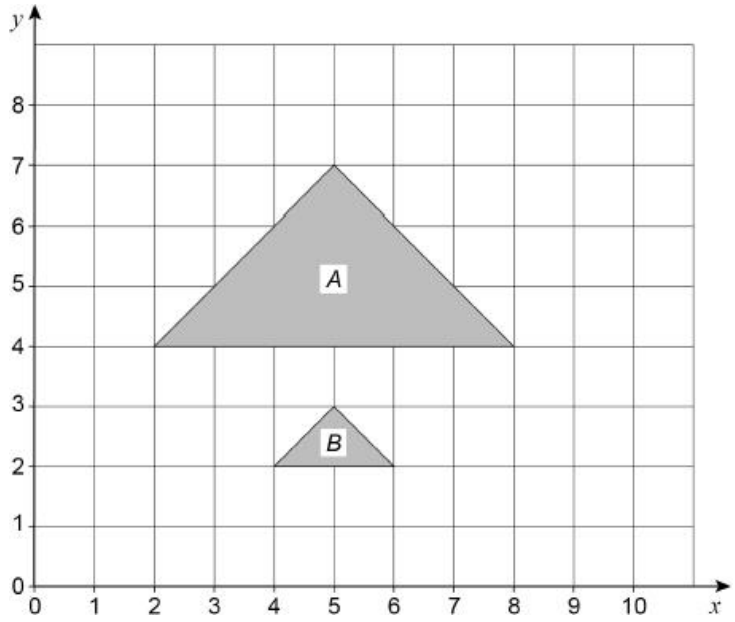
Answer _____

(Total 5 marks)

Likely – Transformations

Q1.

Describe fully the **single** transformation that maps triangle *A* to triangle *B*.



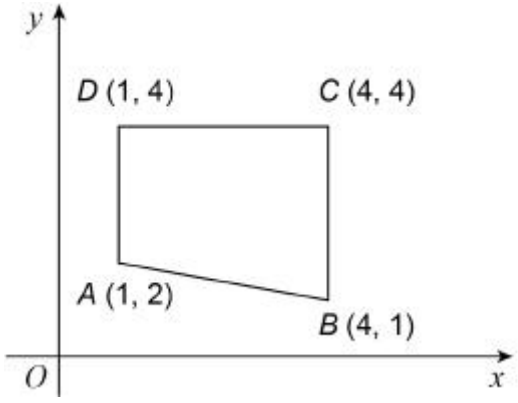
_____

_____

(Total 3 marks)

Q2.

ABCD is a quadrilateral.



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The quadrilateral is reflected in the line $x = 4$

Which vertices are invariant?

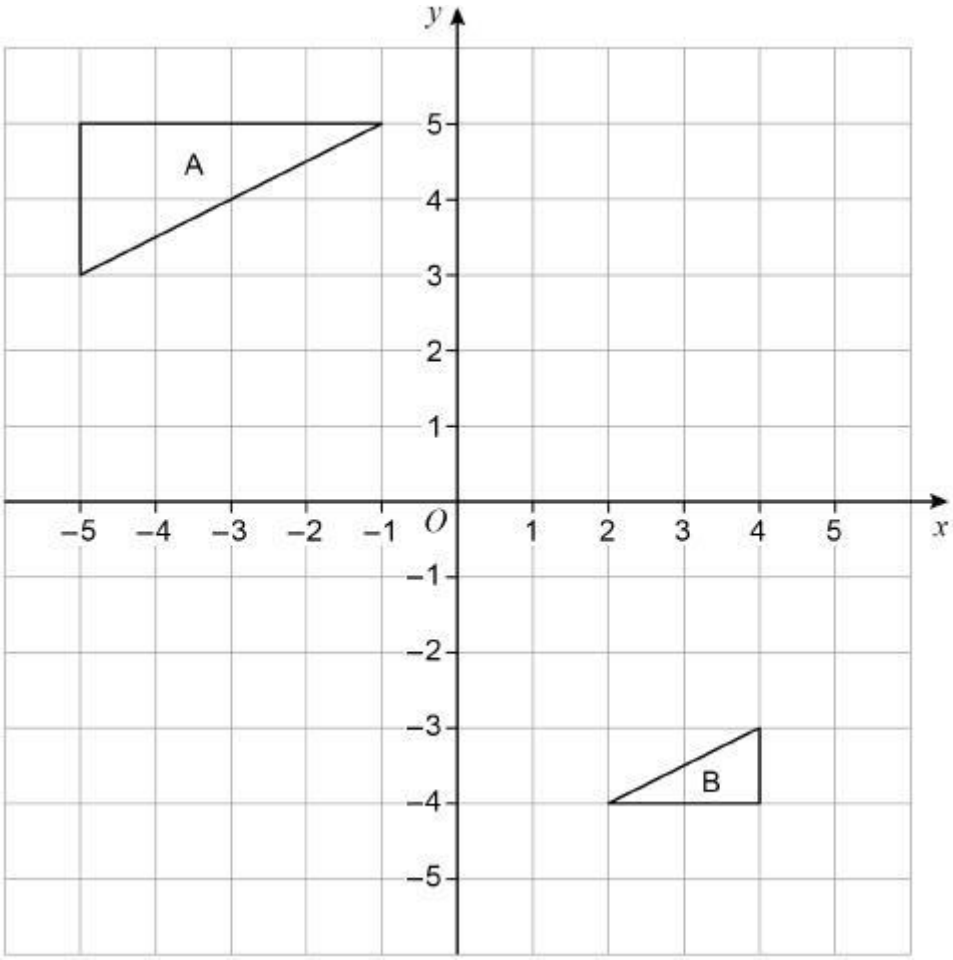
Circle your answer.

A and *D* *C* and *D* *B* and *C* *B* and *D*

(Total 1 mark)

Q3.

Shape A and shape B are shown on the grid.



Describe the **single** transformation that maps shape A to shape B.

_____

_____

_____

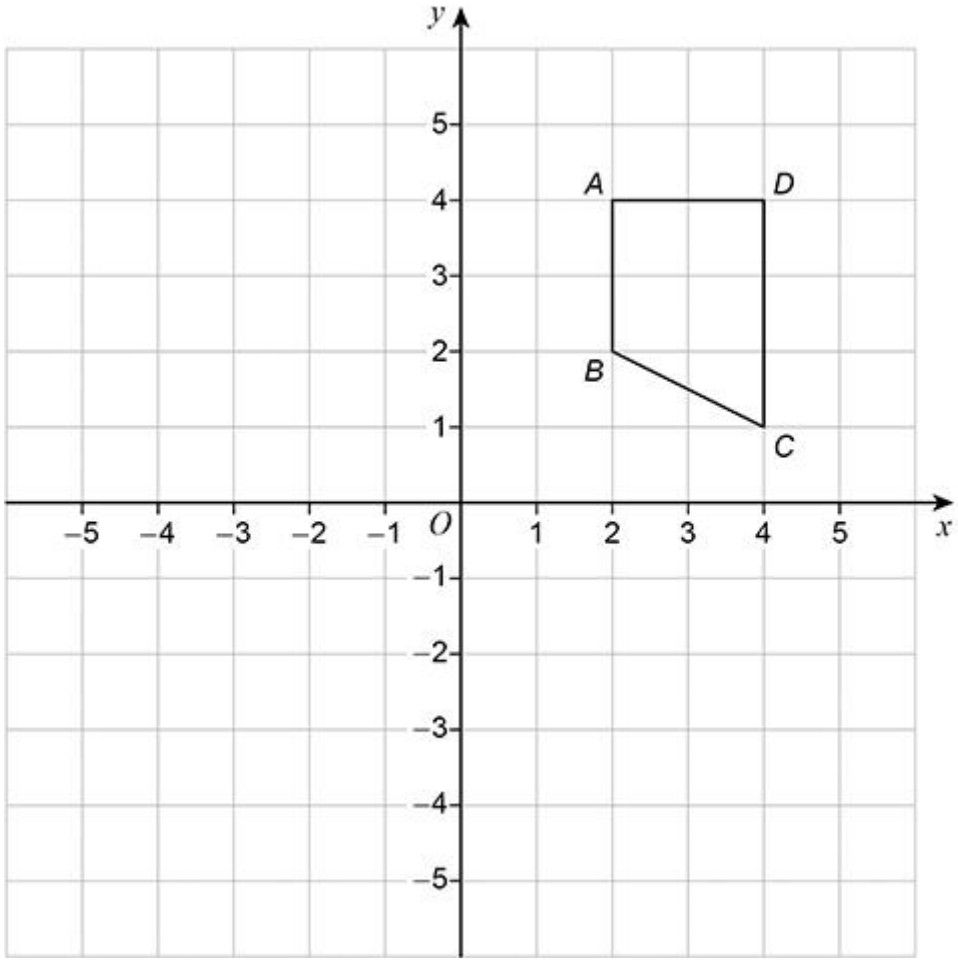
_____

_____

(Total 3 marks)

Q4.

Quadrilateral *ABCD* is shown.



Work out the coordinates of *C* when *ABCD* is

rotated 90° clockwise about *O*

then

translated by $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$

_____

_____

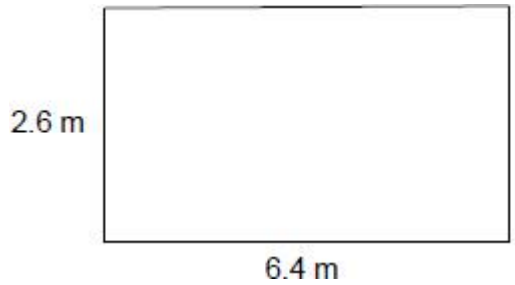
Answer (_____ , _____)

(Total 2 marks)

Likely – Bounds

Q1.

The dimensions of a rectangular floor are to the nearest 0.1 metres.



Not drawn accurately

A force of 345 Newtons is applied to the floor.
The force is to the nearest 5 Newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the upper bound of the pressure.
Give your answer to 4 significant figures.
You **must** show your working.

Answer _____ N/m^2

(Total 5 marks)

Q2.

A lorry is able to carry a maximum of 15 000 kg to 2 significant figures.
Mike loads the lorry with a container weighing 2800 kg to 2 significant figures.
He says,

"The lorry could be carrying more than 20% of its maximum load."

Is he correct?

Yes ☐ No ☐

You **must** show your working.

(Total 4 marks)

Likely – Pythagoras

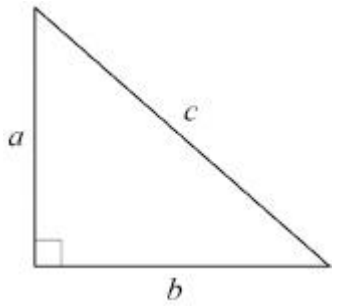
Q1.

In this right-angled triangle,

a = 16 cm

$a : c = 4 : 5$

Work out the area of the triangle.



Answer _____ cm^2

(Total 4 marks)

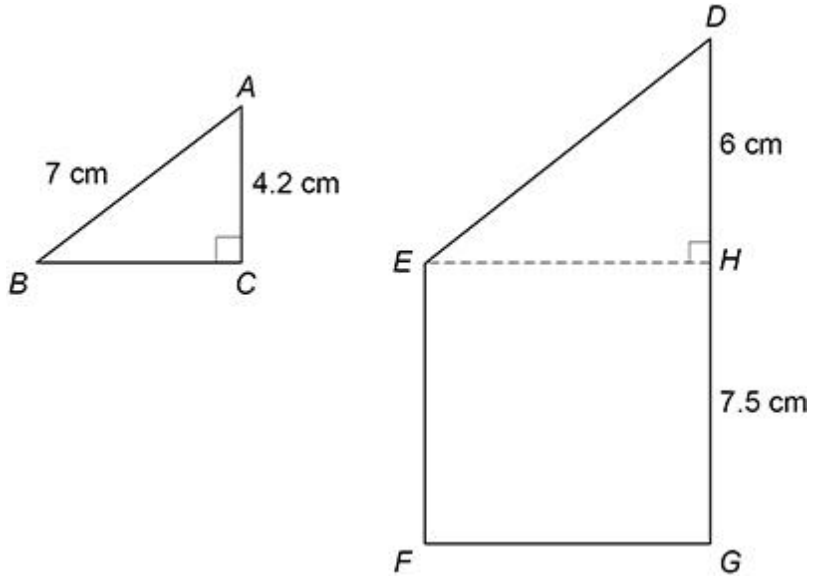
Q2.

Trapezium *DEFG* is formed by joining

triangle *DEH*

to

rectangle *EFGH*.



Not drawn accurately

ABC is similar to *DEH*.

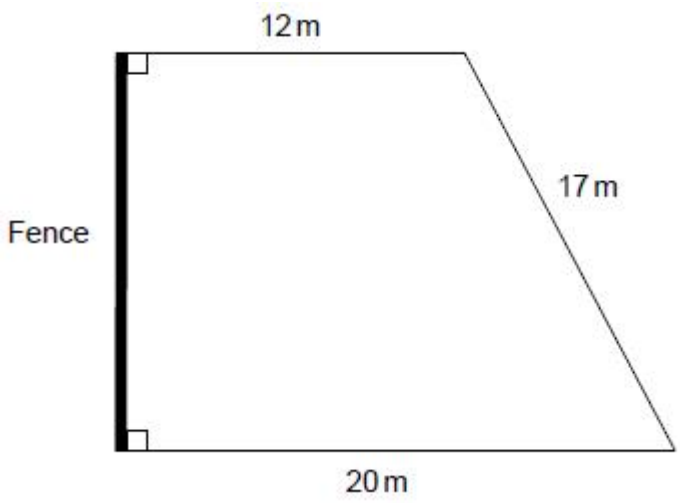
Work out the area of *DEFG.*

Answer _____ cm^2

(Total 5 marks)

Q3.

The diagram shows a lawn with a fence along one edge.



Not drawn accurately

One can of weedkiller covers 90 square metres.
Each can costs £19.25

Work out the total cost of the cans of weedkiller needed to cover the lawn.

Answer £ _____

(Total 5 marks)

Likely – Expected number of outcomes

Q1.

On a biased dice,

P(lands on 6) = 0.38

This dice is rolled 150 times.

How many times would you expect the dice **not** to land on 6 ?

Answer _____

(Total 3 marks)

Q2.

A bag contains discs.

Trial
A disc is chosen at random from the bag.
The colour of the disc is noted.
The disc is put back into the bag.

The trial is carried out 100 times.

The table shows the relative frequency of a blue disc after every 25 trials.

Total number of trials	25	50	75	100
Relative frequency of a blue disc	0.4	0.36	0.4	0.32

(a) For the trials from the 26th to the 50th, how many times was a blue disc chosen?

Answer _____

(2)

(b) There is a total of 1000 discs in the bag.

Work out the **best** estimate of the number of blue discs in the bag.

_____

_____

Answer _____

(1)

(Total 3 marks)

Q3.

Here are the results after 250 spins of a coin.

Heads	128
Tails	122

The coin is spun an extra 50 times.

After all 300 spins, the relative frequency of Heads is 0.49

For the **extra 50 spins**, work out number of Heads : number of Tails

_____

_____

_____

_____

_____

_____

_____

Answer _____ : _____

(Total 3 marks)

Likely – Substitution

Q1.

$\frac{a}{b} = 3c$

$\frac{b}{c} = 2$

Work out the value of a when $c = 8$

Answer _____

(Total 3 marks)

Q2.

This formula works out the tax you pay on what you earn.

$$T = 0.2(E - 12570)$$

T is the tax you pay in pounds.

E is the amount you earn in pounds.

(a) How much tax do you pay if you earn £24 000?

Answer £ _____

(2)

(b) What is the most you can earn without paying tax?

Answer £ _____

(1)

(c) Alison pays £6300 tax.

Work out the amount she earns.

Answer £ _____

(3)

(Total 6 marks)

Q3.

p is a positive number.

n is a negative number.

For each statement, tick the correct box.

	Always true	**Sometimes true**	**Never true**
$p + n$ is positive	☐	☐	☐
$p - n$ is positive	☐	☐	☐
$p^2 + n^2$ is positive	☐	☐	☐
$p^3 \div n^3$ is positive	☐	☐	☐

(Total 4 marks)

Likely – Compound Interest and Reverse percentage

Q1.

A bus route had 90 000 passengers last year.
The number of passengers was predicted to increase

by 3% this year
and then
by 8% next year.

Is the predicted number of passengers for **next** year more than 100 000 ?
You **must** show your working.

(Total 3 marks)

Q2.

On the same day, Kate buys

a car for £14 000
and
a painting for £5000

The value of the car decreases by 35% in the first year, and then by 10% each year.
The value of the painting increases by 4% each year.

Show that the painting becomes worth more than the car during the fifth year.

(Total 5 marks)

Q3.

£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)

Q4.

The price of a toy increases by 12.5% to £19.53

Work out the **original** price of the toy.

Answer £ _____

(Total 2 marks)

Likely – Grouped data and Histograms

Q1.

The times that 60 customers waited at a supermarket checkout are shown.

Time, t (minutes)	Frequency
$0 \leq t < 2$	18
$2 \leq t < 4$	10
$4 \leq t < 6$	16
$6 \leq t < 8$	12
$8 \leq t < 10$	4

(a) Write down the class interval that contains the median.

Answer _____

(1)

(b) The manager of the supermarket says,

"Over 90% of our customers wait less than eight minutes."

Does the data support this statement?

Yes ☐ No ☐

You **must** show your working.

_____

_____

_____

_____

(2)

(Total 3 marks)

Q2.

Liam takes part in long jump competitions.

Here is some information about 40 of his jumps.

Length of jump, d metres	Number of jumps	Midpoint	
$7.0 \leqslant d < 7.4$	15		
$7.4 \leqslant d < 7.8$	18		
$7.8 \leqslant d < 8.2$	7		
	Total = 40		

Work out an estimate of the mean distance of these 40 jumps.

Give your answer as a decimal.

Answer _____ m

(Total 3 marks)

Q3.

Here is some information about the members of a basketball club.

	Number of members	Mean height of members
Junior	30	1.6 m
Senior	20	2.05 m

Work out the mean height of all 50 members of the club.

Give your answer as a decimal.

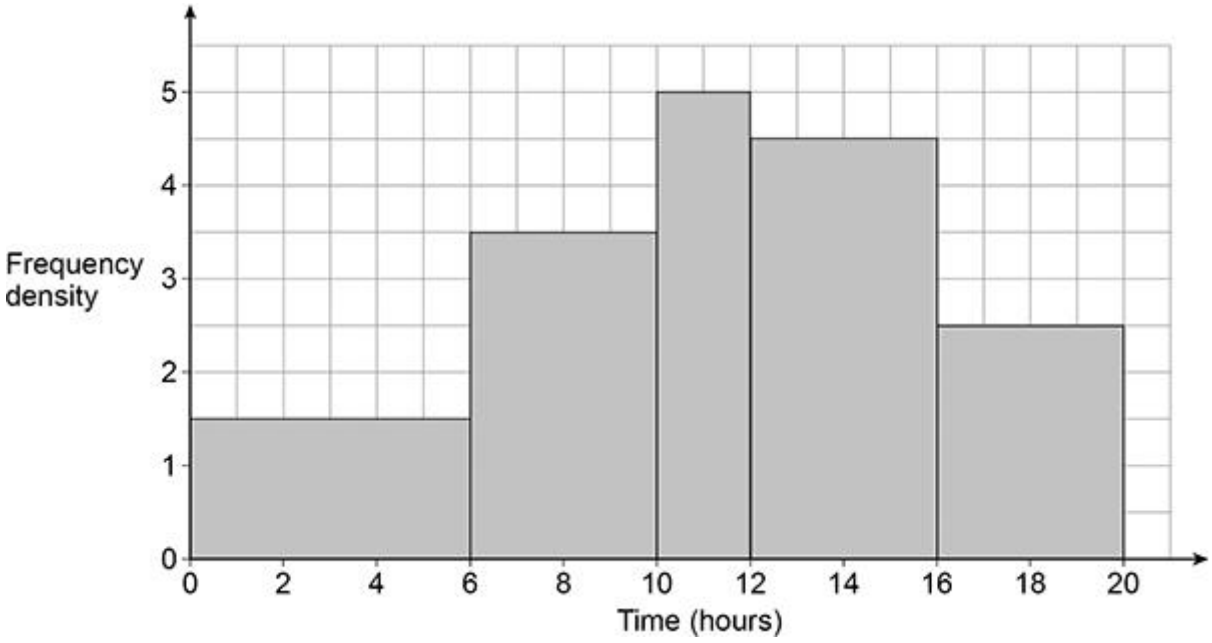
Answer _____ m

(Total 3 marks)

Q4.

61 students recorded how many hours they spent revising for a test.

The histogram represents the results.



(a) Work out an estimate of the mean time the 61 students spent revising.

You may use the table to help you.

Time, x (hours)	Frequency	Midpoint	
$0 \leqslant x < 6$			
$6 \leqslant x < 10$			
$10 \leqslant x < 12$			
$12 \leqslant x < 16$			
$16 \leqslant x < 20$			

Answer _____ hours

(4)

(b) Give a reason why the answer to part (a) is an estimate.

_____

(1)

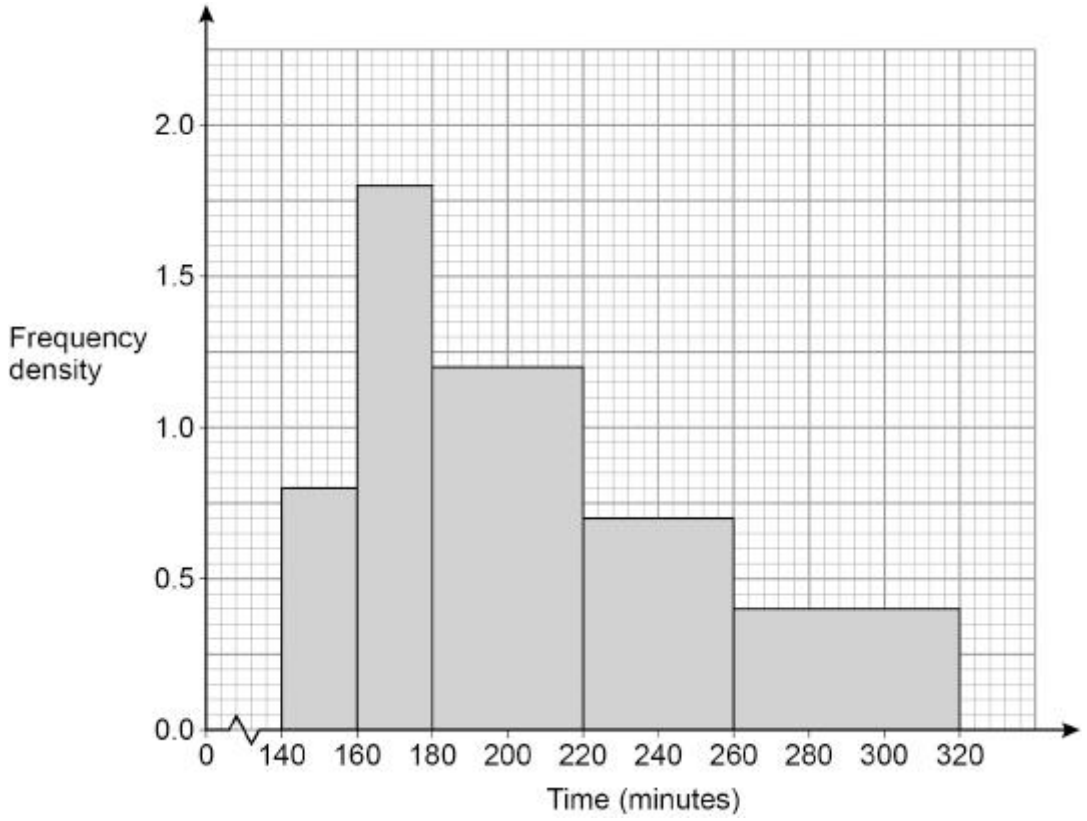
(Total 5 marks)

Q5.

180 runners **started** a marathon.

Some of the runners did not complete it.

(a) The histogram represents the times of the runners who did complete the marathon.



How many runners did **not** complete the marathon?

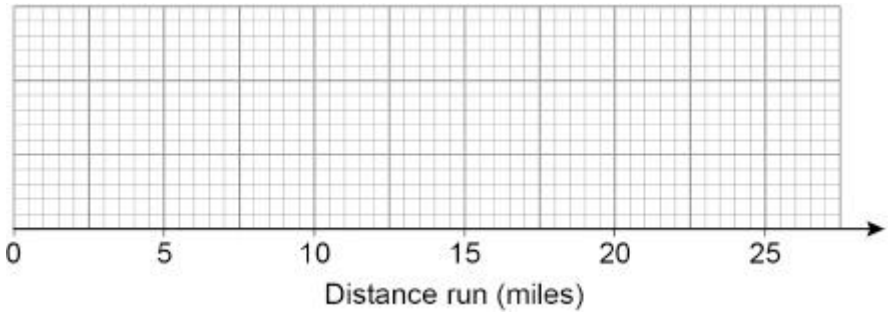
Answer _____

(3)

(b) The table shows information about the runners who did **not** complete the marathon.

	Distance run (miles)
Least distance	5
Greatest distance	23
Lower quartile	11
Median	18
Interquartile range	9

Draw a box plot to represent the information.



(3)

(Total 6 marks)

Likely – Venn diagrams

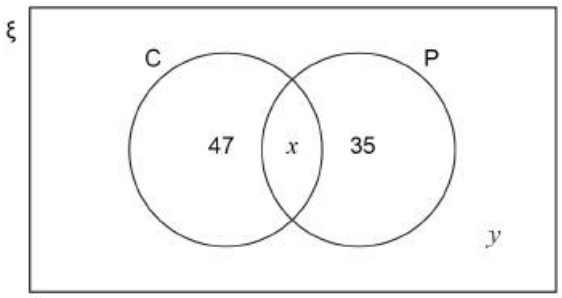
Q1.

The Venn diagram shows some information about 150 students.

ξ = 150 students

C = students who study Chemistry

P = students who study Physics



The probability that a Physics student, chosen at random, also studies Chemistry is $\frac{5}{12}$

One of the 150 students is chosen at random.

Work out the probability that the student does **not** study either Chemistry or Physics.

_____

_____

Answer _____

(Total 4 marks)

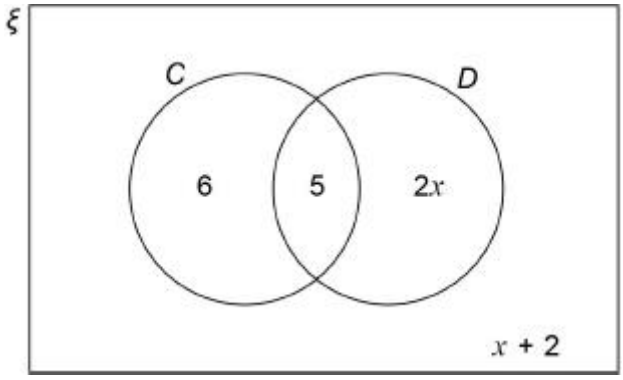
Q2.

In the Venn diagram

ξ represents 31 students in a class

C is students who have a cat

D is students who have a dog



(a) One student from the class is picked at random.

Work out the probability that the student has a dog.

Answer _____

(3)

(b) One of the students who has a cat is picked at random.

Work out the probability that this student has a dog.

Answer _____

(1)

(Total 4 marks)

Likely – Application of ratio

Q1.

A is half of B.

Work out the ratio $A : B$

Circle your answer.

1 : 2 2 : 1 1 : 3 3 : 1

(Total 1 mark)

Q2.

The ratio of $x : y$ is 3 : 4

What fraction of y is x?

Answer _____

(Total 1 mark)

Q3.

The ratio of the number of adult to junior members at a gym is 7 : 6

Fourteen more juniors join the gym.

The ratio of the number of adults to juniors at the gym is now 7 : 8

Work out the total number of people at the gym.

_____

_____

_____

_____

_____

_____

Answer _____

(Total 3 marks)

Q4.

a is three quarters of c

$6b = 5c$

Work out the ratio $a : b : c$

Give your answer in its simplest form, where a, b and c are integers.

Answer _____ : _____ : _____

(Total 3 marks)

Likely – Solve quadratic equations

Q1.

(a) Factorise fully $10a^2 + 25a$

Answer _____

(2)

(b) Solve $x^2 + 2x - 15 = 0$

x = _____

(3)

(Total 5 marks)

Q2.

Solve $x^2 + 7x - 11 = 0$

Give your solutions as decimals.

Answer _____

(Total 2 marks)

Q3.

Using the quadratic formula, or otherwise, solve $3x^2 + x - 5 = 0$

Answer _____

(Total 2 marks)

Q4.

Solve $2x(x + 10) = 5x - 18$

Answer _____

(Total 4 marks)

Likely – Iterative processes

Q1.

A sphere has radius r cm

An approximate value of r can be found using the iterative formula

$$r_{n+1} = \sqrt{\frac{239}{r_n}}$$

The starting value is $r_1 = 7$

(a) Work out the values of r_2 and r_3

r_2 = _____

r_3 = _____

(2)

(b) Continue the iteration to work out the radius to 1 decimal place.

Answer _____ cm

(1)

(Total 3 marks)

Q2.

Use the iteration $x_{n+1} = \sqrt{\frac{2x_n + 4}{5}}$

to work out an approximate solution to $x = \sqrt{\frac{2x + 4}{5}}$

Start with $x_1 = 1$

Give your answer to 2 decimal places.

Answer _____

(Total 3 marks)

Q3.

An approximate value of a root of an equation, x, can be found using the iterative formula

$$x_{n+1} = \sqrt[3]{5(x_n)^2 - 2x_n - 3}$$

The starting value is $x_1 = 4$

(a) Work out the values of x_2 and x_3

x_2 = _____

x_3 = _____

(2)

(b) By continuing the iteration, show that the value of x is more than 4.25

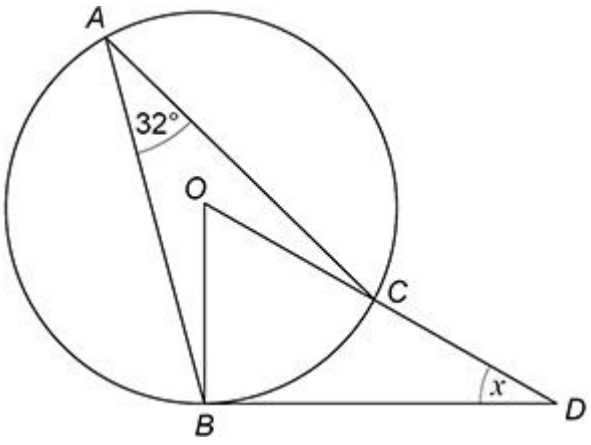
(1)

(Total 3 marks)

Likely – Circle Theorems

Q1.

A, *B* and *C* are points on a circle, centre *O*.
BD is a tangent to the circle.
OCD is a straight line.



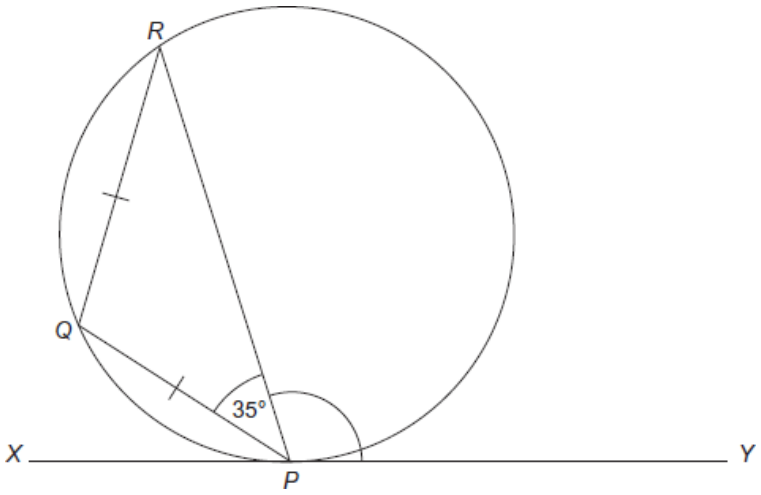
Work out the size of angle x.

x = _____ degrees

(Total 3 marks)

Q2.

P, *Q* and *R* are points on a circle.
Triangle *PQR* is isosceles.
XY is a tangent to the circle at *P*.



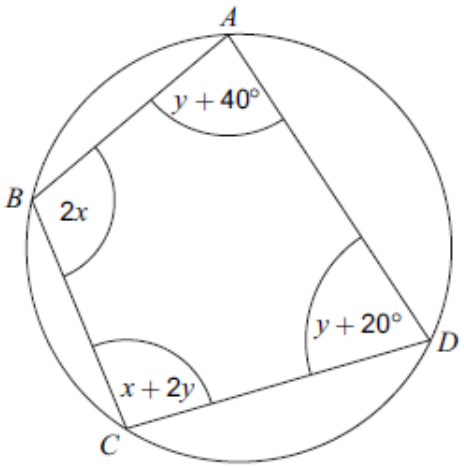
Work out the size of angle *RPY*.

Answer _____ degrees

(Total 2 marks)

Q3.

ABCD is a cyclic quadrilateral.



Work out the values of x and y.

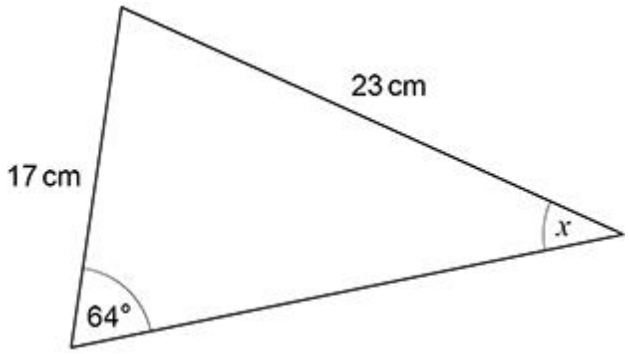
x = _____ , y = _____

(Total 5 marks)

Likely – Trigonometry (non-right angle)

Q1.

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

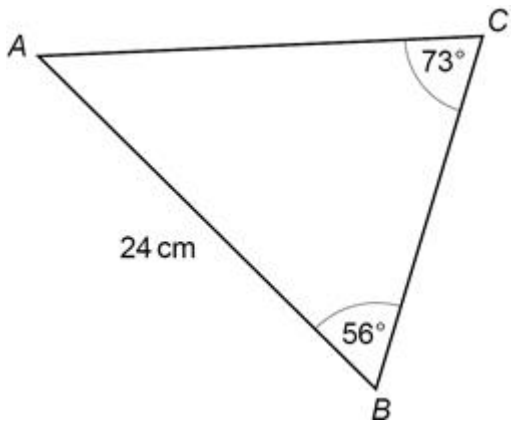


x = _____ °

(Total 3 marks)

Q2.

Work out the area of triangle *ABC*.



Answer _____ cm^2

(Total 4 marks)

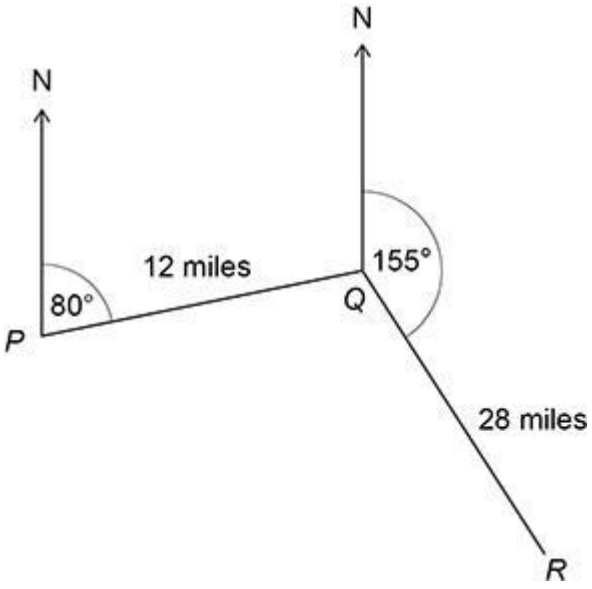
Q3.

A ship sails from *P* to *Q* and then from *Q* to *R*.

Q is 12 miles from *P*, on a bearing of 080°

R is 28 miles from *Q*, on a bearing of 155°

Work out the direct distance from *P* to *R*.



Answer _____ miles

(Total 4 marks)

Likely – Similar Areas and Volumes

Q1.

Two spheres have radii in the ratio 5 : 3

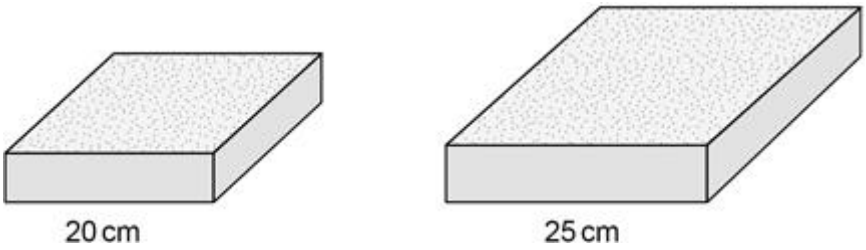
Circle the ratio of their volumes.

5 : 3 15 : 9 25 : 9 125 : 27

(Total 1 mark)

Q2.

Here are two square-based paving stones.
The stones are similar solids.



The price per cm^3 is the same for both stones.
The price of the **larger** stone is £17.50

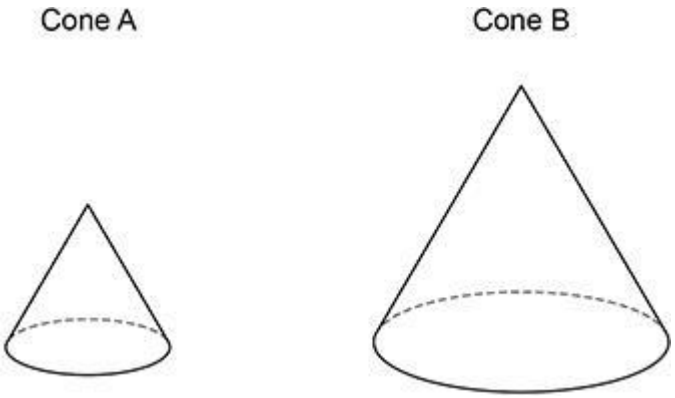
Work out the price of the smaller stone.

Answer £ _____

(Total 4 marks)

Q3.

Here are two similar cones.



The surface area of cone A is 2 m^2

The surface area of cone B is 4.5 m^2

Work out the ratio radius of cone A : radius of cone B

Give your answer in the form 1 : n

Answer _____ : _____

(Total 3 marks)

Likely – Factorise Quadratics

Q1.

Circle the factor of $x^2 - 5x$

$x - 1$ $\quad$ $-5x$ $\quad$ $x - 5$ $\quad$ $5x$

(Total 1 mark)

Q2.

Factorise $x^2 - 64$

Circle your answer.

$(x + 8)^2$ $\quad$ $(x - 8)^2$ $\quad$ $(x + 8)(x - 8)$ $\quad$ $x(x - 64)$

(Total 1 mark)

Q3.

Factorise $25a^2 - b^2$

Answer _____

(Total 1 mark)

Q4.

Factorise $3x^2 - 16x - 12$

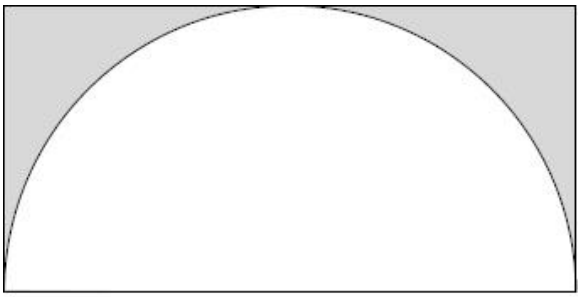
Answer _____

(Total 2 marks)

Likely – Circles and sectors

Q1.

The diagram shows a semicircle of diameter 15 cm inside a rectangle.



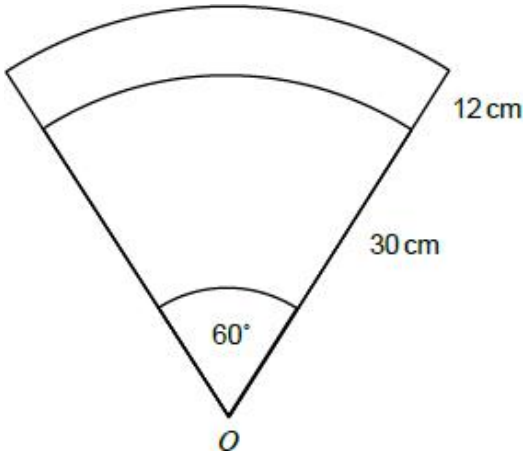
Work out the shaded area.

Answer _____ cm^2

(Total 4 marks)

Q2.

The diagram shows two circular arcs with centre *O*



How much longer is the big arc than the small arc?

Answer _____ cm

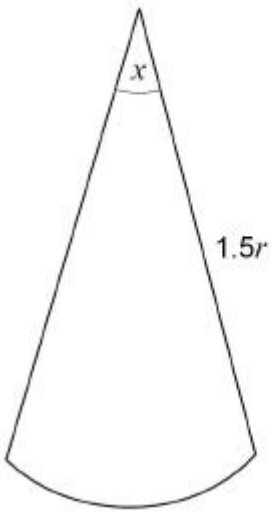
(Total 4 marks)

Q3.

Here are two sectors from different circles.

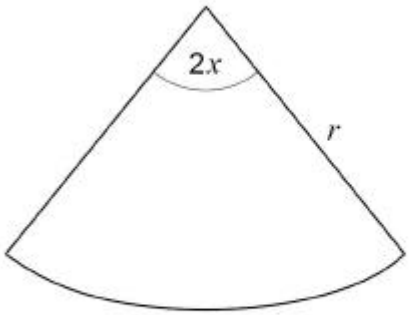
Not drawn accurately

Sector A



Sector B

Not drawn accurately



Which sector has the bigger area?

Tick a box.

☐ Sector A ☐ Sector B

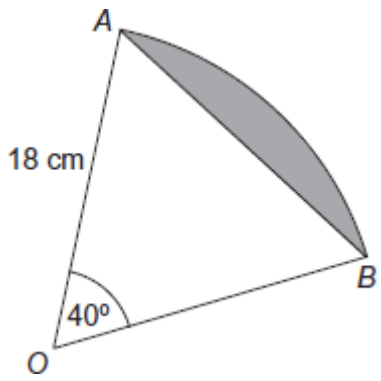
Show working to support your answer.

(Total 2 marks)

Q4.

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 _____ cm^2

(Total 3 marks)