Chhetri Academy

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GCSE MATHS

Ratio, proportion and rates of change

Edexcel 1MA1 | Subtopic collection Topic 31

Ratio

Higher tier

Past paper question booklet

100	2005-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

2. Three women earned a total of £36
They shared the £36 in the ratio 7:3:2

Donna received the largest amount.

(a) Work out the amount Donna received.

£.....
(3)

A year ago, Donna weighed 51.5 kg.
Donna now weighs $8\frac{1}{2}\%$ less.

(b) Work out how much Donna now weighs.
Give your answer to an appropriate degree of accuracy.

..... kg
(4)

(Total 7 marks)

Q2

1. Mr Brown makes some compost.
He mixes soil, manure and leaf mould in the ratio 3:1:1

Mr Brown makes 75 litres of compost.

(a) How many litres of soil does he use?

..... litres
(3)

Mr Brown sows 200 flower seeds.

For each flower seed the probability that it will produce a flower is 0.8

(b) Work out an estimate for the number of these flower seeds that will produce a flower.

.....
(2)

Q1

(Total 5 marks)

5. Lillian, Max and Nazia share a sum of money in the ratio 2 : 3 : 5

Nazia receives £60

Work out how much money Lillian receives.

£ .....

(Total 3 marks)

Q5

21. The volumes of two mathematically similar solids are in the ratio 27 : 125

The surface area of the smaller solid is 36 cm^2.

Work out the surface area of the larger solid.

..... cm^2

(Total 3 marks)

Q21

Blank

8. There are some sweets in a bag.

18 of the sweets are toffees.
12 of the sweets are mints.

(a) Write down the ratio of the number of toffees to the number of mints.
Give your ratio in its simplest form.

..... : .....
(2)

There are some oranges and apples in a box.
The total number of oranges and apples is 54
The ratio of the number of oranges to the number of apples is 1 : 5

(b) Work out the number of apples in the box.

.....
(2)

Q8

(Total 4 marks)

13. A piece of wood is 180 cm long.
Tom cuts it into three pieces in the ratio 2 : 3 : 4

Work out the length of the longest piece.

..... cm

(Total 3 marks)

Q13

7. Anna and Bill share £40 in the ratio 2 : 3

Work out how much each person gets.

Anna £.....

Bill £.....

(Total 3 marks)

Q7

Question 08

1. A box contains milk chocolates and dark chocolates only.
The number of milk chocolates to the number of dark chocolates is in the ratio 2 : 1

There are 24 milk chocolates.

Work out the total number of chocolates.

.....

Q1

(Total 2 marks)

7 A company sends every item of mail by second class post.
Each item of mail is either a letter or a packet.

The tables show information about the cost of sending a letter by second class post and the cost of sending a packet by second class post.

Letter

Weight range	Second Class
0–100g	32p

Packet

Weight range	Second Class
0–100g	£1.17
101–250g	£1.51
251–500g	£1.95
501–750g	£2.36
751–1000g	£2.84

The company sent 420 items by second class post.
The ratio of the number of letters sent to the number of packets sent was 5 : 2

$\frac{2}{3}$ of the packets sent were in the weight range 0 – 100 g.

The other packets sent were in the weight range 101 – 250 g.

Work out the total cost of sending the 420 items by second class post.

£ .....

(Total for Question 7 is 5 marks)

1 Grace and Jack share £140 in the ratio 3 : 4

Work out the amount of money that Jack gets.

£ .....

(Total for Question 1 is 2 marks)

3 A shop sells freezers and cookers.

The ratio of the number of freezers sold to the number of cookers sold is 5 : 2
The shop sells a total of 140 freezers and cookers in one week.

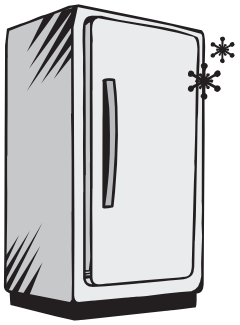
*(a) Work out the number of freezers and the number of cookers sold that week.

(3)

Jake buys this freezer in a sale.
The price of the freezer is reduced by 20%.

(b) Work out how much Jake saves.

Freezer
Original Price
£145



£ .....

(2)

(Total for Question 3 is 5 marks)

Question 12

2 Ali, Ben and Candice share £300 in the ratio 2 : 3 : 5

How much money does Candice get?

£ .....

(Total for Question 2 is 2 marks)

3 Build-a-mix makes concrete.

1 cubic metre of concrete has a weight of 2400 kg.

15% of the concrete is water.

The rest of the ingredients of concrete are cement, sand and stone.
The weights of these ingredients are in the ratio 1 : 2 : 5

(a) Work out the weight of cement, of sand and of stone in 1 cubic metre of concrete.

cement = ... kg

sand = ... kg

stone = ... kg

(4)

Build-a-mix needs to make 30 cubic metres of concrete.
Build-a-mix has only got 6.5 tonnes of cement.

*(b) Will this be enough cement for Build-a-mix to make 30 cubic metres of concrete?
You must show all of your working.

(3)

(Total for Question 3 is 7 marks)

5. Melissa is 13 years old.
Becky is 12 years old.
Daniel is 10 years old.

Melissa, Becky and Daniel share £28 in the ratio of their ages.
Becky gives a third of her share to her mother.

How much should Becky now have?

£ .....

Q5

(Total 4 marks)

Question 15

2 A pile of sand has a weight of 60 kg.
The sand is put into a small bag, a medium bag and a large bag in the ratio 2 : 3 : 7

Work out the weight of sand in each bag.

small bag ..... kg

medium bag ..... kg

large bag ..... kg

(Total for Question 2 is 3 marks)

10 Mrs Jennings shares £770 between her two sons, Pete and Tim.
She shares the money in the ratio of her sons' ages.

The combined age of her two sons is 66 years.
Pete is 6 years younger than Tim.

Work out how much money each son gets.
You must show all your working.

Pete £ .....

Tim £ .....

(Total for Question 10 is 5 marks)

Question 17

***2** Mrs Collins is organising a school trip.
120 students are going on the trip.

The ratio of the number of staff to the number of students must be 1 : 15

Mrs Collins books three coaches for the trip.
Each coach has 42 seats.

Are there enough seats for all the students and staff?
You must show all your working.

(Total for Question 2 is 4 marks)

3 Graham and Michael share £35 in the ratio 5 : 2

Work out the amount of money that Graham gets.

£ .....

(Total for Question 3 is 2 marks)

10 Susie has to deliver some packages and some parcels.

The total number of packages is 4 times the number of parcels.
The total number of packages and parcels is 40

Each parcel has a weight of 1.5 kg.
The total weight of the packages and parcels is 37.6 kg.

Each of the packages has the same weight.

Work out the weight of each package.

..... kg

(Total for Question 10 is 4 marks)

***13** Talil is going to make some concrete mix.
He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.

Talil wants to make 180 kg of concrete mix.

Talil has

15 kg of cement
85 kg of sand
100 kg of gravel

Does Talil have enough cement, sand and gravel to make the concrete mix?

(Total for Question 13 is 4 marks)

12 5 schools sent some students to a conference.

One of the schools sent both boys and girls.
This school sent 16 boys.
The ratio of the number of boys it sent to the number of girls it sent was 1 : 2

The other 4 schools sent only girls.
Each of the 5 schools sent the same number of students.

Work out the total number of students sent to the conference by these 5 schools.

.....

(Total for Question 12 is 4 marks)

Question 22

1 Keith and Graham share £105 in the ratio 4 : 3

Work out how much Keith gets.

£.....

(Total for Question 1 is 2 marks)

6 Bill gives away £20 000 to help animals.

He gives 20% of the £20 000 to a donkey sanctuary.
He shares the rest of the £20 000 between a dogs' home and a cats' home in the ratio 3 : 2

How much money does Bill give to the cats' home?

£.....

(Total for Question 6 is 4 marks)

7 Colin, Dave and Emma share some money.

Colin gets $\frac{3}{10}$ of the money.

Emma and Dave share the rest of the money in the ratio 3 : 2

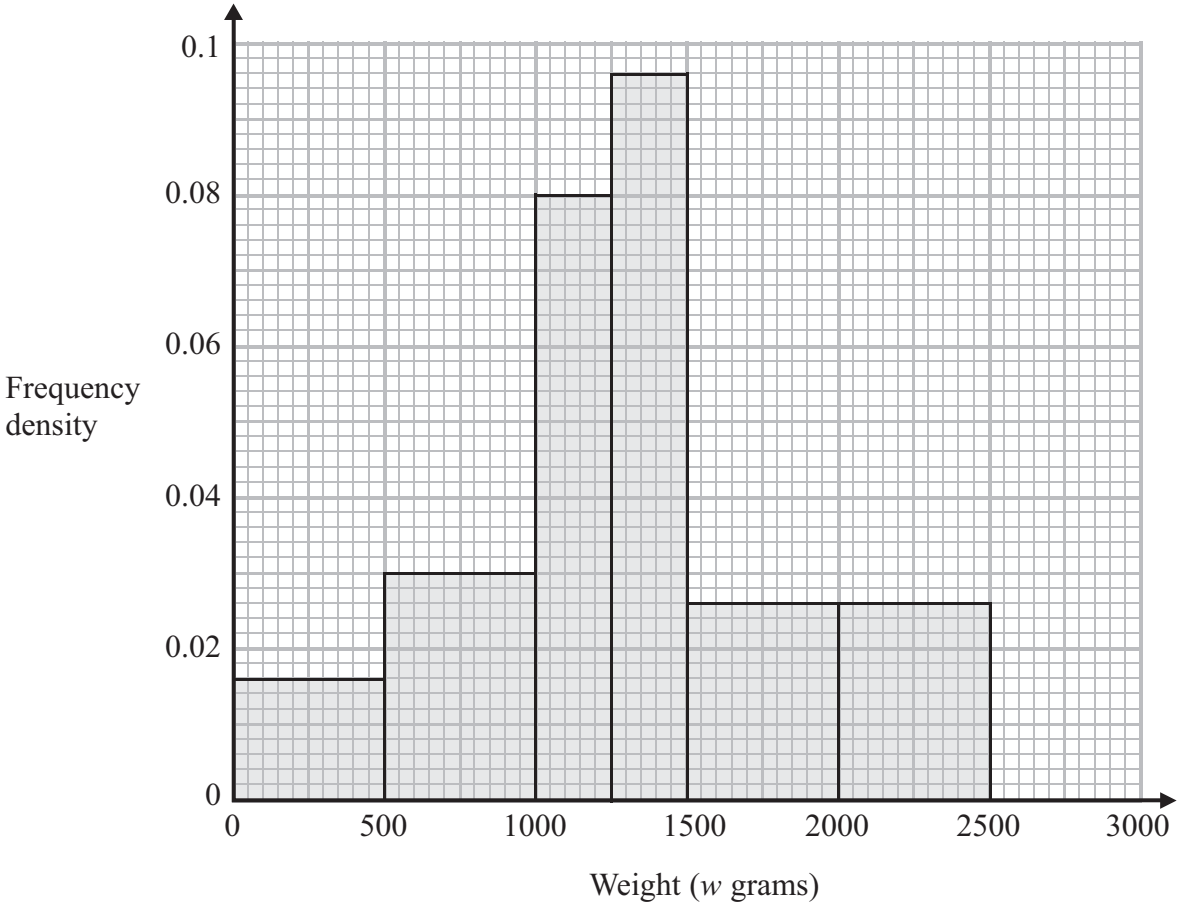
What is Dave's share of the money?

.....

(Total for Question 7 is 4 marks)

14 Jim went on a fishing holiday.

The histogram shows some information about the weights of the fish he caught.



(a) Use the histogram to complete the frequency table.

Weight (w grams)	Frequency
$0 < w \leqslant 500$	8
$500 < w \leqslant 1000$	
$1000 < w \leqslant 1250$	
$1250 < w \leqslant 1500$	
$1500 < w \leqslant 2500$	

(2)

Jim kept all the fish he caught with a weight greater than 2000 g.

(b) Find the ratio of the number of fish Jim kept to the total number of fish he caught.

.....

(2)

(c) Use the histogram to find an estimate of the median.

..... g

(2)

(Total for Question 14 is 6 marks)

11 Each day a company posts some small letters and some large letters.

The company posts all the letters by first class post.

The tables show information about the cost of sending a small letter by first class post and the cost of sending a large letter by first class post.

Small Letter

Weight	First Class Post
0–100 g	60p

Large Letter

Weight	First Class Post
0–100 g	£1.00
101–250 g	£1.50
251–500 g	£1.70
501–750 g	£2.50

One day the company wants to post 200 letters.

The ratio of the number of small letters to the number of large letters is 3 : 2

70% of the large letters weigh 0–100 g.

The rest of the large letters weigh 101–250 g.

Work out the total cost of posting the 200 letters by first class post.

£.....

(Total for Question 11 is 5 marks)

24 $OACB$ is a parallelogram.

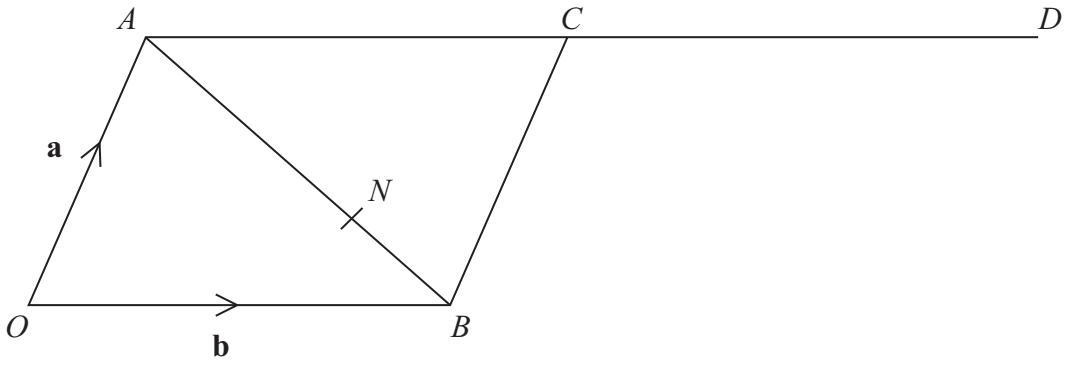


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$
D is the point such that $\overrightarrow{AC} = \overrightarrow{CD}$
The point N divides AB in the ratio $2:1$

(a) Write an expression for $\overrightarrow{ON}$ in terms of **a** and **b**.

.....

(3)

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

(3)

(Total for Question 24 is 6 marks)

2 Pavel and Katie share some sweets in the ratio 3 : 8
Katie gets 32 sweets.

(a) How many sweets does Pavel get?

.....

(2)

Katie also has a tin of chocolates.
There are 80 chocolates in the tin.
45% of the chocolates have toffee in the middle.

(b) Work out the number of chocolates that have toffee in the middle.

.....

(2)

(Total for Question 2 is 4 marks)

19 Here is a cuboid drawn on a 3-D grid.

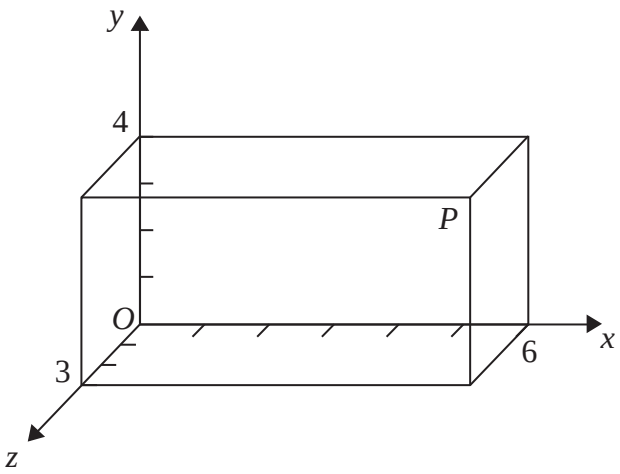


Diagram **NOT** accurately drawn

P is a vertex of the cuboid.

T divides the line *OP* in the ratio 1 : 2

Find the coordinates of *T*.

(..... , ... , ...)

(Total for Question 19 is 2 marks)

***4** 140 children will be at a school sports day.
Lily is going to give a cup of orange drink to each of the 140 children.
She is going to put 200 millilitres of orange drink in each cup.

The orange drink is made from orange squash and water.
The orange squash and water are mixed in the ratio 1 : 9 by volume.

Orange squash is sold in bottles containing 750 millilitres.

Work out how many bottles of orange squash Lily needs to buy.
You must show all your working.

(Total for Question 4 is 4 marks)

7 60 children go to a nursery.
The ratio of girls to boys is 3 : 2

The children go to the nursery either in the morning or in the afternoon.

$\frac{3}{4}$ of the children go to the nursery in the morning.

The rest of the children go to the nursery in the afternoon.

7 boys go to the nursery in the afternoon.

Work out how many girls go to the nursery in the morning.

.....

(Total for Question 7 is 5 marks)

*14

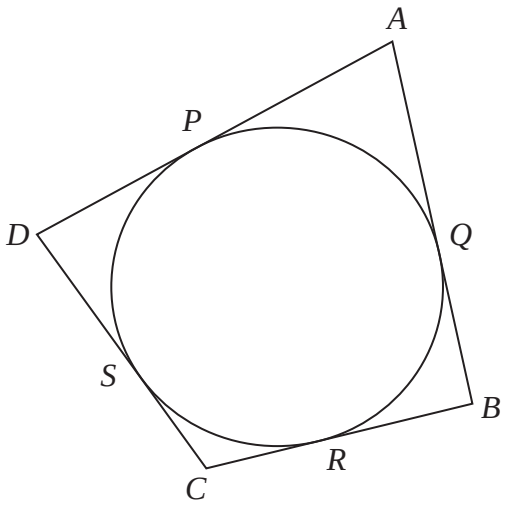


Diagram **NOT** accurately drawn

ABCD is a quadrilateral.
AB, *AD*, *BC* and *CD* are tangents to a circle.
The tangents touch the circle at *Q*, *P*, *R* and *S* respectively.
AC goes through the centre of the circle.

AP : *PD* is in the ratio 3 : 2
AQ : *QB* is in the ratio 3 : 2

Prove that *ABCD* is a kite.

(Total for Question 14 is 5 marks)

8 Sandra has a piece of string 153 cm long.
She cuts the string into three lengths in the ratio 4 : 2 : 3

Work out the length, in centimetres, of each piece of string.

..... cm

..... cm

..... cm

(Total for Question 8 is 3 marks)

6 Stephen plays in a basketball team.

The list shows the numbers of points Stephen scored in 15 games of basketball this year.

26 14 33 8 21 18 20 9 17 22 21 18 22 30 25

(a) Show this information in an ordered stem and leaf diagram.



(3)

Last year the ratio of the number of games Stephen's team won to the number of games Stephen's team did **not** win was 5 : 4

Last year Stephen's team played 36 games.

(b) Work out the number of games Stephen's team won last year.

.....

(2)

(Total for Question 6 is 5 marks)

6 Gary's motorbike uses petrol.

Gary needs to mix oil with the petrol.
He mixes oil and petrol in the ratio 1 : 14 by volume.

Gary is going to ride his motorbike 3000 miles.
Each 20 miles he rides uses 1 litre of the oil and petrol mixture.

A 500 m*l* bottle of oil costs £3.99

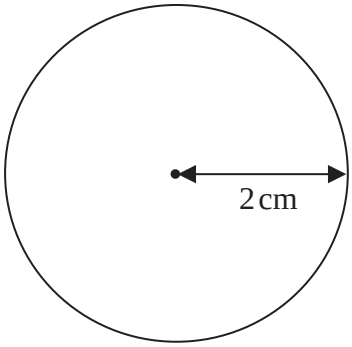
Work out the total cost of the bottles of oil Gary needs to buy.
(1 litre = 1000 m*l*)

You must show all your working.

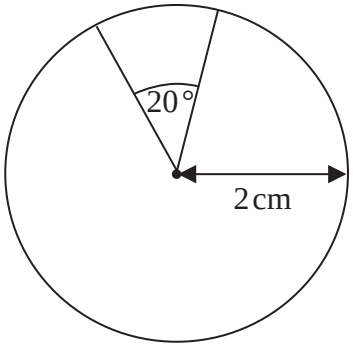
£.....

(Total for Question 6 is 4 marks)

20 Here are two watch faces, **A** and **B**.



face **A**



face **B**

Diagram **NOT** accurately drawn

Both watch faces are circular with radius 2 cm.

The materials used to make both watch faces have the same thickness.

A is made entirely of plastic.
B has a 20° sector of metal and a 340° sector of plastic.

The ratio of the cost per cm^2 of the metal to the cost per cm^2 of the plastic is 3 : 2

Work out the ratio of the cost of the materials for **A** to the cost of the materials for **B**.
Give your answer in its simplest form.
You must show all your working.

.....

(Total for Question 20 is 4 marks)

8 Emma has a digital photo.



Diagram **NOT** accurately drawn

The photo has a width of 720 pixels.
The photo has a height of 540 pixels.

(a) Write down the ratio of the width of the photo to the height of the photo.
Give your ratio in its simplest form.

.....

(2)

Emma wants the ratio of the width of the photo to the height of the photo to be 3 : 2
She reduces the number of pixels in the height of the photo.
The width of the photo is still 720 pixels.

The ratio of the width of the photo to the new height of the photo is 3 : 2

(b) Work out the new height of the photo.

..... pixels

(2)

(Total for Question 8 is 4 marks)

***8** Seeta is organising a concert to raise money for a school and for a hospital.

A total of $\frac{1}{20}$ of the money received from selling tickets will be spent on hiring a hall.

The rest of the money received from selling tickets will be given to the school and to the hospital in the ratio $2:3$

Seeta expects to sell 1000 tickets at £23.50 each.

Work out the amount of money that Seeta expects to give to the school and to the hospital.
You must show all your working.

(Total for Question 8 is 5 marks)

3 There are some red counters and some yellow counters in a bag in the ratio 1 : 5
There are 20 yellow counters in the bag.

(a) Work out the number of red counters in the bag.

.....

(2)

Janet puts some more red counters into the bag.
The ratio of the number of red counters to the number of yellow counters is now 1 : 2

(b) How many red counters does Janet put into the bag?

.....

(2)

(Total for Question 3 is 4 marks)

27 The diagram shows a sphere and a solid cylinder.

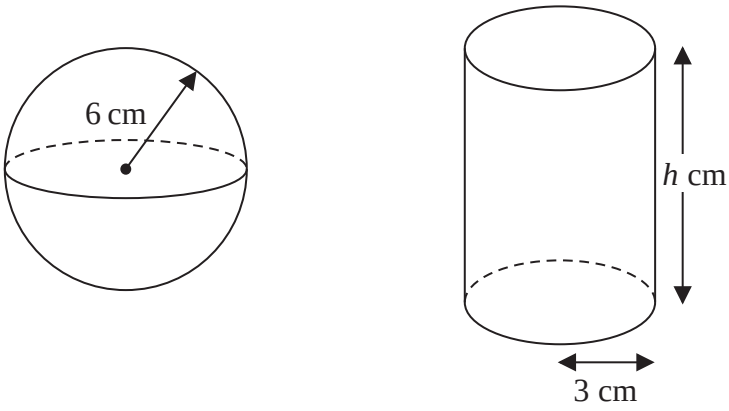


Diagram **NOT** accurately drawn

The sphere has radius 6 cm.
The solid cylinder has a base radius of 3 cm and a height of h cm.

The total surface area of the cylinder is twice the total surface area of the sphere.

Work out the ratio of the volume of the sphere to the volume of the cylinder.
Give your answer in its simplest form.
You must show all your working.

.....

(Total for Question 27 is 5 marks)

2 Jon shares £700 equally between his two children, Ellie and Maddie.

Ellie gives £125 of her share of the money to Maddie.

(a) Write down the ratio of the amount of money Ellie now has to the amount of money Maddie now has.

.....

(2)

Jenny shares £630 between her two children, Daniel and Rose, in the ratio 5 : 13

(b) Work out how much money Jenny gives to each child.

Daniel £.....

Rose £.....

(3)

(Total for Question 2 is 5 marks)

3 A supermarket car park has 200 spaces.
10% of the spaces are for staff.

The other spaces are for disabled people, for parents and for other customers in the ratio 1 : 2 : 7

Paul is going to paint a sign for each of the spaces for staff, for disabled people and for parents.
He is **not** going to paint signs for the spaces for other customers.

Work out the total number of spaces Paul is going to paint a sign for.

.....

(Total for Question 3 is 4 marks)

6 Babajan makes breakfast cereal.
She mixes nuts, raisins and oats in the ratio 3 : 2 : 5 by weight.

On Monday, Babajan uses 60 grams of nuts.

(a) Work out the weight of raisins and the weight of oats she uses to make the breakfast cereal.

raisins ..... grams

oats ..... grams

(3)

On Tuesday, Babajan makes 300 grams of the breakfast cereal.

500 grams of nuts cost £8

(b) Work out the cost of the nuts used to make 300 grams of the breakfast cereal.

£ .....

(3)

(Total for Question 6 is 6 marks)

14 White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3 : 7

The ratio of the number of white circles to the number of white squares is 4 : 5

The ratio of the number of black circles to the number of black squares is 2 : 5

Work out what fraction of all the shapes are circles.

.....

(Total for Question 14 is 4 marks)

2 On Saturday, some adults and some children were in a theatre.
The ratio of the number of adults to the number of children was 5 : 2

Each person had a seat in the Circle or had a seat in the Stalls.

$\frac{3}{4}$ of the children had seats in the Stalls.
117 children had seats in the Circle.

There are exactly 2600 seats in the theatre.

On this Saturday, were there people on more than 60% of the seats?
You must show how you get your answer.

(Total for Question 2 is 5 marks)

4 Daniel bakes 420 cakes.
He bakes only vanilla cakes, banana cakes, lemon cakes and chocolate cakes.

$\frac{2}{7}$ of the cakes are vanilla cakes.

35% of the cakes are banana cakes.

The ratio of the number of lemon cakes to the number of chocolate cakes is 4 : 5

Work out the number of lemon cakes Daniel bakes.

.....

(Total for Question 4 is 5 marks)

Question 47

2 Kiaria is 7 years older than Jay.
Martha is twice as old as Kiaria.
The sum of their three ages is 77

Find the ratio of Jay's age to Kiaria's age to Martha's age.

.....

(Total for Question 2 is 4 marks)

Question 48

November 2017 | 1MA1/1H | Original Q14

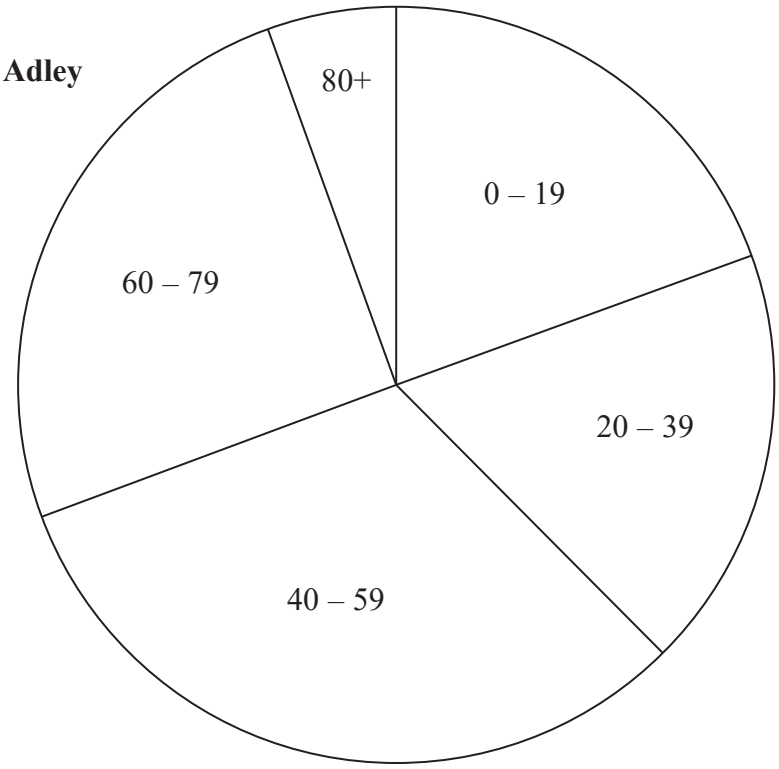
14 The ratio $(y + x) : (y - x)$ is equivalent to $k : 1$

Show that $y = \dfrac{x(k+1)}{k-1}$

(Total for Question 14 is 3 marks)

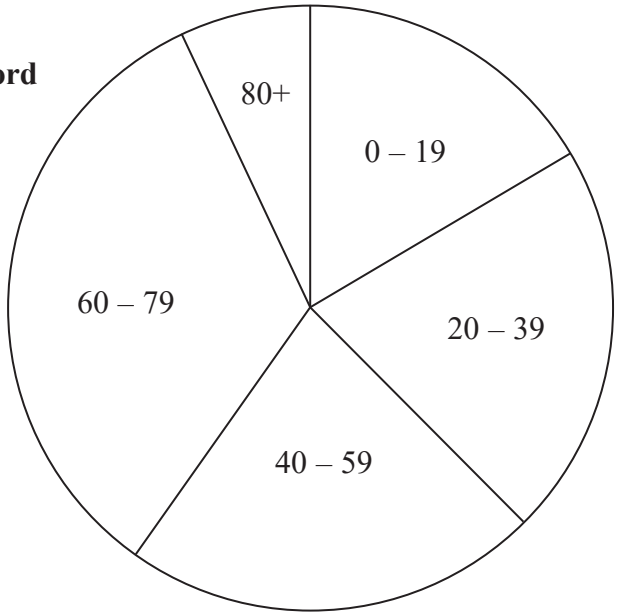
11 The pie charts give information about the ages, in years, of people living in two towns, Adley and Bridford.

Adley



Diagrams accurately drawn

Bridford



The ratio of the number of people living in Adley to the number of people living in Bridford is given by the ratio of the areas of the pie charts.

What proportion of the total number of people living in these two towns live in Adley **and** are aged 0 – 19?
Give your answer correct to 3 significant figures.

.....

(Total for Question 11 is 3 marks)

Question 50

November 2017 | 1MA1/3H | Original Q4

4 There are only blue pens, green pens and red pens in a box.

The ratio of the number of blue pens to the number of green pens is 2 : 5
The ratio of the number of green pens to the number of red pens is 4 : 1

There are less than 100 pens in the box.

What is the greatest possible number of red pens in the box?

.....

(Total for Question 4 is 3 marks)

14 Cone **A** and cone **B** are mathematically similar.
The ratio of the volume of cone **A** to the volume of cone **B** is 27 : 8

The surface area of cone **A** is 297 cm^2

Show that the surface area of cone **B** is 132 cm^2

(Total for Question 14 is 3 marks)

2 In a village

the number of houses and the number of flats are in the ratio 7 : 4
the number of flats and the number of bungalows are in the ratio 8 : 5

There are 50 bungalows in the village.

How many houses are there in the village?

.....

(Total for Question 2 is 3 marks)

Question 53

8 The perimeter of a right-angled triangle is 72 cm.
The lengths of its sides are in the ratio 3 : 4 : 5

Work out the area of the triangle.

.....cm^2

(Total for Question 8 is 4 marks)

Question 54

16 There are only red counters, blue counters and purple counters in a bag.
The ratio of the number of red counters to the number of blue counters is 3 : 17

Sam takes at random a counter from the bag.
The probability that the counter is purple is 0.2

Work out the probability that Sam takes a red counter.

.....

(Total for Question 16 is 3 marks)

Question 55

4 Raya buys a van for £8500 plus VAT at 20%

Raya pays a deposit for the van.
She then pays the rest of the cost in 12 equal payments of £531.25 each month.

Find the ratio of the deposit Raya pays to the total of the 12 equal payments.
Give your answer in its simplest form.

.....

(Total for Question 4 is 5 marks)

Question 56

15 Three solid shapes **A**, **B** and **C** are similar.

The surface area of shape **A** is $4\,cm^2$
The surface area of shape **B** is $25\,cm^2$

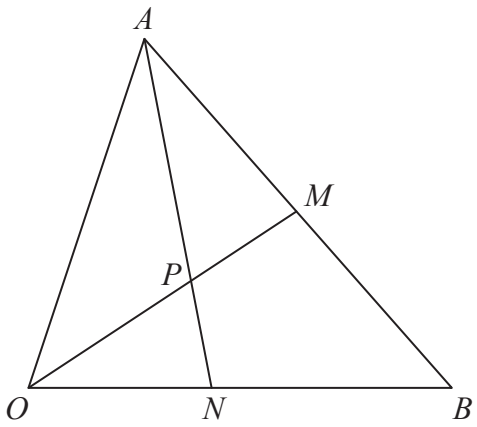
The ratio of the volume of shape **B** to the volume of shape **C** is $27 : 64$

Work out the ratio of the height of shape **A** to the height of shape **C**.
Give your answer in its simplest form.

.....

(Total for Question 15 is 4 marks)

21



OAB is a triangle.
OPM and APN are straight lines.
M is the midpoint of AB.

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

$OP : PM = 3 : 2$

Work out the ratio $ON : NB$

.....

(Total for Question 21 is 5 marks)

Question 58

November 2018 | 1MA1/2H | Original Q10

10 Robert makes 50 litres of green paint by mixing litres of yellow paint and litres of blue paint in the ratio 2 : 3

Yellow paint is sold in 5 litre tins.
Each tin of yellow paint costs £26

Blue paint is sold in 10 litre tins.
Each tin of blue paint costs £48

Robert sells all the green paint he makes in 10 litre tins.
He sells each tin of green paint for £66.96

Work out Robert's percentage profit on each tin of green paint he sells.

.....%

(Total for Question 10 is 5 marks)

Question 59

17 p and q are two numbers such that $p > q$

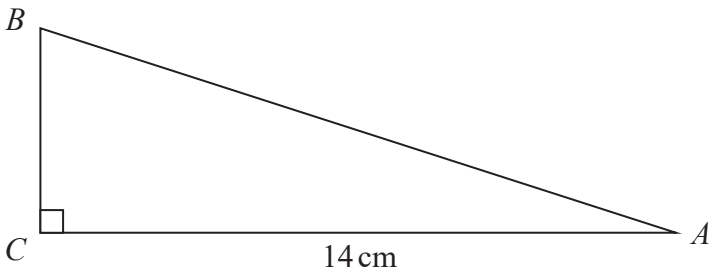
When you subtract 5 from p and subtract 5 from q the answers are in the ratio $5 : 1$
When you add 20 to p and add 20 to q the answers are in the ratio $5 : 2$

Find the ratio $p : q$
Give your answer in its simplest form.

.....

(Total for Question 17 is 5 marks)

6 ABC is a right-angled triangle.



$AC = 14$ cm.
Angle $C = 90°$

size of angle B : size of angle $A = 3 : 2$

Work out the length of AB.
Give your answer correct to 3 significant figures.

.....cm

(Total for Question 6 is 4 marks)

6 A shop sells packs of black pens, packs of red pens and packs of green pens.

There are
2 pens in each pack of black pens
5 pens in each pack of red pens
6 pens in each pack of green pens

On Monday,

$$\text{number of packs of black pens sold} : \text{number of packs of red pens sold} : \text{number of packs of green pens sold} = 7:3:4$$

A total of 212 pens were sold.

Work out the number of green pens sold.

.....

(Total for Question 6 is 4 marks)

17 Given that

$$x^2 : (3x + 5) = 1 : 2$$

find the possible values of x.

.....

(Total for Question 17 is 4 marks)

Question 63

7 £360 is shared between Abby, Ben, Chloe and Denesh.

The ratio of the amount Abby gets to the amount Ben gets is 2 : 7

Chloe and Denesh each get 1.5 times the amount Abby gets.

Work out the amount of money that Ben gets.

£.....

(Total for Question 7 is 4 marks)

9 The circumference of circle **B** is 90% of the circumference of circle **A**.

(a) Find the ratio of the area of circle **A** to the area of circle **B**.

.....

(2)

Square **E** has sides of length e cm.
Square **F** has sides of length f cm.

The area of square **E** is 44% greater than the area of square **F**.

(b) Work out the ratio $e : f$

.....

(2)

(Total for Question 9 is 4 marks)

Question 65

17 There are some small cubes and some large cubes in a bag.
The cubes are red or the cubes are yellow.

The ratio of the number of small cubes to the number of large cubes is $4:7$

The ratio of the number of red cubes to the number of yellow cubes is $3:5$

(a) Explain why the least possible number of cubes in the bag is 88

.....

.....

.....

(1)

All the small cubes are yellow.

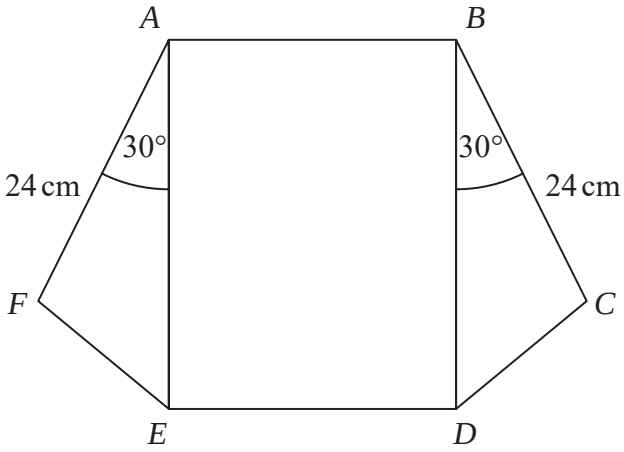
(b) Work out the least possible number of large yellow cubes in the bag.

.....

(3)

(Total for Question 17 is 4 marks)

14 The diagram shows a rectangle, *ABDE*, and two congruent triangles, *AFE* and *BCD*.



area of rectangle *ABDE* = area of triangle *AFE* + area of triangle *BCD*

$$AB : AE = 1 : 3$$

Work out the length of *AE*.

..... cm

(Total for Question 14 is 4 marks)

Question 67

3 Tom and Adam have a total of 240 stamps.
The ratio of the number of Tom's stamps to the number of Adam's stamps is 3 : 7

Tom buys some stamps from Adam.
The ratio of the number of Tom's stamps to the number of Adam's stamps is now 3 : 5

How many stamps does Tom buy from Adam?
You must show all your working.

.....

(Total for Question 3 is 4 marks)

13 Liquid A and liquid B are mixed together in the ratio 2 : 13 by volume to make liquid C.

Liquid A has density 1.21 g/cm^3
Liquid B has density 1.02 g/cm^3

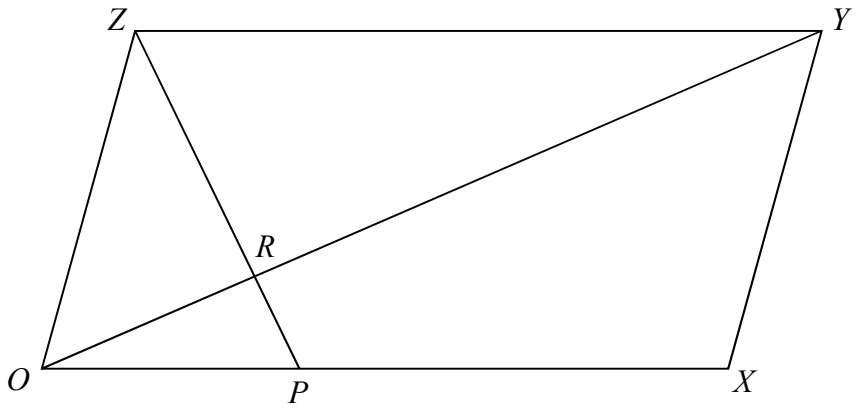
A cylindrical container is filled completely with liquid C.
The cylinder has radius 3 cm and height 25 cm.

Work out the mass of the liquid in the container.
Give your answer correct to 3 significant figures.
You must show all your working.

..... g

(Total for Question 13 is 4 marks)

24 $OXYZ$ is a parallelogram.



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

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

P is the point on OX such that $OP : PX = 1 : 2$
R is the point on OY such that $OR : RY = 1 : 3$

Work out, in its simplest form, the ratio $ZP : ZR$
You must show all your working.

.....

(Total for Question 24 is 5 marks)

Question 70

10 Given that $\frac{a}{b} = \frac{2}{5}$ and $\frac{b}{c} = \frac{3}{4}$

find $a : b : c$

.....

(Total for Question 10 is 3 marks)

21 $5c + d = c + 4d$

(a) Find the ratio $c : d$

.....

(2)

$6x^2 = 7xy + 20y^2$ where $x > 0$ and $y > 0$

(b) Find the ratio $x : y$

.....

(3)

(Total for Question 21 is 5 marks)

Question 72

5 Rosie, Matilda and Ibrahim collect stickers.

$$\begin{matrix}\text{number of stickers}\\ \text{Rosie has}\end{matrix} : \begin{matrix}\text{number of stickers}\\ \text{Matilda has}\end{matrix} : \begin{matrix}\text{number of stickers}\\ \text{Ibrahim has}\end{matrix} = 4:7:15$$

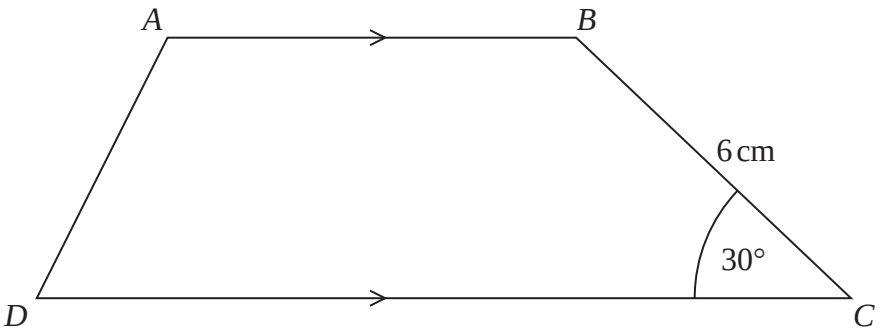
Ibrahim has 24 more stickers than Matilda.

Ibrahim has more stickers than Rosie.
How many more?

.....

(Total for Question 5 is 3 marks)

18 Here is trapezium $ABCD$.



The area of the trapezium is $66\,cm^2$

the length of AB : the length of $CD = 2 : 3$

Find the length of AB.

..... cm

(Total for Question 18 is 5 marks)

19 **A**, **B** and **C** are three spheres.

The volume of sphere **A** is $125\,cm^3$
The volume of sphere **B** is $27\,cm^3$

The ratio of the radius of sphere **B** to the radius of sphere **C** is $1:2$

Work out the ratio of the surface area of sphere **A** to the surface area of sphere **C**.

.....

(Total for Question 19 is 3 marks)

14 Olivia and Jessica have in total half as many sweets as Fran and Gary have in total.

Fran and Gary share their sweets in the ratio $2:3$
Olivia and Jessica share their sweets in the ratio $9:1$

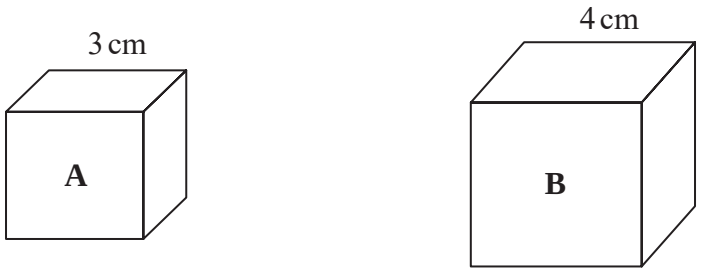
Fran got w sweets.
Gary got x sweets.
Olivia got y sweets.
Jessica got z sweets.

Find, in its simplest form, $w:x:y:z$

.....

(Total for Question 14 is 4 marks)

7 Here are two cubes, **A** and **B**.



Cube **A** has a mass of 81 g.

Cube **B** has a mass of 128 g.

Work out

the density of cube **A** : the density of cube **B**

Give your answer in the form $a : b$, where a and b are integers.

.....

(Total for Question 7 is 3 marks)

15 A, B and C are three points such that

$\overrightarrow{AB} = 3\mathbf{a} + 4\mathbf{b}$

$\overrightarrow{AC} = 15\mathbf{a} + 20\mathbf{b}$

(a) Prove that A, B and C lie on a straight line.

(2)

D, E and F are three points on a straight line such that

$\overrightarrow{DE} = 3\mathbf{e} + 6\mathbf{f}$

$\overrightarrow{EF} = -10.5\mathbf{e} - 21\mathbf{f}$

(b) Find the ratio

length of DF : length of DE

.....

(3)

(Total for Question 15 is 5 marks)

15 The ratio of Marta's hourly pay to Khalid's hourly pay is 6 : 5

Both Marta and Khalid get an increase of £1.50 in their hourly pay.
The ratio of Marta's hourly pay to Khalid's hourly pay after this increase is 13 : 11

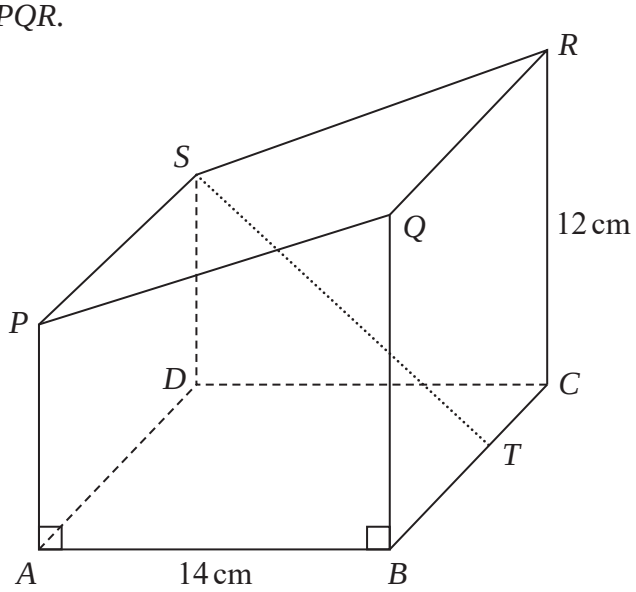
Work out the hourly pay before the increase for Marta and for Khalid.

Marta £.....

Khalid £.....

(Total for Question 15 is 4 marks)

18 Here is a prism *ABCDSPQR*.



The base *ABCD* of the prism is a square of side 14 cm
T is the point on *BC* such that *BT* : *TC* = 4 : 3

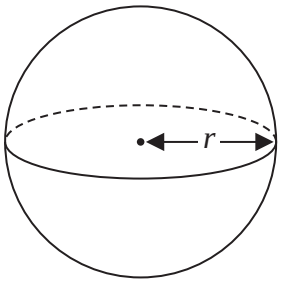
The cross section of the prism is in the shape of a trapezium of area 147 cm^2
CR = 12 cm

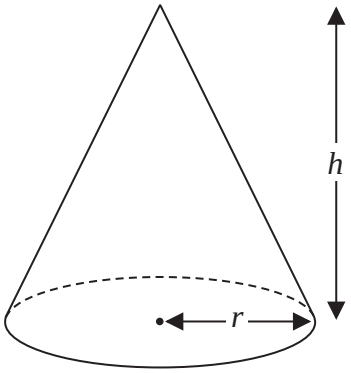
Find the size of the angle between the line *ST* and the base *ABCD*.
Give your answer correct to 1 decimal place.

.....°

(Total for Question 18 is 5 marks)

24 Here is a solid sphere and a solid cone.





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

Volume of cone = $\frac{1}{3}\pi r^2 h$

All measurements are in cm.

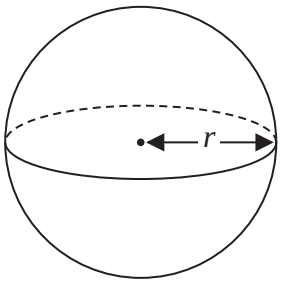
The volume of the sphere is equal to the volume of the cone.

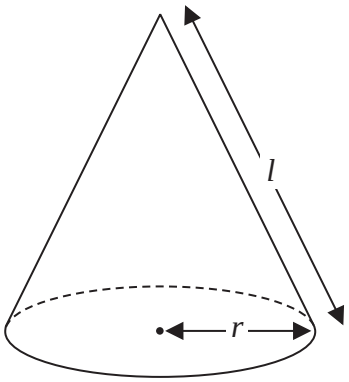
(a) Find $r : h$
Give your answer in its simplest form.

.....

(2)

Here is a different solid sphere and a different solid cone.





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

Curved area of cone = $\pi r l$

All measurements are in cm.

The surface area of the sphere is equal to the **total** surface area of the cone.

(b) Find $r : h$

Give your answer in the form $1 : \sqrt{n}$ where n is an integer.

.....

(4)

(Total for Question 24 is 6 marks)

2 Rob has been asked to divide 120 in the ratio $3:5$

Here is his working.

$$120 \div 3 = 40 \qquad 120 \div 5 = 24$$

Rob's working is not correct.

Describe what Rob has done wrong.

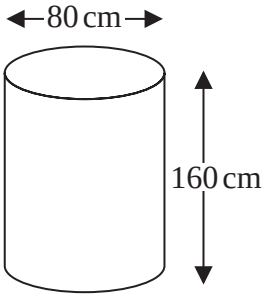
.....

.....

.....

(Total for Question 2 is 1 mark)

4 Karina has 4 tanks on her tractor.
Each tank is a cylinder with diameter 80 cm and height 160 cm.



The 4 tanks are to be filled completely with a mixture of fertiliser and water.

The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.
Karina has 32 litres of fertiliser.

1 litre = 1000 cm^3

Has Karina enough fertiliser for the 4 tanks?
You must show how you get your answer.

(Total for Question 4 is 4 marks)

17 There are four boxes on a shelf, **A**, **B**, **C** and **D**.

The total weight of **A** and **B** is 3 times the total weight of **C** and **D**.

The weight of **A** is $\frac{2}{3}$ of the weight of **B**.

The weight of **C** is 75% of the weight of **D**.

Find the ratio

weight of **A** : weight of **B** : weight of **C** : weight of **D**

.....

(Total for Question 17 is 4 marks)

19 There are only blue counters, red counters and green counters in a box.

The probability that a counter taken at random from the box will be blue is 0.4
The ratio of the number of red counters to the number of green counters is 7 : 8

Sameena takes at random a counter from the box.
She records its colour and puts the counter back in the box.
Sameena does this a total of 50 times.

Work out an estimate for the number of times she takes a green counter.

.....

(Total for Question 19 is 3 marks)

Question 85

3 There are 48 counters in a bag.
There are only red counters and blue counters in the bag.

$$\text{number of red counters} : \text{number of blue counters} = 1 : 2$$

Helen has to work out how many red counters are in the bag.

She says,

"There are 24 red counters in the bag because 1 is half of 2 and 24 is half of 48"

Is Helen correct?
You must give a reason for your answer.

.....

.....

.....

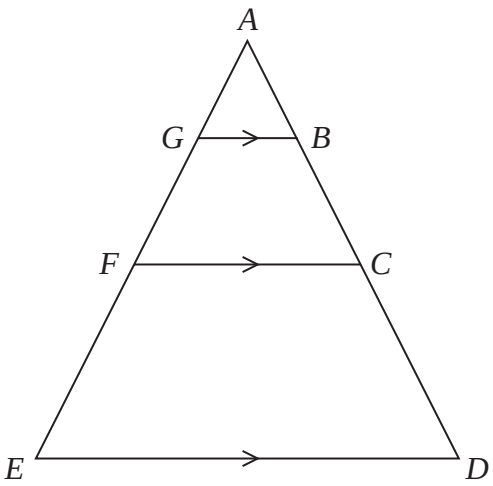
(Total for Question 3 is 1 mark)

18 $2a : 5c = 6 : 25$
$4b : 7c = 20 : 21$

Show that $a + b : b + c = 17 : 20$

(Total for Question 18 is 3 marks)

23 Here are three similar triangles, *ABG*, *ACF* and *ADE*.



ABCD and *AGFE* are straight lines.

$AB : BC : CD = 1 : 2 : 3$

Show that

area of ABG : area of $BCFG$: area of $CDEF = 1 : 8 : 27$

(Total for Question 23 is 3 marks)

24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.
The rest of the counters are green.

$$x : y = 1 : 3$$

Freda takes at random two counters from the box.

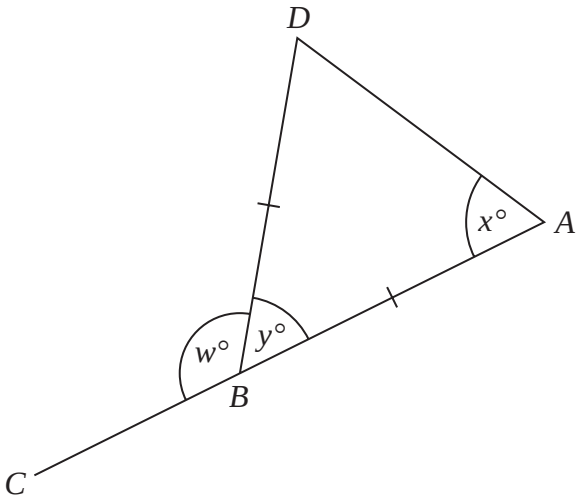
Find, in terms of x, an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

.....

(Total for Question 24 is 5 marks)

6 The diagram shows an isosceles triangle *ABD* and the straight line *ABC*.



$BA = BD$

$x : y = 2 : 1$

Work out the value of w.

$w =$ .....

(Total for Question 6 is 4 marks)

13 Solid **A** and solid **B** are similar.

The ratio of the height of solid **A** to the height of solid **B** is $2:5$

The volume of solid **A** is $12\,cm^3$

Work out the volume of solid **B**.

..... cm^3

(Total for Question 13 is 3 marks)

5 Chris, Debbie and Errol share some money in the ratio 3 : 4 : 2
Debbie gets £120

Chris then gives some of his share to Debbie and some of his share to Errol.
The money that Chris, Debbie and Errol each have is now in the ratio 2 : 5 : 3

How much money did Chris give to Errol?

£.....

(Total for Question 5 is 4 marks)

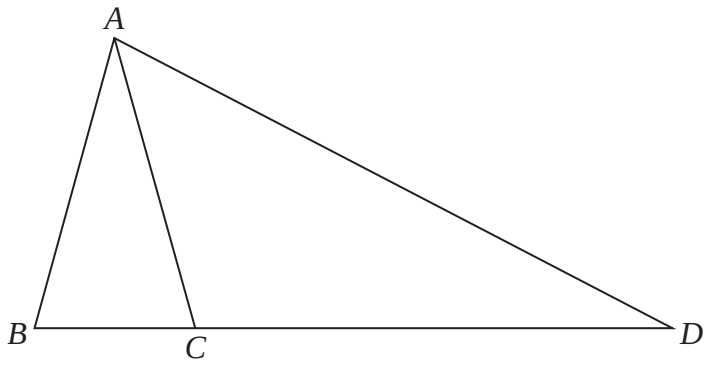
23 Given that $\frac{2x^2 + y^2}{4x^2 - y^2} = \frac{43}{11}$ where $x > 0$ and $y > 0$

find, in its simplest form, the ratio $x : y$

.....

(Total for Question 23 is 4 marks)

19



ABC and *DAB* are similar isosceles triangles.

$AB = AC$
$AD = BD$

$BC : CD = 4 : 21$

Find the ratio $AB : AD$

.....

(Total for Question 19 is 3 marks)

6 Andy, Luke and Tina share some sweets in the ratio $1:6:14$

Tina gives $\frac{3}{7}$ of her sweets to Andy.

Tina then gives $12\frac{1}{2}\%$ of the rest of her sweets to Luke.

Tina says,

"Now all three of us have the same number of sweets."

Is Tina correct?
You must show how you get your answer.

(Total for Question 6 is 4 marks)

Question 95

10 There are only red counters and yellow counters in bag **A**.

number of red counters : number of yellow counters = 3 : 5

There are only green counters and blue counters in bag **B**.
The number of counters in bag **B** is half the number of counters in bag **A**.

Given that there are x red counters in bag **A**,

use algebra to show that the total number of counters in bag **A** and bag **B** is $4x$

(Total for Question 10 is 3 marks)

12 **A**, **B** and **C** are three solid spheres.

Sphere **A** has a volume of $64\,cm^3$
Sphere **B** has a volume of $125\,cm^3$

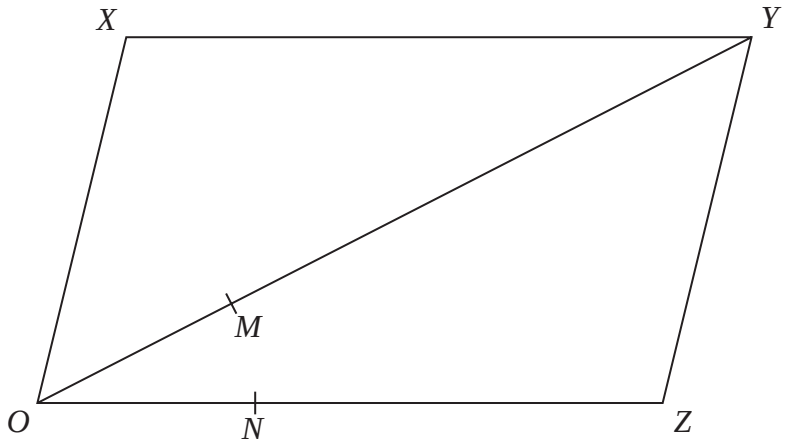
The radius of sphere **C** is 50% of the radius of sphere **B**.

Work out the ratio of the surface area of sphere **A** to the surface area of sphere **C**.
Give your answer in the form $a:b$ where a and b are integers.

.....

(Total for Question 12 is 4 marks)

15 $OXYZ$ is a parallelogram.



$\overrightarrow{OY}$ = **a** and $\overrightarrow{OZ}$ = **b**

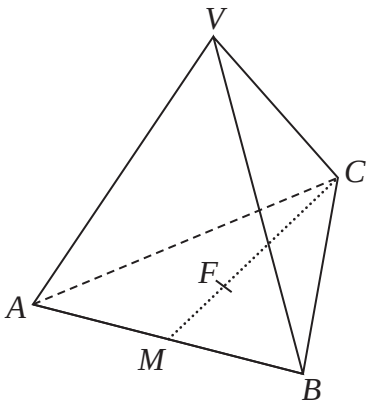
M is the point on OY such that $OM : MY = 1 : 3$
N is the point on OZ such that $ON : NZ = 1 : 2$

Work out the ratio $XN : MN$
You must show all your working.

.....

(Total for Question 15 is 4 marks)

20 *VABC* is a solid pyramid.
ABC is an equilateral triangle.



M is the midpoint of *AB*.
F is the point on *MC* such that $MF : FC = 1 : 2$

The vertex *V* is vertically above *F*.
$VA = VB = VC$

$VF = 8\,\text{cm}$ Angle $VCM = 52°$

Work out the side length of the equilateral triangle *ABC*.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 20 is 3 marks)

2 Sid, Tam and Musa share £6900 in the ratio 2 : 3 : 5

Work out how much money each person receives.

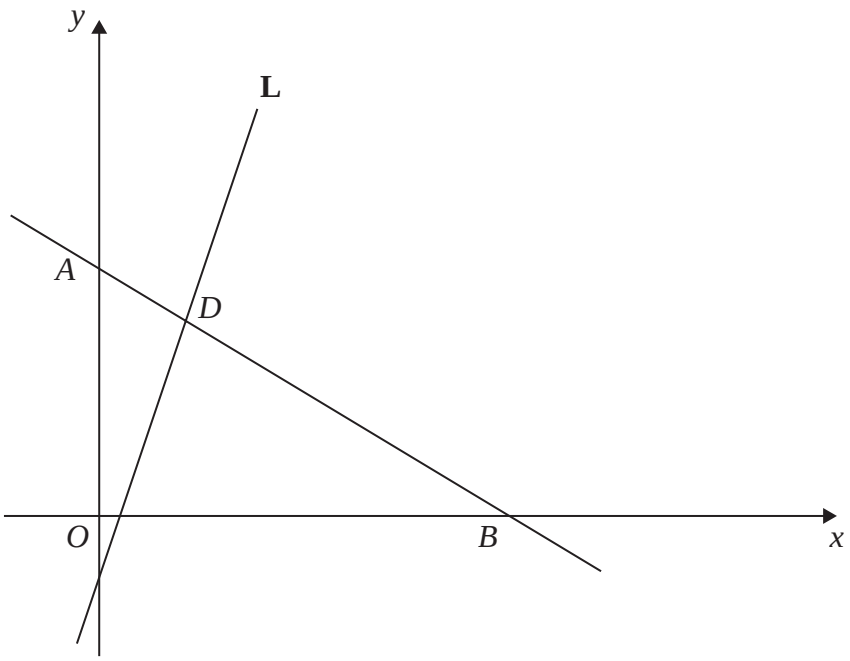
Sid £.....

Tam £.....

Musa £.....

(Total for Question 2 is 3 marks)

20



In the diagram
A is the point (0, 8)
B is the point (16, 0)

The point *D* divides the line segment *AB* in the ratio 1 : 3
The line **L** passes through *D*.
The gradient of **L** is $\sqrt{3}$

L passes through the point with coordinates (–2, f)

Show that $f < -4$

(Total for Question 20 is 5 marks)