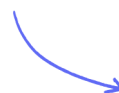


Ratios

Introduction to Ratios / Sharing in a Ratio / Working with Proportion

Easy (14 questions)	/42
Medium (25 questions)	/89
Hard (22 questions)	/84
Very Hard (15 questions)	/58
Total Marks	/273

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Easy Questions

1 (a) Here are the ingredients needed to make 10 pancakes.

Pancakes

Ingredients to make **10** pancakes

300 *ml* of milk 120 g of flour 2 eggs

Matthew makes 30 pancakes.

Work out how much flour he uses.

(2 marks)

(b) Tara makes some pancakes. She uses 750 *ml* of milk.

Work out how many pancakes she makes.

(2 marks)

2 Here are the ingredients needed to make 16 gingerbread men.

Ingredients
to make **16**
gingerbread men

180 g flour
40 g ginger
110 g butter
30 g sugar

Hamish wants to make 24 gingerbread men.

Work out how much of each of the ingredients he needs.

(3 marks)

- 3** This is a list of ingredients for making chicken soup for 4 people.

Ingredients for **4** people

60 g butter

300 g chicken

150 *ml* cream

1 onion

640 *ml* chicken stock

Bill is going to make chicken soup for 6 people.

Work out the amount of each ingredient he needs.

(3 marks)

- 4** 225 grams of flour are needed to make 9 cakes.

Marian wants to make 20 of these cakes. She has 475 grams of flour.

Does Marian have enough flour to make 20 cakes? You must show all your working.

(3 marks)

5 Jack is building a wall.

He uses 300 bricks to build part of the wall.

This part of the wall is 5 metres long and 1.5 metres high.

The complete wall will be 8 metres long and 1.5 metres high.

How many more bricks does Jack need to complete the wall?

(3 marks)

6 (a) Jon shares £700 equally between his two children, Ellie and Maddie.

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

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

(2 marks)

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

Work out how much money Jenny gives to each child.

(3 marks)

7 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.

(3 marks)

- 8 Aiko, Max and Pau share 5400 yen in the ratios 5: 3:4 How much money does each of them get?

Aiko yen

Max yen

Pau yen

(3 marks)

- 9 A is half of B .

Work out the ratio $A : B$

A. 1 : 2

B. 2 : 1

C. 1 : 3

D. 3 : 1

(1 mark)

- 10 The ratio 45 minutes to 3 hours 45 minutes can be written in the form 1 : n .

Find the value of n .

$n =$

(2 marks)

- 11 (a) The ratio 2 centimetres to 5 metres can be written in the form 1 : n .

Find the value of n .

$n =$

(2 marks)

- (b) Jay, Sheila and Harry share £7200 in the ratio 1 : 2 : 5.

How much does Harry receive?

£

(2 marks)

- 12 The ratio 50 grams to 1 kilogram can be written in the form 1 : n .

Find the value of n .

n =

(2 marks)

- 13 Last year, Katie earned £16200.

Her total loan repayments were £6400.

Katie estimates that the ratio of her loan repayments to her earnings is approximately 3 : 8.

Is she correct?

Show your reasoning.

(3 marks)

- 14 18 rice cakes weigh a total of 130 g. There are 329 calories in 100 g of rice cakes. How many calories are there in one rice cake?

..... calories

(3 marks)

Medium Questions

1 (a) Here are the ingredients needed to make 12 shortcakes.

Shortcakes
Makes 12 shortcakes
50 g of sugar
200 g of butter
200 g of flour
10 <i>ml</i> of milk

Liz makes some shortcakes. She uses 25 *ml* of milk.

How many shortcakes does Liz make?

(2 marks)

(b) Robert has

500 g of sugar
1000 g of butter
1000 g of flour
500 *ml* of milk

Work out the greatest number of shortcakes Robert can make.

(2 marks)

2 Here is a list of ingredients for making 18 mince pies.

Ingredients for mince pies

225 g of butter
350 g of flour
100 g of sugar
280 g of mincemeat
1 egg

Elaine wants to make 45 mince pies.

Elaine has

1 kg of butter
1 kg of flour
500 g of sugar
600 g of mincemeat
6 eggs

Does Elaine have enough of each ingredient to make 45 mince pies?
You must show clearly how you got your answer.

(4 marks)

3 Here are the ingredients needed to make **8** shortbread biscuits.

Shortbread biscuits
makes **8** biscuits

120 g butter
60 g caster sugar
180 g flour

Tariq is going to make some shortbread biscuits. He has the following ingredients

330g butter 200g caster sugar 450g flour

Work out the greatest number of shortbread biscuits that Tariq can make with his ingredients. You must show all your working.

(3 marks)

- 4** 160 cm of gold wire has a weight of 17.8 grams.

Work out the weight of 210 cm of the gold wire.

(3 marks)

- 5** There are 1200 students at a school.

Kate is helping to organise a party. She is going to order pizza.

Kate takes a sample of 60 of the students at the school. She asks each student to tell her **one** type of pizza they want.

The table shows information about her results.

Pizza	Number of students
ham	20
salami	15
vegetarian	8
margarita	17

Work out how much ham pizza Kate should order. Write down any assumption you make **and** explain how this could affect your answer.

(3 marks)

- 6** Rob is learning about the planets.

Rob makes a model of the Sun. He also makes a model of the planet Jupiter.

Rob is going to hang the two models in the school hall.

Rob wants a distance of 16 m between the two models. The real distance between the planet Jupiter and the Sun is 8×10^8 km

Work out the scale Rob should use. Give your answer in the form $1 : n$

(3 marks)

- 7** The ratio of the number of boys to the number of girls in a school is 4: 5 There are 95 girls in the school.

Work out the total number of students in the school.

(3 marks)

8 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.

(4 marks)

9 (a) 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.

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

(3 marks)

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

500 grams of nuts cost £8

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

(3 marks)

- 10** 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?

(4 marks)

- 11 (a)** Emma has a digital photo.

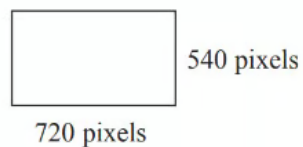


Diagram **NOT**
accurately drawn

The photo has a width of 720 pixels.

The photo has a height of 540 pixels.

Write down the ratio of the width of the photo to the height of the photo.

Give your ratio in its simplest form.

(2 marks)

- (b)** 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

Work out the new height of the photo.

(2 marks)

12 (a) Deon needs 50g of sugar to make 15 biscuits.

She also needs

three times as much flour as sugar

two times as much butter as sugar

Deon is going to make 60 biscuits.

Work out the amount of flour she needs.

(3 marks)

(b) Deon has to buy all the butter she needs to make 60 biscuits. She buys the butter in 250 g packs.

How many packs of butter does Deon need to buy?

(2 marks)

13 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,

number of packs of black pens sold	:	number of packs of red pens sold	:	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.

(4 marks)

- 14** Brendon, Asha and Julie share some money in the ratios 3 : 2 : 6 The **total** amount of money that Asha and Julie receive is \$36

Work out the amount of money that Brendon receives.

\$.....

(3 marks)

- 15** A plane has a length of 73 metres.

A scale model is made of the plane.

The scale of the model is 1 : 200

Work out the length of the scale model.

Give your answer in centimetres.

(3 marks)

- 16** A football team played 55 games.

Each game was won, drawn or lost.

number of games won : number of games drawn : number of games lost = 6 : 3 : 2

Work out how many more games the team won than the team lost.

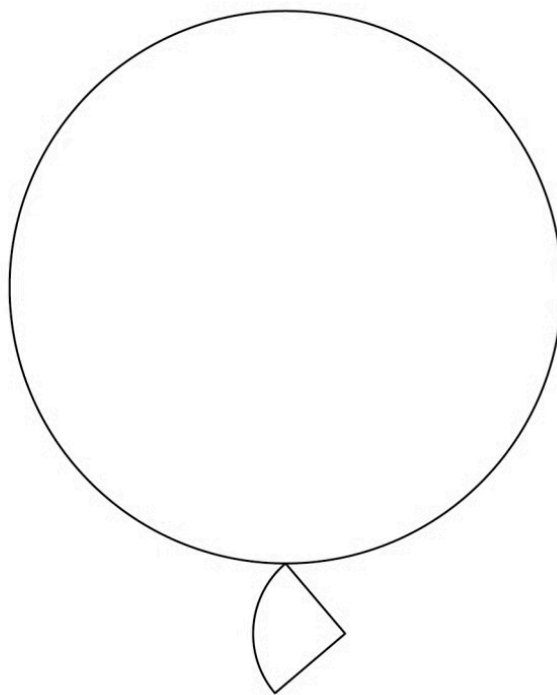
(3 marks)

17 Two wire shapes make an earring. The shapes are

a circle with radius 21 mm

and

a quarter circle.



Not drawn
accurately

radius of circle : radius of quarter circle = 7 : 2

Show that the radius of the quarter circle is 6 mm

(1 mark)

- 18** White paint costs £2.80 per litre.
Blue paint costs £3.50 per litre.
White paint and blue paint are mixed in the ratio 3 : 2

Work out the cost of 18 litres of the mixture.

£.....

(4 marks)

- 19** Ed and Fay shared £330 in the ratio 7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?

£.....

(3 marks)

- 20** George is the manager of a shoe shop.
He samples 50 of his customers and asks them about the one style of shoe they would buy next.
The table shows his results.

Style of shoe	Number of customers
Laced shoes	18
Boots	15
Sandals	8
Trainers	5
Other	4

George buys 1000 pairs of shoes with the number of each style based on his survey results. How many pairs of sandals should he buy? Write down any assumption you make about his sample.

(3 marks)

- 21** Reece and Sarah share some money in the ratio 9 : 16.

Reece says that Sarah gets more than 60% of this money.

Show that Reece is correct.

(3 marks)

- 22** Two bags each contain only red counters and yellow counters.

In Bag A, the ratio of red counters to yellow counters is 1 : 4.

In Bag B, $\frac{1}{4}$ of the counters are red.

i) Sharon says

"The proportion of the counters that are red is the same in both bags."

Explain why Sharon is not correct.

[1]

ii) The number of counters in the two bags is the same.

Complete the table below to show how many counters of each colour could be in the bags.

	Red counters	Yellow counters
Bag A		
Bag B		

[3]

(4 marks)

23 A sports centre hires out tennis courts, football pitches and basketball courts.

Each tennis court session lasts 30 minutes.

Each football pitch session lasts 60 minutes.

Each basketball court session lasts 45 minutes.

On Saturday, the number of bookings was in the ratio

tennis courts : football pitch : basketball court = 6 : 5 : 3

A total of 1230 minutes of booking were made that day.

Work out the total number of minutes of basketball bookings.

(4 marks)

24 Palak and Marya are painting fences.

Palak paints 5 metres of fence every 8 minutes.

Marya paints 9 metres of fence every 12 minutes.

On Wednesday:

Palak paints for 10 hours

Marya paints for 7 hours

Work out the total number of metres of fence painted by both Palak and Marya on Wednesday.

(4 marks)

25 A field is planted with four types of flowers: tulips, roses, daffodils and lilies.

The ratio of the number of tulips to the number of roses is 2:5.

The number of daffodils and the number of lilies are each 1.5 times the number of tulips.

There are 832 flowers in total.

Work out how many roses there are.

(4 marks)

Hard Questions

- 1** Colin works on 5 days each week. Each day he drives from his home to work and from work to his home.

Colin pays £3.50 each day to use the car park at work.

The distance from Colin's home to work is 18 miles. Colin's car uses one gallon of petrol every 45.2 miles.

1 litre of petrol costs 136.9p

1 gallon = 4.546 litres

Work out the total cost for Colin to use his car for work each week. You must show all your working.

(5 marks)

- 2 (a)** William is building a planetary path for people to walk along. The planetary path will have a model of the Sun and models of the planets.

William uses two different scales. He uses

1 cm to 1000 km for the diameter of each planet

1 m to 1 000 000km for the distance from the Sun to each planet

William makes a model of the planet Venus.

The model has a diameter of 12.1 cm.

Work out the real diameter of the planet Venus. Give your answer in standard form.

(2 marks)

- (b)** William works out the distance from the model of the Sun to the model of the planet Neptune.

The real distance from the Sun to the planet Neptune is 4.503×10^9 km.

Work out the distance from the model of the Sun to the model of the planet Neptune. Give your answer in km, correct to 1 decimal place.

(3 marks)

- 3 (a)** 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.

Work out the number of red counters in the bag.

(2 marks)

- (b)** 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

How many red counters does Janet put into the bag?

(2 marks)

- 4** Frank, Mary and Seth shared some sweets in the ratio 4 : 5 : 7 Seth got 18 more sweets than Frank.

Work out the total number of sweets they shared.

(3 marks)

- 5 (a)** There are some red counters and some yellow counters in a bag. There are 30 yellow counters in the bag.
The ratio of the number of red counters to the number of yellow counters is 1 : 6

Work out the number of red counters in the bag.

(2 marks)

- (b)** Riza 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

How many red counters does Riza put into the bag?

(2 marks)

- 6 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.

(4 marks)

- 7 The surface gravity of a planet can be worked out using the formula

$$g = \frac{6.67 \times 10^{-11} m}{r^2}$$

where

m kilograms is the mass of the planet

r metres is the radius of the planet

For the Earth and Jupiter here are the values of m and r .

Earth		Jupiter
$m = 5.98 \times 10^{24}$		$m = 1.90 \times 10^{27}$
$r = 6.378 \times 10^6$		$r = 7.149 \times 10^7$

Work out the ratio of the surface gravity of Earth to the surface gravity of Jupiter. Write your answer in the form 1 : n

(3 marks)

- 8 Mariana sells bags of bird food.

The bags that Mariana sold last week each contained 12kg of seeds.

The bags that she is going to sell next week will each contain a mixture of nuts and seeds where for each bag

$$\text{weight of nuts : weight of seeds} = 4 : 5$$

The total weight of the nuts and the seeds in each bag will be 19.35 kg

The weight of seeds in each bag that Mariana sells next week will be less than the weight of seeds in each bag that Mariana sold last week.

Work out this decrease as a percentage of the weight of seeds in each bag that Mariana sold last week. Give your answer correct to one decimal place.

..... %

(4 marks)

- 9 Andreas, Isla and Paulo share some money in the ratios 3 : 2 : 5

The **total** amount of money that Isla and Paulo receive is £76 more than the amount of money that Andreas receives.

Andreas buys a video game for £48.50 with some of his share of the money.

Work out how much money Andreas has left from his share of the money when he has bought the video game.

£.....

(4 marks)

- 10 Work out the difference between the largest share and the smallest share when 3450 yen is divided in the ratio 2 : 6 : 7

..... yen

(3 marks)

- 11 $a : b = 4 : 3$

Choose the correct statement.

A. b is $\frac{4}{7}$ of a

B. b is $\frac{3}{7}$ of a

C. b is $\frac{4}{3}$ of a

D. b is $\frac{3}{4}$ of a

(1 mark)

- 12 Jeff and Kaz share £270 in the ratio Jeff : Kaz = 2.6 : 1

How much **more** than Kaz does Jeff get?

£

(3 marks)

13 The cost of a holiday is £2400

Rana pays a deposit followed by monthly payments, in the ratio

deposit : total of the monthly payments = 3 : 5

She makes 6 equal monthly payments.

Work out her monthly payment.

£.....

(4 marks)

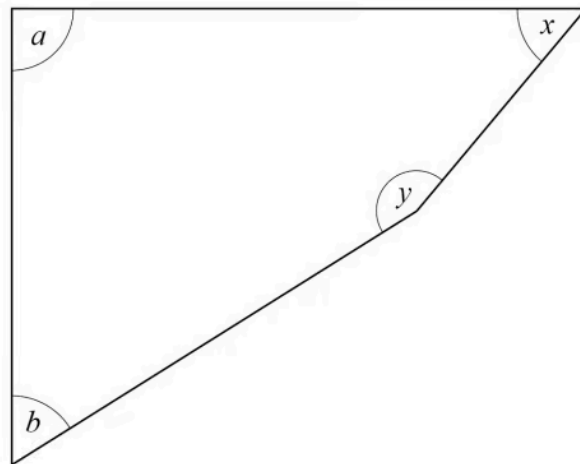
14 Work out

cube root of 512 : reciprocal of 0.4

Give your answer in the form $n : 1$

(3 marks)

15 Here is a quadrilateral.



Not drawn
accurately

$$a = 90^\circ \text{ and } a : b = 5 : 3$$

$$x : y = 1 : 3$$

Show that $b = x$

(3 marks)

16 $x \text{ km/h} = y \text{ mph}$

Use $8 \text{ km/h} = 5 \text{ mph}$ to write a formula for y in terms of x .

(2 marks)

- 17 Purple paint is made by mixing red paint and blue paint in the ratio $5 : 2$
Yan has 30 litres of red paint and 9 litres of blue paint.

What is the **maximum** amount of purple paint he can make?

.....litres

(3 marks)

18 Theo starts with savings of £18 James starts with no savings.

Each week from now,

Theo will save £4.50 and James will save £4

In how many weeks will Theo and James have savings in the ratio 15 : 8 ?

(3 marks)

19 Rana sells 192 cakes in the ratio small : medium : large = 7 : 6 : 11

The profit for one medium cake is twice the profit for one small cake.

The profit for one large cake is three times the profit for one small cake.

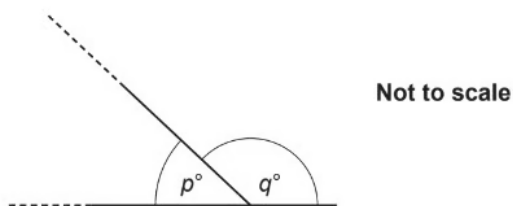
Her total profit is £532.48

Work out the profit for one small cake.

£.....

(5 marks)

- 20 (a)** An interior angle of an isosceles triangle is p° and an exterior angle is q° .



It is given that $q = 5p$.

Write the ratio $p : q$ in its simplest form.

(2 marks)

- (b)** Work out the two different possible sets of angles for the isosceles triangle.

Triangle 1: $^\circ$, $^\circ$, $^\circ$

Triangle 2: $^\circ$, $^\circ$, $^\circ$

(4 marks)

- 21** Sundip and Emma have some money.

The ratio of Sundip's money to Emma's money is 3 : 5.

Emma spends £450 of her money.

The ratio of Sundip's money to Emma's money is now 2 : 3.

Find how much money Sundip has.

£

(4 marks)

- 22 (a)** Bob makes dry concrete by mixing cement, sand and stone in the ratio 1 : 2 : 3 by weight. He buys the cement, sand and stone in bags as shown in this table.

	Weight of bag (kg)	Cost per bag (£)
Cement	25	5.50
Sand	20	2.00
Stone	15	3.90

He packs the dry concrete into 30kg bags.

Bob buys just enough cement, sand and stone to make 50 bags of dry concrete.

Show that Bob buys 500kg of sand.

(3 marks)

(b) Bob sells the 50 bags of dry concrete for a total of £396.

Calculate Bob's percentage profit.

(5 marks)

Very Hard Questions

- 1 (a)** A factory makes 450 pies every day. The pies are chicken pies or steak pies. Each day Milo takes a sample of 15 pies to check.

The proportion of the pies in his sample that are chicken is the same as the proportion of the pies made that day that are chicken.

On Monday Milo calculated that he needed exactly 4 chicken pies in his sample.

Work out the total number of chicken pies that were made on Monday.

(2 marks)

- (b)** On Tuesday, the number of steak pies Milo needs in his sample is 6 correct to the nearest whole number.

Milo takes at random a pie from the 450 pies made on Tuesday.

Work out the lower bound of the probability that the pie is a steak pie.

(2 marks)

- 2** 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.

(5 marks)

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

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

(3 marks)

- 4 Danil, Gabriel and Hadley share some money in the ratios 3 : 5 : 9 The difference between the amount of money that Gabriel receives and the amount of money that Hadley receives is 196 euros.

Work out the amount of money that Danil receives.

..... euros

(3 marks)

- 5 Saj makes Rose Pink paint and Cherry Pink paint.

He mixes red paint with white paint as shown.

Rose Pink red : white = 1 : 2		Cherry Pink red : white = 4 : 3
--------------------------------------	--	--

He makes 60 litres of Rose Pink paint. To this Rose Pink paint he adds

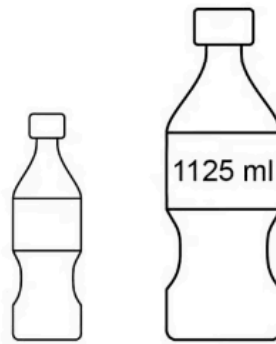
80 litres of red paint and 28 litres of white paint.

Has he now made Cherry Pink paint? You **must** show your working.

(4 marks)

- 6 Juice is sold in small bottles and large bottles.

The volume of the large bottle is 1125 ml.



volume of small bottle : volume of large bottle = 2 : 5

A café has small glasses and large glasses.

volume of small glass : volume of large glass = 4 : 7

A small bottle fills 6 small glasses with no juice left over. How many large glasses can be filled by a large bottle?

You **must** show your working.

(4 marks)

$$d = 2f$$
$$7 \quad \frac{e-f}{d-e} = \frac{1}{4}$$

Work out the ratio $e : f$

(3 marks)

8 $x : y = 7 : 4$

$$x + y = 88$$

Work out the value of $x - y$

(3 marks)

9 At a party there are 90 people.

48 are women and 42 are men.

Some women leave.

Some men arrive.

The ratio of women to men is now $10 : 11$

Are there now more than 90 people at the party?

Tick **one** box.

☐ Yes ☐ No ☐ Cannot tell

Show working to support your answer.

(2 marks)

10 During a game, players can win and lose counters.

At the start of the game

Rob, Tim and Zak share the counters in the ratio $5 : 6 : 7$

At the end of the game

Rob, Tim and Zak share the **same number** of counters in the ratio $7 : 9 : 8$

Show that Rob ends the game with more counters than he started with.

(3 marks)

11 Here are two sets of numbers, A and B.

Set A		Set B		
200	160	270	400	483
104	100	300	x	

mean of Set A : mean of Set B = 3 : 8

Work out the value of x .

(4 marks)

12 Hanif makes green paint by mixing blue paint and yellow paint in the ratio

blue : yellow = 7 : 3

He buys blue paint in 50-litre containers, each costing £225 He buys yellow paint in 20-litre containers, each costing £80

He wants to sell the green paint in 5-litre tins make 40% profit on each tin.

How much should he sell each tin for?

£.....

(5 marks)

13

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

A sphere has radius $2x$ cm

A cone has

radius $3x$ cm

perpendicular height h cm

The sphere and the cone have the same volume.

Work out radius of cone : perpendicular height of cone

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

(4 marks)

14 The prices of two phones are in the ratio $x : y$.

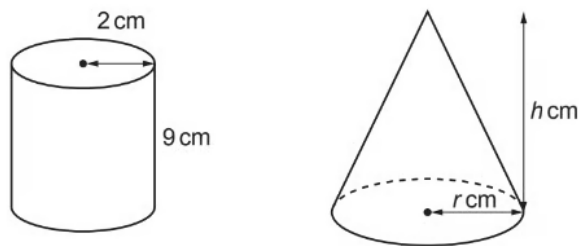
When the prices are both increased by £20, the ratio becomes $5 : 2$.

When the prices are both reduced by £5, the ratio becomes $5 : 1$.

Express the ratio $x : y$ in its lowest terms.

(6 marks)

- 15 The diagram shows a cylinder and a cone.



The cylinder has radius 2cm and height 9cm.
The cone has radius r cm and height h cm.

The ratio $r : h$ is 1 : 4.

The volume of the cone is **equal to** the volume of the cylinder.

Work out the value of r .

[The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$]

(5 marks)