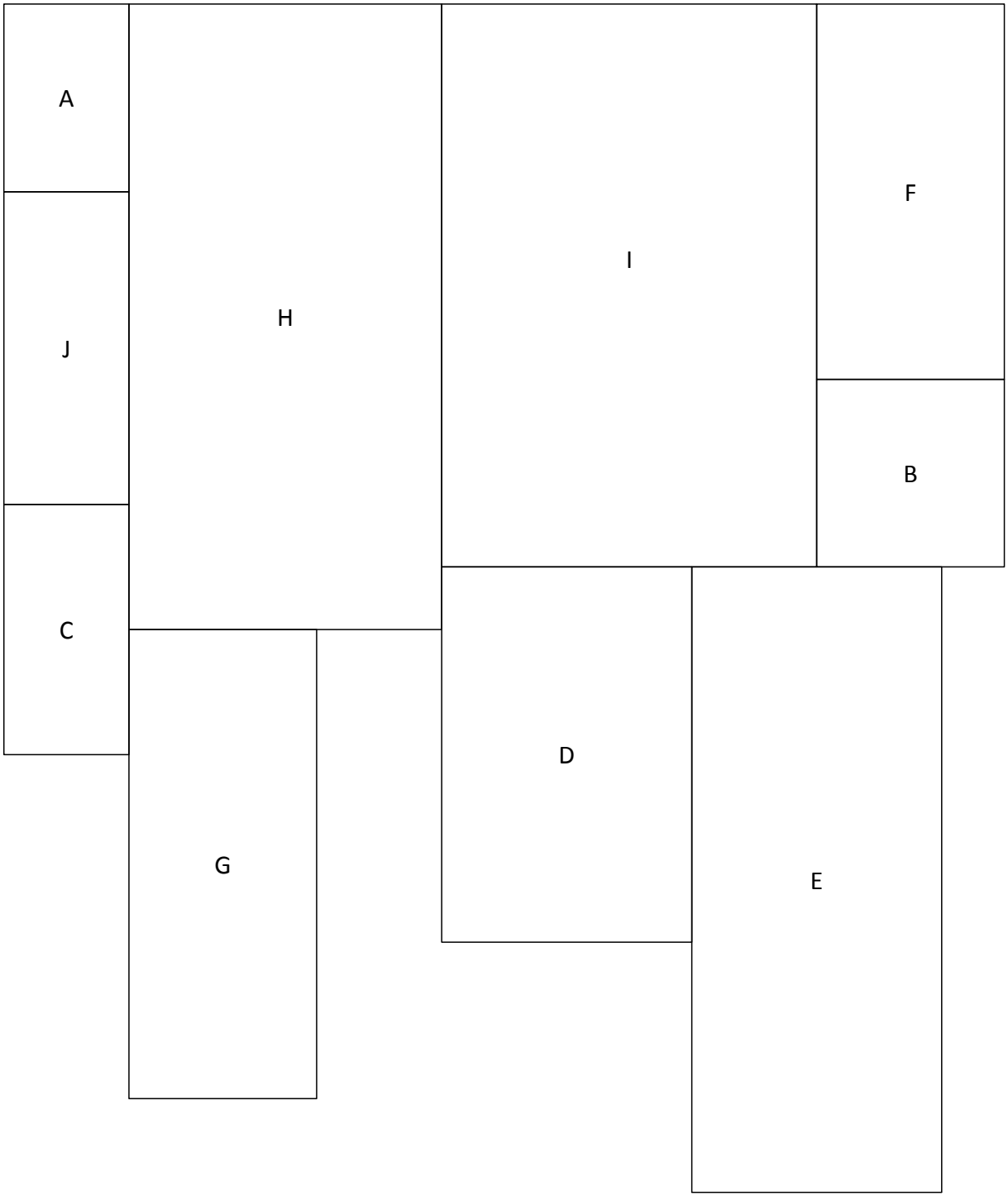
Let's think about look-alike rectangles ...



Mr T

You will need resource sheet N2c_1 for this activity. Cut out the rectangles and then sort them into three groups of three that “look alike” and one “oddball”.

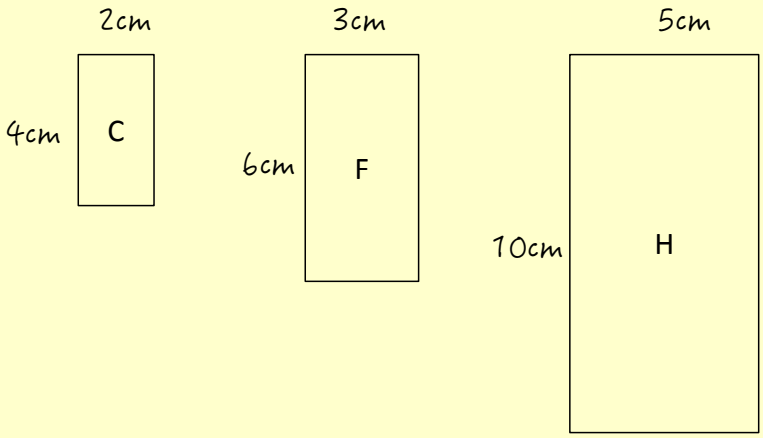




Alice

Alice's first group

In my first group the height of each rectangle is twice the width of the rectangle.

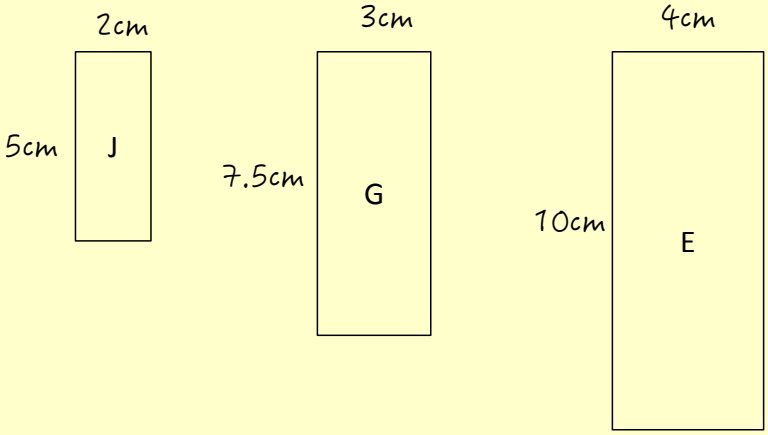




Taro

Taro's second group

In my second group the height of each rectangle is 2.5 times the width of the rectangle.

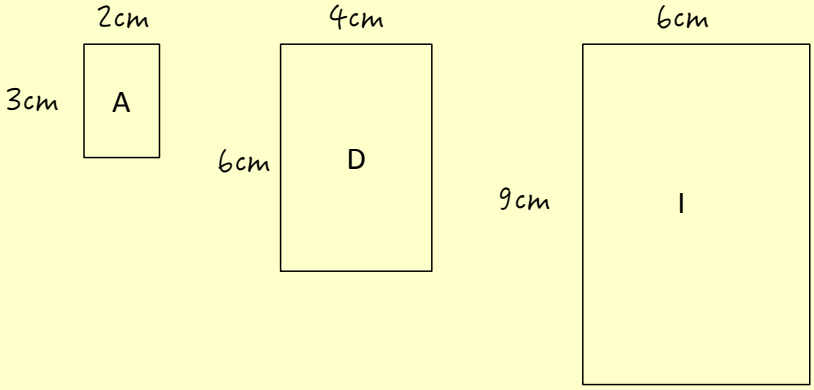




Evie

Evie's third group

In my third group if you divide the height by the width for each rectangle, you always get 1.5.



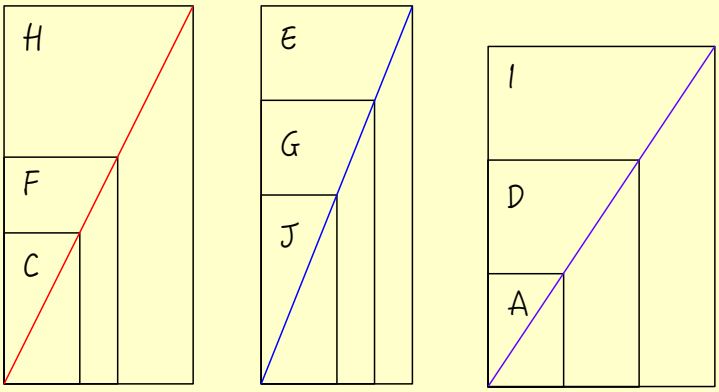
That means the height of each rectangle is 1.5 times the width of the rectangle.

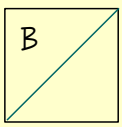


Jon

Jon's idea

I didn't measure anything. I simply stacked the shapes by matching up the left hand lower corners and then lining up the diagonals to the top right hand corners. The odd one out is E as the diagonal doesn't line up with any of the others.







The diagonals

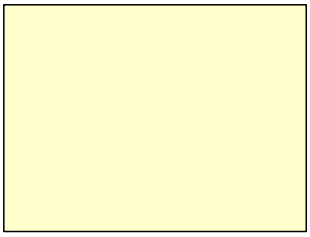
Let's think about creating look-alike rectangles ...



Mr T

Look at this rectangle.
Can you draw two more look-alike rectangles?

3cm



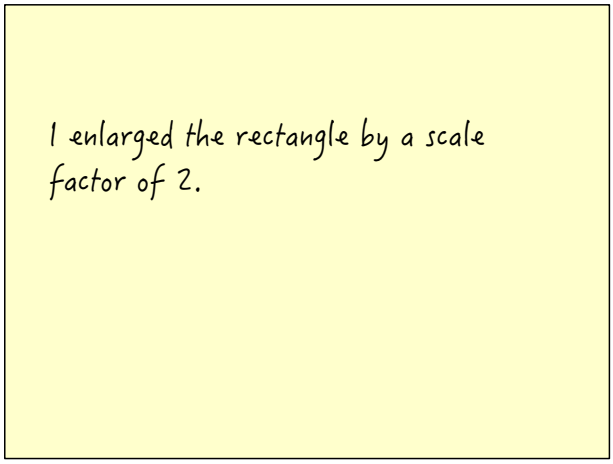
4cm



Amber

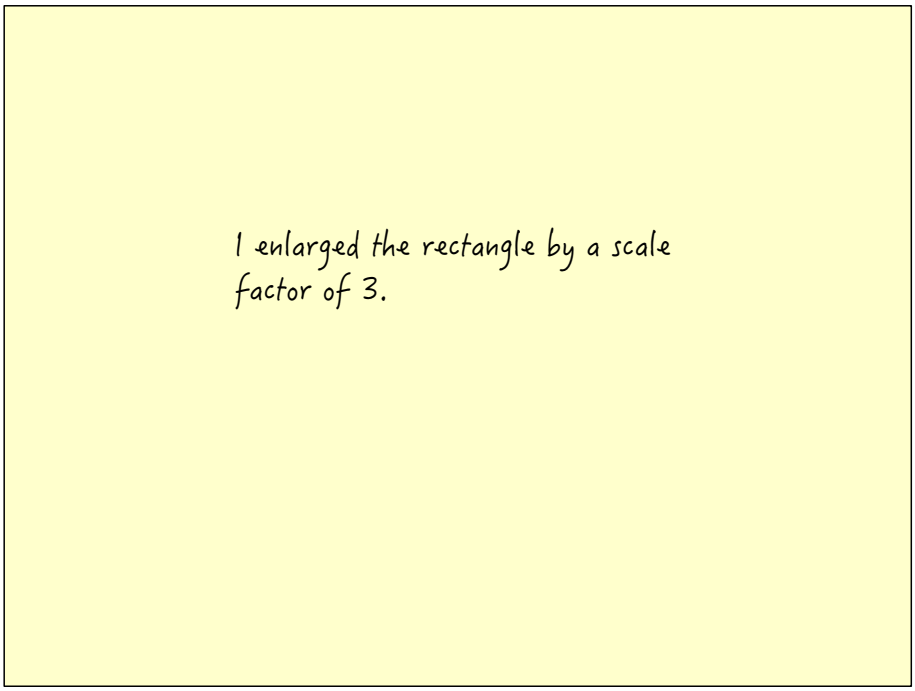
Amber's look-alike rectangles

6cm



8cm

9cm



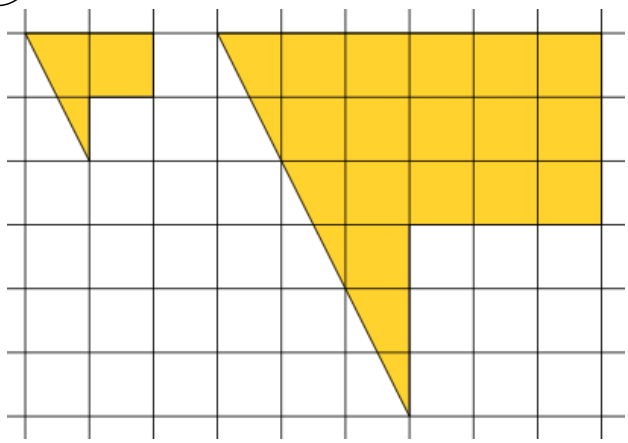
12cm



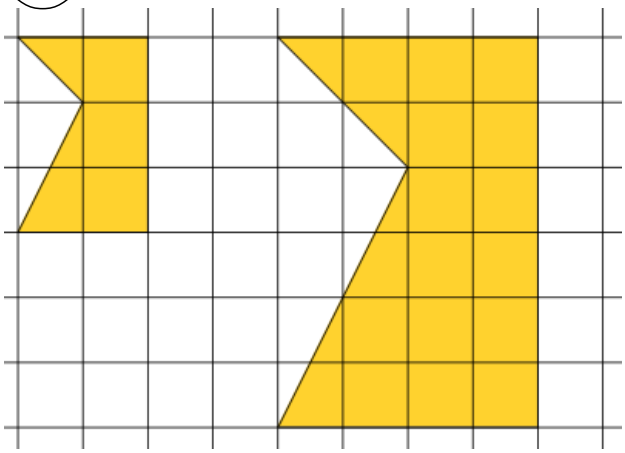
Mr T

In each of these diagrams, the original shape is on the left and the copy is on the right. Write down the scale factor in each case..

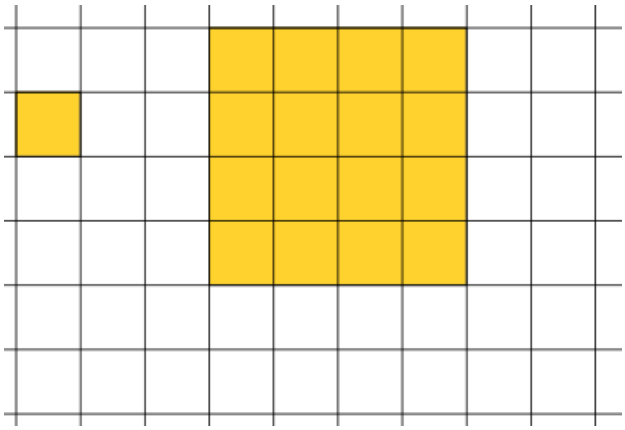
1



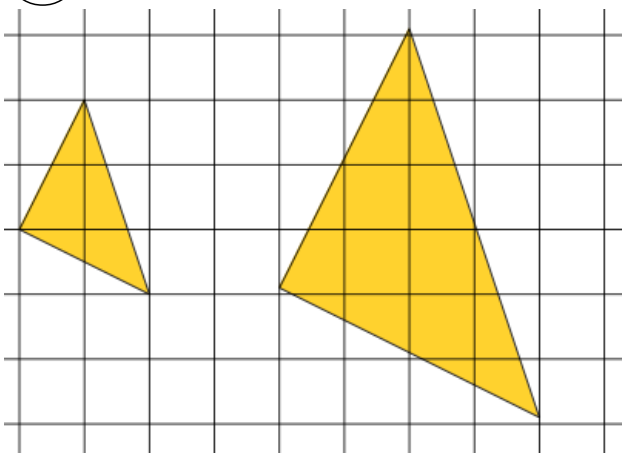
2



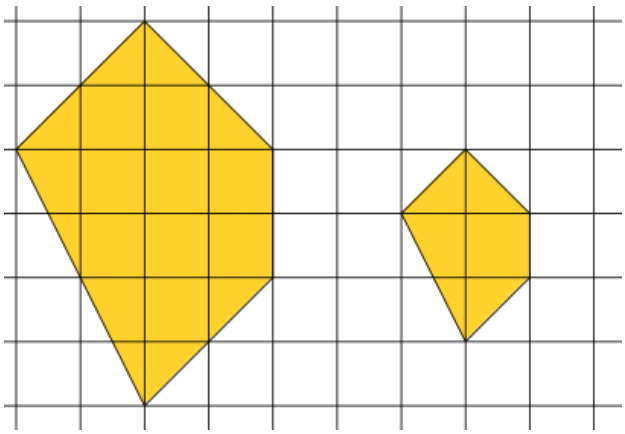
3



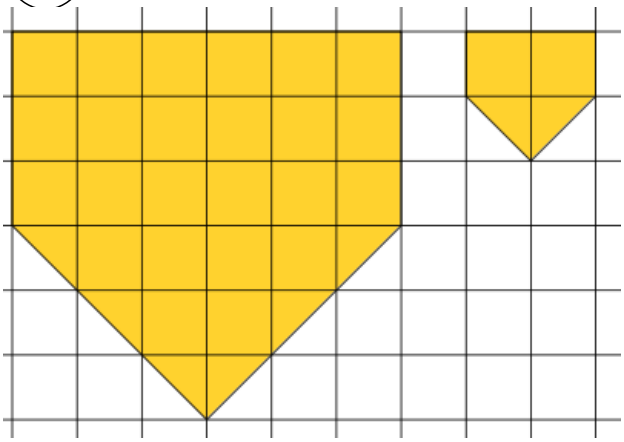
4



5



6



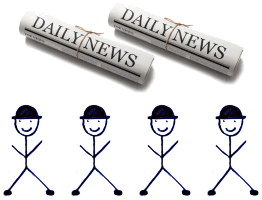
Odd one out ...



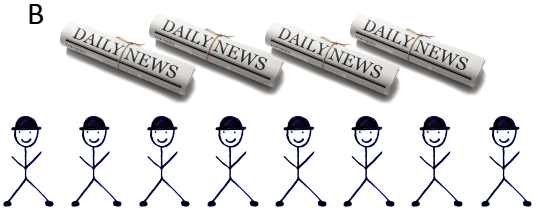
Miss F

Look at these four cards. Which is the odd one out?
Explain your reasoning to your partner.

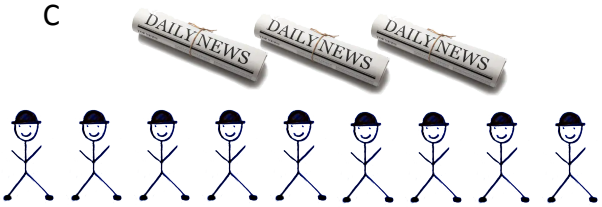
A



B



C



D





Sarah

C is the odd one out because in A, B and D there are twice as many men as newspapers.

C should have 6 men if it is to be the same as the other cards.



Amber



Miss F

Sarah is quite right. Another way of saying this is the **ratio** of newspapers to men is **1:2**



Matthew

In that case we could write the ratio as 2:4 (card A) or 4:8 (card B) as well. The second number just has to be twice as big as the first number.

Equivalent ratios

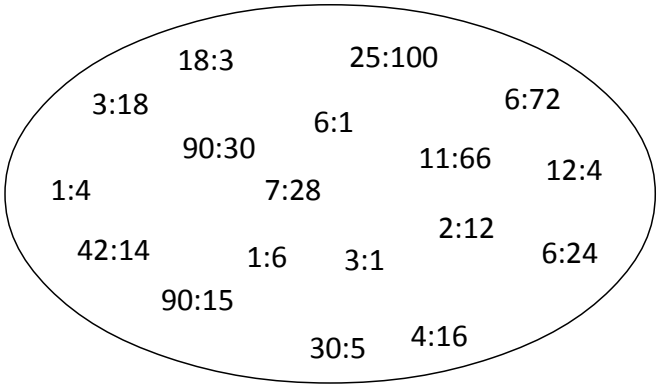


Miss F

Families of ratios that tell the same story are called **equivalent ratios**. So 1:2, 2:4, 3:6, 4:8, 25:50, 100:200 are all equivalent. They all say that the second number is twice as big as the first number.

Fitness check

Sort these ratios into groups of equivalent ratios.





Miss F

In each, the **simplest form of the ratio** is the one that contains the smallest possible integers.

1 For each family of equivalent ratios, which would you describe as the simplest form?

Fitness check

1. Which is the odd one out in each of these lists of ratios?
   a) 1:5, 15:75, 10:50, 12:70, 50:250
   b) 2:14, 4:28, 5:35: 7:56; 9:63; 40:280
   c) 3:2, 4:3, 9:6, 15:10; 21:14; 300:200

2. In each case, write down the simplest form of the ratio.

Simplifying ratios

Sometimes we need to **simplify ratios**. That means writing the ratio with the smallest possible integers even when it doesn't appear in the list.
For example in b) above the simplest ratio in the list is 2:14 but this could be written as 1:7.
This process is called **simplifying ratios**.

3. Simplify these ratios
   a) 5:15 b) 20:30 c) 18:45 d) 24:12



Mr T

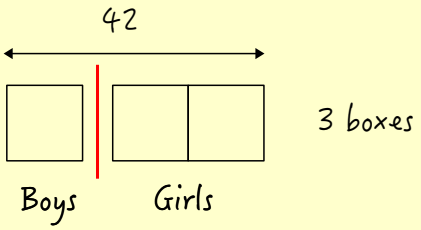
42 pupils went on a trip to the Isle of Wight and the ratio of boys to girls was 1:2. How many girls went on the trip?



Evie

Evie's solution

I drew some boxes to help me



42 ÷ 3 = 14, so 14 in each box
So 1 x 14 = 14 boys
and 2 x 14 = 28 girls
28 girls went on the trip.

2

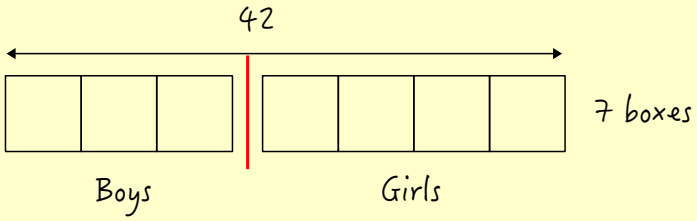
How many girls would there have been in the ratio of boys to girls had been 3:4 instead?



Krish

Krish's solution

I used Evie's box method to help me



42 ÷ 7 = 6, so 6 in each box
So 3 x 6 = 18 boys
and 4 x 6 = 24 girls
24 girls went on the trip.

Question creation - Have fun creating problems that can be solved using the box method for your friends to try.

Some of the pupils' questions ...



Sarah

My Geography homework took four times as long as my Maths homework last night. Altogether I spent 75 minutes on my homework. How long did I spend on my Geography homework?





Jon

I sorted out my Lego last night and found that I had 3 red pieces for every 2 yellow pieces. Altogether I had 175 pieces of Lego. How many red pieces did I have?





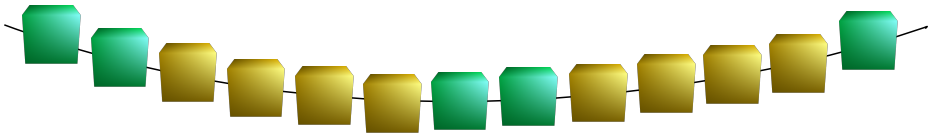
Amber

I bought my mum a bunch of 48 yellow and white flowers for her birthday.There were twice as many yellow flowers as white flowers. How many of the flowers were yellow?





Taro

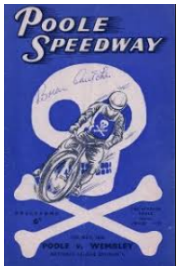


I made a bracelet for my sister's birthday from coloured cubes. I used a repeating pattern of 2 green, followed by 4 gold. If I used 72 cubes altogether, how many gold cubes did I use?



Matthew

I collect Speedway programmes from Sheffield and Poole. I have three times as many Sheffield programmes as Poole programmes. Altogether I have about 50 programmes. How many Sheffield programmes might I have?



Let's think about M&M's



Mr T

I picked up a handful of M&M's from my sweetie tin this morning.
I was surprised to find exactly one third of them are red.



3

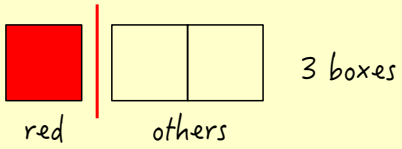
How many M&M's might I have picked up?



Amber

Amber's solution

I used the box method. If one third are red then one box out of three is red and two boxes must be other colours.



So he could have picked up 15 M&M's (5 in each box).
Or 30 (10 in each box)
Or 39 (13 in each box)
In fact he could have picked up any multiple of 3.



Taro

So there is a connection between fractions and ratios.

The ratio of red to the other colours is 1:2 and that means $\frac{1}{3}$ are red and $\frac{2}{3}$ are other colours.

Let's think about the relation between fractions and ratios



Miss F

Earlier Jon told us that he had 175 pieces of Lego. He also told us that he had 3 red pieces for every 2 yellow pieces.

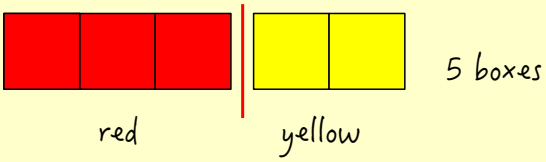
4 What fraction of his Lego pieces are yellow?



Matthew

Matthew's working

I used the box method. It makes things very clear.



You can see that $\frac{2}{5}$ of his Lego pieces are yellow and $\frac{3}{5}$ are red.

Fitness check

1. Rewrite these ratio statements as fraction statements.
   a) The ratio of boys to girls in the junior choir is 1:3.
   b) The ratio of cup cakes to donuts on sale in the canteen is 3:5.
   c) The ratio of 2 wheel drive cars to 4 wheel drive cars is 2:5.

2. Rewrite these fraction statements as ratio statements.
   a) $\frac{2}{3}$ of my stamp collection come from European countries.
   b) I spent $\frac{3}{5}$ of my birthday money on a new computer game and saved the rest.
   c) Evie had a box of mini chocolates. She gave $\frac{1}{6}$ to Jon, $\frac{1}{3}$ to Amber and kept the rest.

Let's think about scale models



Miss F

My brother and I have a large collection of scale model cars. I usually collect 1:18 scale models but my brother prefers 1:24 scale models. Recently we both bought a model of the Jaguar F type coupe.



1:18 scale
(Approx 249mm long)



1:24 scale
(approx 187mm long)

5 What is the actual length of the Jaguar F type coupe?



Alice

That's easy. The real length will be 18 times bigger, so 18 x 249 = 4482mm.

Or you could say it should be 24 x 187 = 4488mm

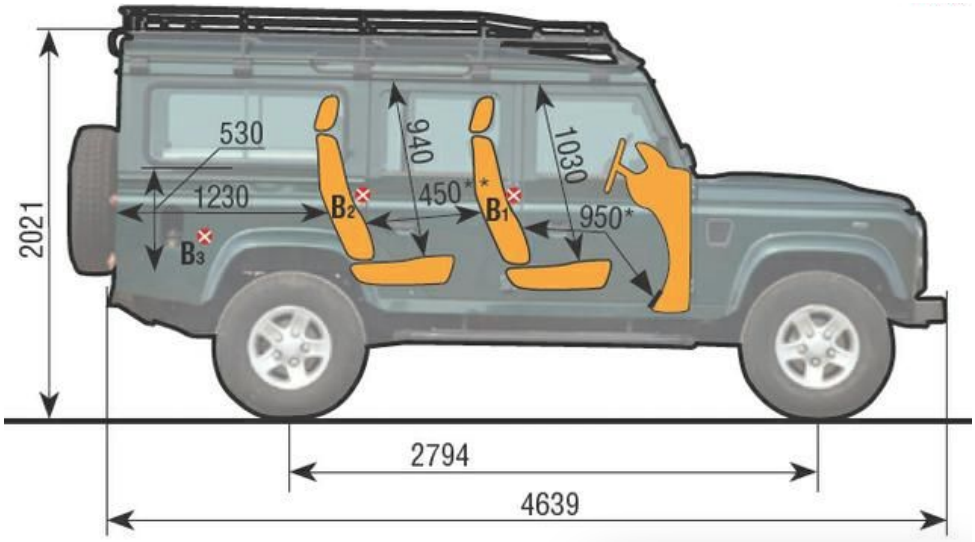


Krish

6 Why do Alice and Krish get different answers?

Fitness check

This picture shows some of the key dimensions of a Land Rover Defender 110



1. What would be the length of a 1:18 scale model?
2. What would be the wheelbase (distance between the centres of the wheels in a side view) of a 1:24 scale model?
3. What would be the height of a 1:32 scale model?
4. If the overall length of a scale model of the Land Rover is 386mm, what is the scale of the model?
5. If the wheelbase of a scale model of the Land Rover is 87mm, what is the scale of the model?
6. Matthew builds scale models of aeroplanes. His favourite is a 1:144 scale model of Concorde.
   a) If the wingspan of the model is 178mm, what is the approximate wingspan of the actual aircraft?
   b) If the actual length of Concorde is 61.67m, what is the length of Matthew's model?
7. Sarah's grandad has a scale model of Big Jake (the world's tallest horse) that is 236mm tall. If Big Jake is actually 2.10m tall, what is the scale of the model?
8. A local shop is selling a doll's house with an advertised scale of 1:12.
   a) If the height of the model is 59cm, how tall is the house that it models?
   b) If the height of the front door of a normal house is 2m, what should be the height of the front door on the doll's house?
9. The length of a planned new country path on a scale drawing was 42cm. The actually length of the path when it was completed was 336m. What was the scale of the drawing?



Sarah

Sarah's solution to Q7

Height of the model = 236mm
Height of the horse = 2.10m = 210cm = 2100mm
Scale factor = 2100 ÷ 236 = 8.9
So the scale of the model is approximately 1:9

7 Why did Sarah convert the height of the horse into millimetres?



Jon

Jon's solution to Q8

a) The height of the model is 59cm, so the height of the house will be 12 x 59 = 708cm or 7.08m.
b) The height of the front door of the house is 2m or 200cm.
So the height of the door on the doll's house should be 200 ÷ 12 = 16.7cm.



Amber

Amber's solution to Q9

The length of the path on the drawing is 42cm.
The length of the actual path is 336m or 33600cm.
So the scale factor is 33600 ÷ 42 = 800
So the scale of the drawing is 1:800



Mr T

Quite often scales are given in mixed units such as 1cm:5m. To write these correctly as ratios, the two quantities must be measured in the same units.
Since 5m is actually 500cm, the ratio should be written as 1:500 with no units necessary.

Fitness check

Rewrite these ratios in the correct form (without units)

a) 6 hours : 1 day b) 2km : 400m c) 20p : £2 d) 3cm : 6mm

e) £5 : 25p f) 300ml : 2 litres g) 1cm : 1km

Map scales



Miss F

Scales on maps refers to the ratio between distance on a map and the corresponding distance on the ground. They often involve large numbers such as a 1:100 000 scale map.

8 What distance does 3cm on a 1:100 000 scale map represent?



Krish

Krish's solution

3cm on the map represents 3 x 100000cm on the ground.
That is 300000cm or 3000m or 3K.
It would make more sense to answer in kilometres.

Fitness check

1. How far do the these distances on a map, represent on the ground?
   a) 6cm (scale 1:20 000)
   b) 15cm (scale 1:200 000)
   c) 3.6cm (scale 1:100 000)
2. What lengths on a map would represent these distances?
   a) 200km (1:1 000 000)
   b) 5400km (1:10 000 000)
   c) 12km (1:40 000)
3. What are the scales on these maps if
   a) 5cm represents 40km?
   b) 12cm represents 144km?
   c) 1.5cm represents 600km?

Let's think about buying oranges ...





Mr T

You can buy 3 Spanish oranges at the local supermarket for 90p.
But you can get a better deal if you buy !0 Spanish oranges.

8 How much might 10 Spanish oranges cost?



Matthew

Matthew's solution

90p for 3 oranges that is 90 ÷ 3 = 30p each.
At the same rate 10 oranges should cost 10 x 30 = 300p.
That's £3
So anything under £3 would be a better bargain.



Evie

Doesn't it have to be a multiple of 10?
For example £2.80, so that the customer can see how much each orange costs?

9 How would you answer Evie's question?

Unit price

Fitness check

1. If 5 pizzas cost ££39.75, how much should 8 pizzas cost?



2. A recipe for 10 people includes 250g of oats. What quantity of oats are need for 12 people?

3. If 4 Chelsea buns cost £2.80, how much would 9 buns cost?



4. 24 pencils and 6 pens cost £6.30. How much would 36 pencils and 9 pens cost?

5. A track cyclist cover 60 laps of the track in 20 minutes. At the same rate how many laps would he cover in 35 minutes?



6. A recipe for 8 people requires 6 eggs. How many eggs are needed for 12 people.

7. A bricklayer lays 330 bricks in 6 hours. How long will it take him to lay 500 bricks?



8. If the same bricklayer is paid £450 for laying 1000 bricks, how much will he earn in a 38 hour week?

9. Which bottle is the best value?

500ml bottle for 90p

2 litre bottle for £3

3 litre bottle for £4.80

10. Which of these represents the best deal for buying 2 litre bottles of Cola?

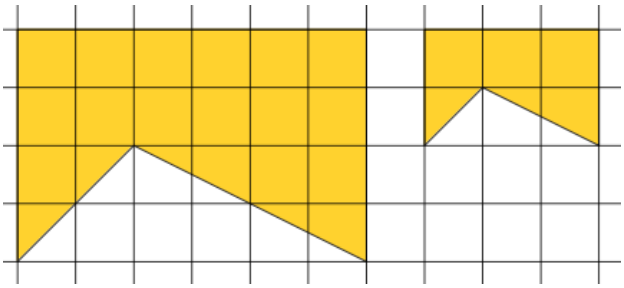
2 litre bottle of Cola £1.60

3 bottles of Cola for the price of 2

Buy one get one free.

Number 2c: Mastery questions

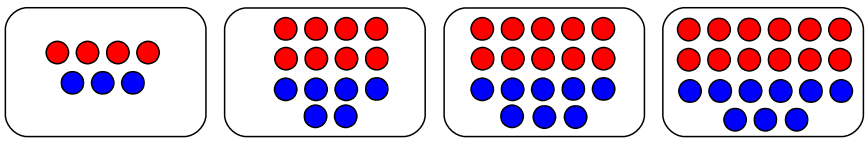
1. In this diagram what is ratio of sides in Shape 1 to Shape 2?



A	B	C	D
1:2	1:3	2:1	3:1

2. Which card does not belong in this look-alike family?

A B C D



3. Which of these ratios does not belong in this group?

A	B	C	D
3:5	6:8	9:15	15:25

4. There are 63 green and red balls in a bag. If the ratio of green to red is 4:3. how many green balls are in the bag?

A	B	C	D
9	21	27	36

5. Evie and Jon share out their money in the ratio 3:2. If Jon gets £32, how much does Evie receive?

A	B	C	D
£48	£32	£16	£3

Number 2c: Mastery questions

6. If the ratio of cup cakes to donuts on sale is 4:5, what fraction of the cakes are the donuts?

A	B	C	D
$\frac{4}{5}$	$\frac{4}{9}$	$\frac{5}{4}$	$\frac{5}{9}$

7. Amber is watching a recording of a TV programme. She pauses it two thirds of the way through to make a phone call. So far, she has been watching for 90 minutes. How long is the TV programme altogether?

A	B	C	D
90 mins	45 mins	120 mins	135 mins

8. The length of a 1:24 scale model of a racing car is 21mm. What is the approximate length of the actual car?

A	B	C	D
210mm	504mm	378mm	2.1m

9. Which of these is the correct form of the ratio 10 minutes to 2 hours?

A	B	C	D
1:6	5:1	1:5	1:12

10. The scale of a map is 1:200 000. What distance is represented by 6cm on the map?

A	B	C	D
12km	1200m	3km	30 000m

11. 3 Chelsea buns cost £2.40. How much would 7 Chelsea buns cost?

A	B	C	D
£7.20	£5.60	80p	£16.80

Number 2c: Mastery questions

12. 5 pizzas cost £35. How much would 3 pizzas cost?

A	B	C	D
£105	£7	£21	£2.10

In questions 13 - 15 you must show all of your working.

13. A recipe for 8 flapjacks needs 30g of butter, 35g of sugar and 60g of rolled oats. If I have 300g of butter, 320g of sugar and 500g of rolled oats, how many flapjacks can I make?

14. A person who weighs 60kg on Earth will weigh approximately 20kg on Mars and 150kg on Jupiter. How much would a man who weighs 45kg on Mars weigh on Jupiter?

15. The ratio of brown eggs to white eggs in a basket is 2:5. If there were 15 more white eggs than brown eggs, how many of each type were in the basket?

N2c_1 Worksheet Look alike rectangles

Cut out the rectangles below and then sort them into three groups of three that "look alike" and one "oddball". Explain your thinking to your partner.

