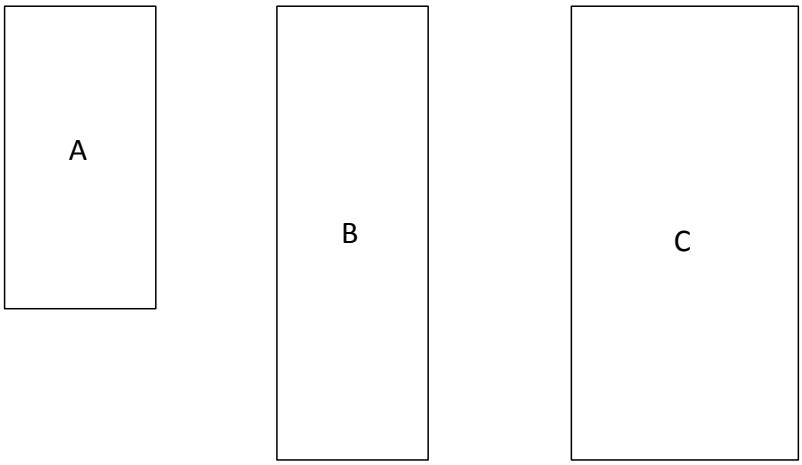
Let's think about look-alike rectangles ...



Mr T

Look at these three rectangles.
Which two would you say look alike? Which one looks different?



1

Explain your thinking to your partner.
What do you think Mr T means by “look alike”?



Sarah

I think rectangle B is is the odd one out.
A and C are in the same proportion.



Matthew

I think you are right. You can enlarge rectangle A to make rectangle C. So their shapes are similar.

2

What does Sarah mean by saying the rectangles are in the same proportion?



Alice

In shapes A and C, the length of each long side looks about twice the length of the short size.



Jon

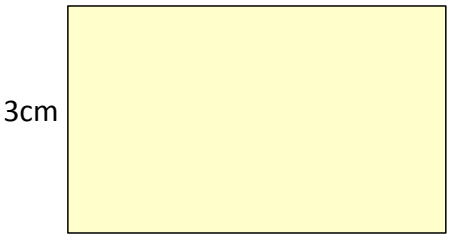
But in B, the length of the long side looks about three times the length of the short side.

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



Mr T

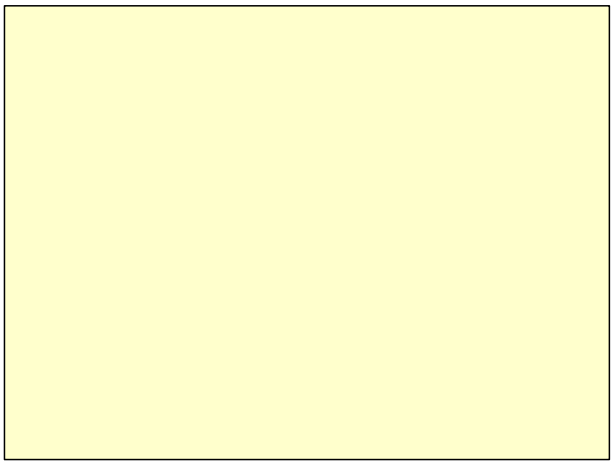
Look at this rectangle.
Can you draw two more look-alike rectangles?





Taro

Taro's first drawing





Amber

Amber's first drawing



3

Who do you think is correct? Explain your thinking to your partner.


Krish

Amber is correct because her rectangle is exactly twice as big as the first rectangle. It has been enlarged by a scale factor of 2.

A new notation


Miss F

Another way of writing this is to use **ratio** notation.
A ratio says how much of one thing there is compared to another thing.
In this case, we could write the ratio as **1:2** because the sides of the second rectangle are twice the size of the sides of the first rectangle.


Sarah

If the ratio is about comparing the lengths of the sides, why don't we write it as 3:6 or 4:8?


Taro

I think you could because they mean the same thing! Both say the lengths of the sides in the second rectangle are twice the lengths of the sides in the first rectangle.

4

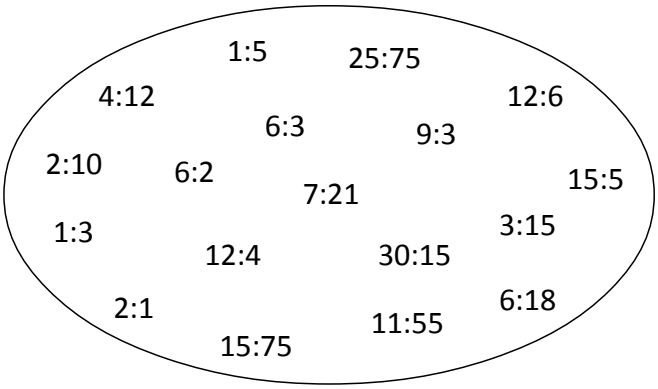
Do you agree with Taro's explanation?


Miss F

Taro is right. We say that 1:2, 3:6 and 4:8 are **equivalent ratios**.We could easily write down more members of this family. For example 50:100.

Fitness check

Sort these ratios into groups of equivalent ratios.

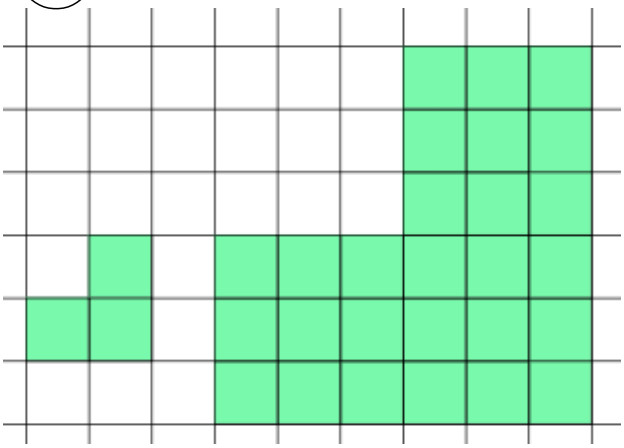




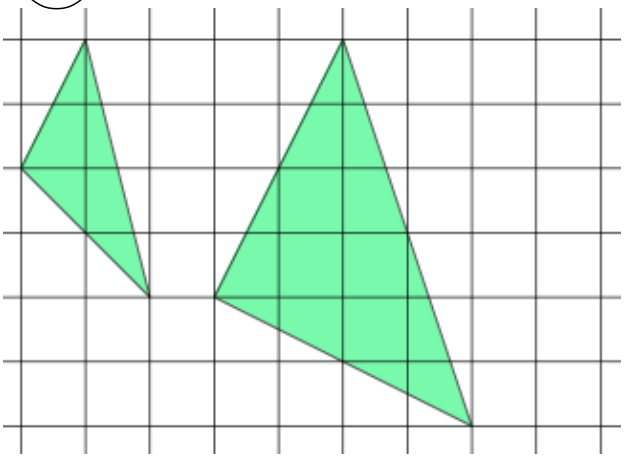
Mr T

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

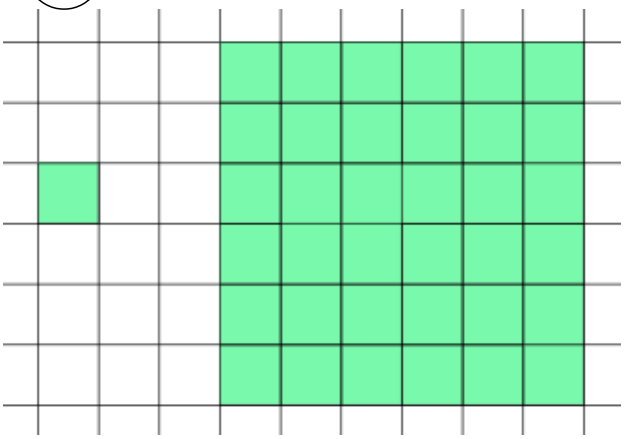
1



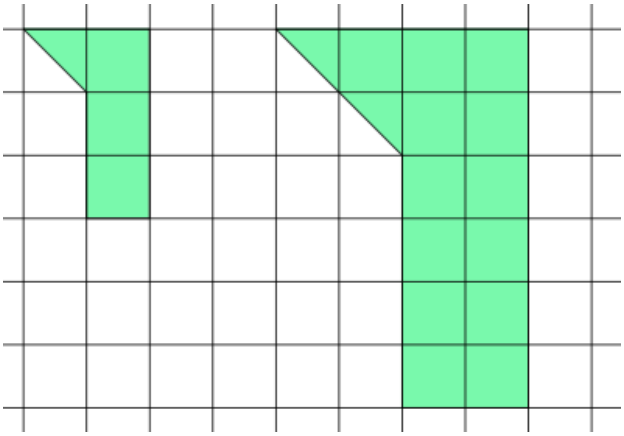
2



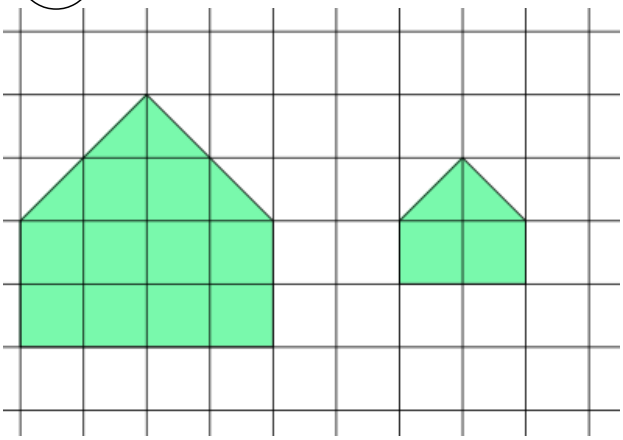
3



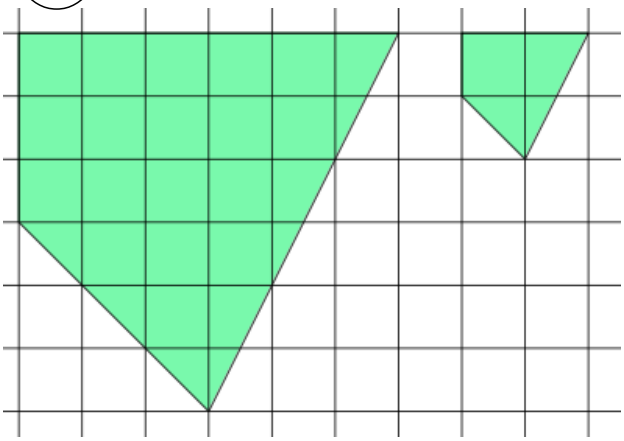
4



5



6

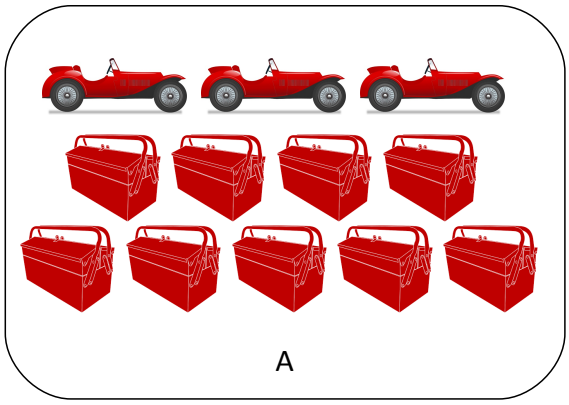


Which goes with which?

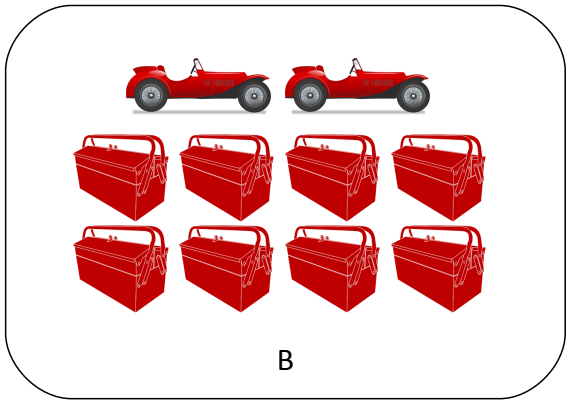


Miss F

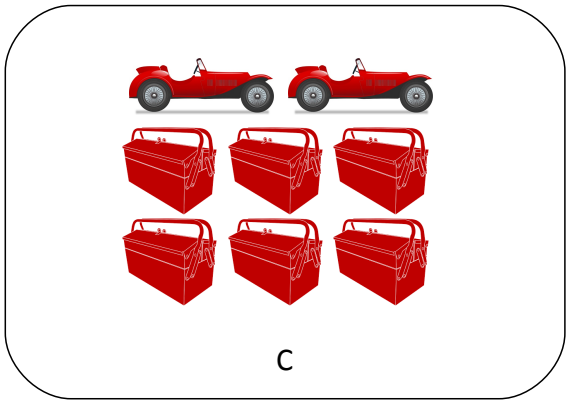
Look carefully at these six cards. Can you place them into two “look-alike” families?



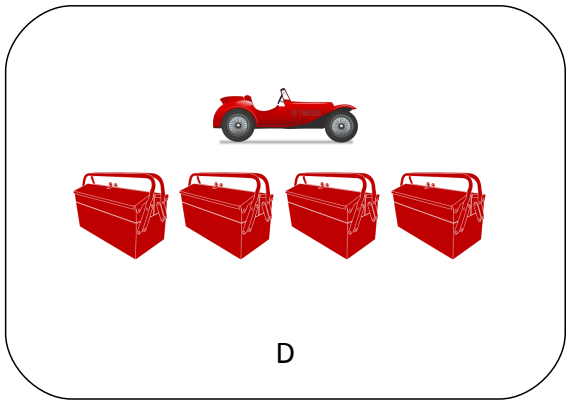
A



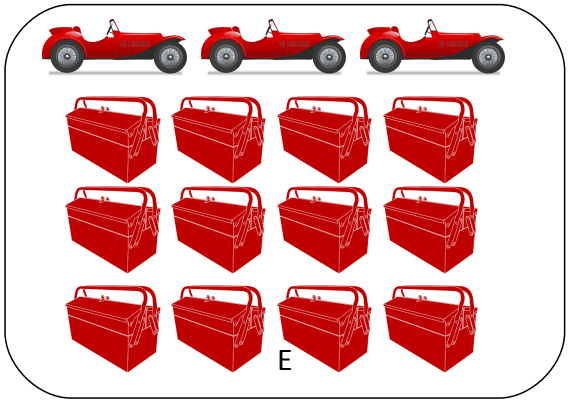
B



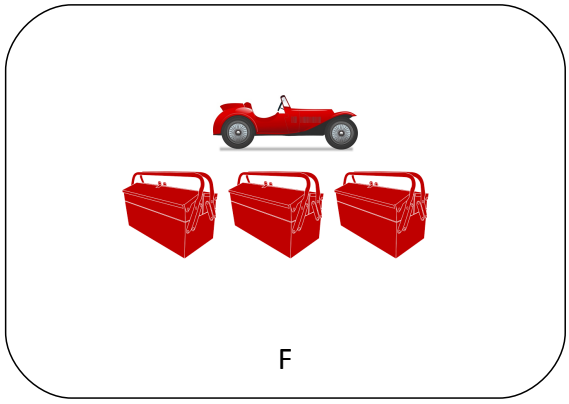
C



D



E



F



Alice

A, C and F go together because, for every red car, there are 3 toolboxes

B, D and E go together because, for every red car, there are 4 toolboxes

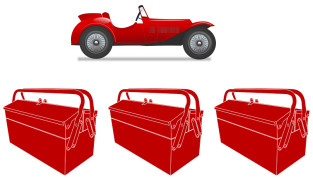


Matthew



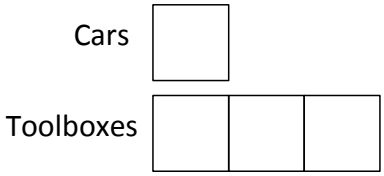
Miss F

Alice says, in her set of look-alike cards, for every car, there are three toolboxes.
So, the ratio of cars to toolboxes could be written as 1:3.



We could represent her family with a simple box diagram.

For example,

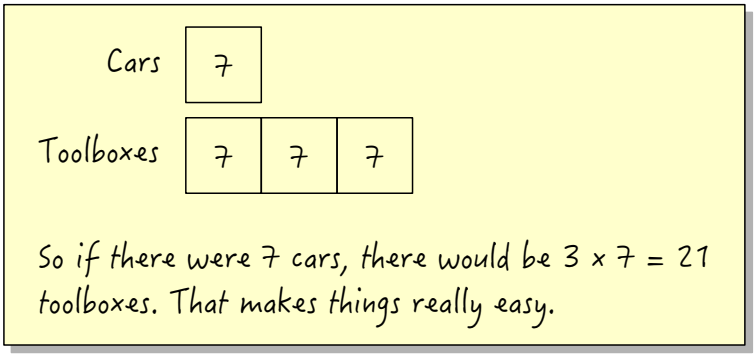


5 Use your diagram to work out how many toolboxes you would have if you had 7 cars.



Taro

Taro's work



Fitness check

1. Using Alice's set of look-alike cards, how many toolboxes would you have if you had
   a) 10 cars b) 25 cars c) 99 cars?

2. Using Alice's set of look-alike cards, how many cars would you have if you had
   a) 18 toolboxes b) 90 toolboxes c) 315 toolboxes?

3. Draw a box model of Matthew's set of cards.
   How many toolboxes would you have if you had
   a) 10 cars b) 25 cars c) 99 cars?
   How many cars would you have if you had
   d) 24 toolboxes e) 96 toolboxes f) 348 toolboxes?

Let's think about cutting up a plank ...





Amber

For a construction project, Amber is cutting a plank of wood into two pieces so that the larger piece is 3 times as long as the smaller piece.

If the plank is originally 240cm long, how long is each piece after she has cut it?



Matthew

We can write this as a ratio, 1:3, and then use the box method.

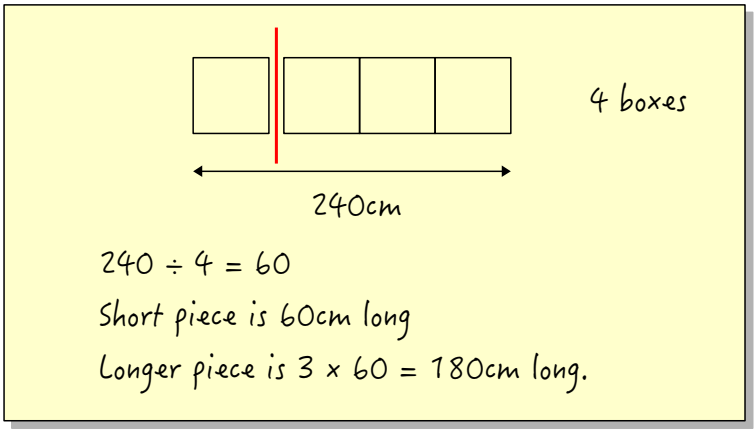
6

Use your diagram to help you to find the length of each piece of wood.



Sarah

Sarah's work



7

How long would each piece be if Amber had to make the larger piece 4 times as long as the smaller piece?

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

Some of the pupils' questions ...



Alice

I had 24 sweets which I shared with my brother in the ratio of 2:1. How many sweets did we each receive?





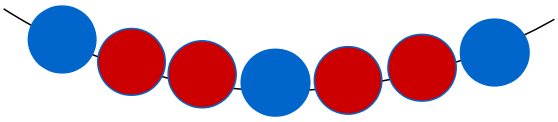
Jon

My English homework last night took three times as long as my Science homework. Altogether I spent 60 minutes on my homework. How long did I spend on my Science homework?





Evie



I have a bracelet made out of blue and red coloured beads. The pattern is one blue bead followed by two red beads. The pattern keeps repeating. If there are 22 red beads, how many beads are there altogether?



Matthew

I have a large stamp collection. I have just noticed that the ratio of New Zealand stamps to Australian stamps is 1:4. If I have 120 stamps altogether from these two countries, how many Australian stamps do I have?







Krish

I bought my mother a bunch of 32 red and white flowers. There were three times as many white flowers as red flowers. How many of the flowers were white?





Taro

I have twice as many model cars as of model aircraft. Altogether I have about 40 models. How many model aircraft might I have?

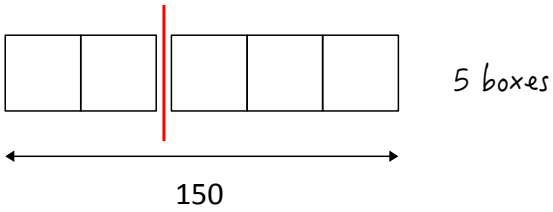


Let's think about making up stories ...



Mr T

Can you create a problem that matches this box diagram?





Amber

Every week, I save £2, and my brother saves £3. Altogether we have saved £150. How much have I saved?



Evie

In my athletics club, there are 150 members. For every 2 girls in the club, there are 3 boys. How many boys are in the club?



Krish

150 people watched my last soccer match. For every 2 who supported my team, 3 supported the other team. How many people supported my team?

Fitness check

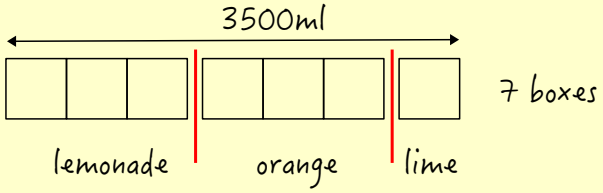
1. Mr T is painting the outside of his house light grey. He estimates that altogether he will require 21L of paint. To get the correct shade of grey, he mixes two cans of black with 5 cans of white. Each can holds 2L. How many cans of each colour should he buy?
2. Miss F is training for the local 5K charity run. Each day she runs for 750m and then walks for 250m. She does this five times altogether.
   a) How far does she actually run each day?
   b) How far does she walk each day?
3. Matthew has created his own refreshing drink called Matt's Delight by mixing 3 glasses of lemonade with 3 glasses of orange squash and 1 glass of lime cordial. He has made 3.5L of Matt's Delight altogether.
   c) How much lemonade did he use?
   d) How much orange squash did he use?
   e) How much lime cordial did he use?



Sarah

Sarah's solution to Q3

The ratio of lemonade to orange squash to lime is 3:3:1.
Matthew uses 3.5L or 3500ml altogether.
I can represent this with a box diagram.



3500 ÷ 7 = 500, so each box represents 500ml.
So he uses

a) 3 x 500 = 1500ml or 1.5L of lemonade
b) 3 x 500 = 1500ml or 1.5L of orange squash
c) 1 x 500 = 500ml or 0.5L of lime cordial.



Miss F

Sarah is absolutely correct. You can use ratios with more than two quantities. This is often used in recipes and in the building trade.

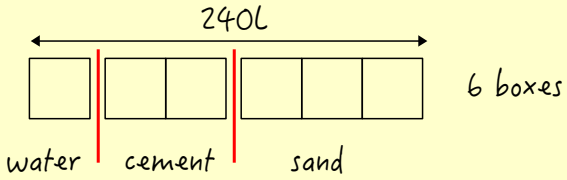
1. Concrete is made by mixing water, cement and sand in the ratio of 1:2:3 by volume. Mr Ahmed, a local builder, needs 240L of concrete to make a drive. How much cement will he need?
2. Miss F loves making flapjacks for her class. She mixes oats, butter and sugar in the ratio of 5:2:3 as well as adding golden syrup and dried fruit. If her main ingredients weigh 1400gm, how much butter did she use?
3. Jon is making a necklace from coloured beads for his sister's 6th birthday. He is making a repeating pattern using red, yellow and green beads in the ratio 3:4:2.
   a) Sketch part of the necklace.
   b) How many of each colour bead will he need if he uses 45 beads altogether?
4. Mr Ahmed's daughter, Regina, designs decorative floors using square tiles. Her latest design uses red, green, blue and yellow tiles in the ratio 1:2:1:3. If she needs 168 tiles altogether, how many of each colour should she buy?



Krish

Krish's solution to Q1

I can represent Mr Ahmed's concrete mix using a box diagram.



240 ÷ 6 = 40, so each box represents 40L.

So he uses

a) 1 x 40 = 40L of water

b) 2 x 40 = 80L of cement

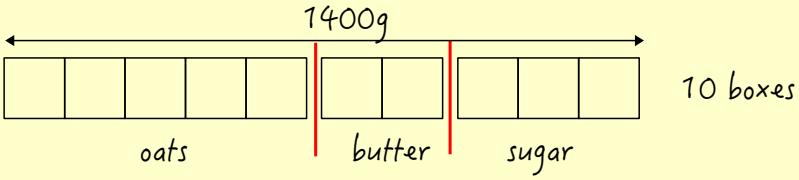
c) 3 x 40 = 120L of sand.



Evie

Evie's solution to Q2

I can represent the flapjacks using a box diagram.



1400 ÷ 10 = 140, so each box represents 140g.

So she uses

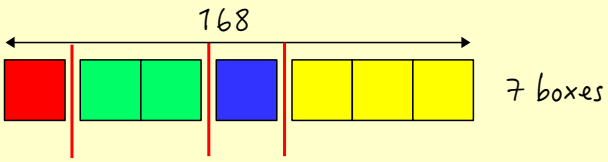
2 x 140 = 280g of butter



Alice

Alice's solution to Q4

I can represent the tiles using a box diagram.



168 ÷ 7 = 24, so each box represents 24 tiles.

So she uses

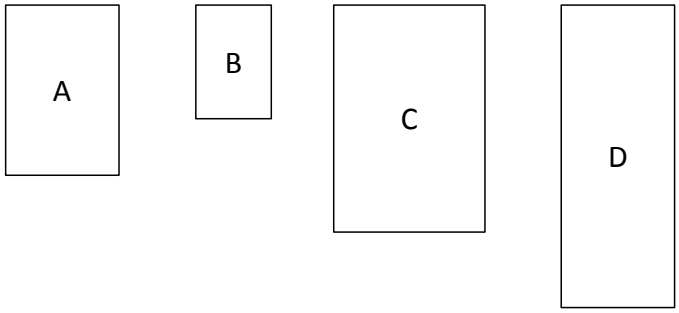
1 x 24 = 24 for red and blue tiles

2 x 24 = 48 green tiles

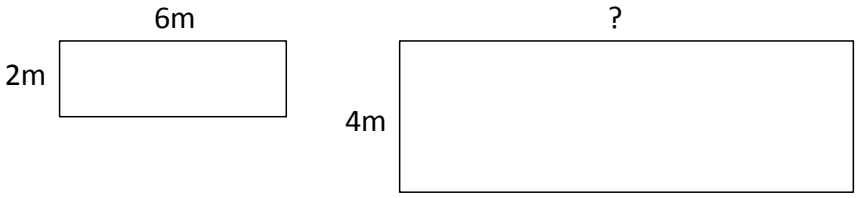
3 x 24 = 72 yellow tiles

Number 1a: Mastery questions

1. Which of these rectangles does not belong in this set of look-alike rectangles?



2. What is the missing length if these two rectangles are in proportion?

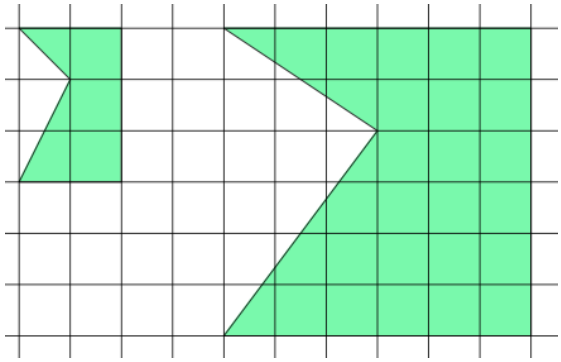


A	B	C	D
6m	8m	12m	16m

3. Which of these ratios is the odd one out?

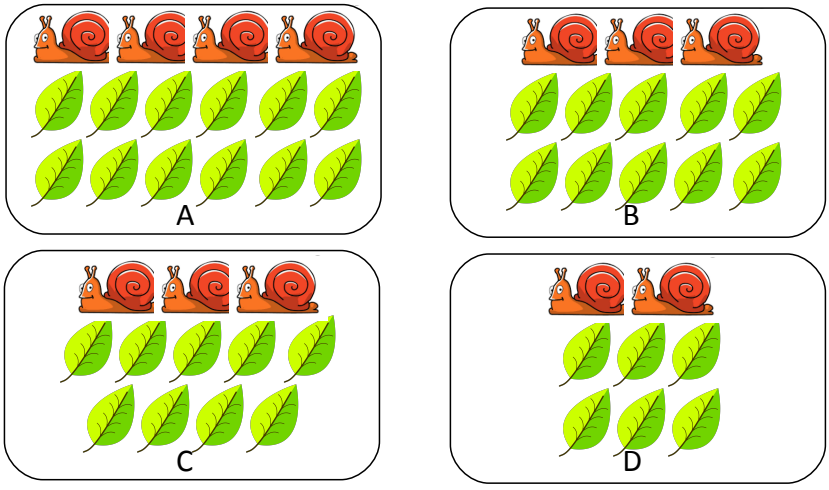
A	B	C	D
5:20	3:12	4:1	1:4

4. In this diagram, the original shape is on the left, and the copy is on the right.
What is the ratio of the lengths of corresponding sides?



A	B	C	D
3	1:3	3:1	1:9

5. Which of these cards does not belong in the look-alike family?



6. A glass of cordial contains four times as much water as cordial. If Alice uses 40ml of cordial, how much water should she put in?

A	B	C	D
120ml	140ml	160ml	200ml

7. Alice has a box of red and blue beads. The ratio of red beads to blue beads in a box is 1:3. If there are 27 blue beads, how many beads are there altogether?

A	B	C	D
36	9	27	81

8. Krish noticed the ratio of diesel-powered cars to petrol powered cars in his street was 1:6. If there were 42 cars in Krish's street, how many were petrol-powered?

A	B	C	D
6	7	36	42

9. Amber made a bucket of purple paint by mixing 1L cans of red and blue paint in the ratio of 2:3. Which of these quantities of purple might she have made?

A	B	C	D
16L	17L	19L	20L

Number 1c: Mastery questions

10. Mr T uses 90g of flour for every 20g sugar to make a donut. If he has 500g of flour and 200g of sugar, how many donuts can he make?

A	B	C	D
4	5	6	10

In questions 11 and 12, you must show all of your work.

11. The ratio of boys to girls in the Yr 7 soccer club is 5:3. If there are 10 more boys than girls in the soccer club, how many a) boys and b) girls are in the soccer club?

12. Matthew has a part-time job packing baskets of mixed fruit at a local orchard. He packs pears, apples and plums in the ratio of 1:2:4. A basket of fruit contains 21 items. How many apples does Matthew use if he packs 8 baskets in a morning?