

Year 6

Small Steps Guidance and Examples

Block 6 – Ratio



Year 6 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number- Place Value		Number- Addition, Subtraction, Multiplication and Division				Fractions				Geometry- Position and Direction	Consolidation
Spring	Number- Decimals		Number- Percentages		Number- Algebra		Measurement Converting units	Measurement Perimeter, Area and Volume		Number- Ratio		Consolidation
Summer	Geometry- Properties of Shapes		Problem solving			Statistics		Investigations				Consolidation

Overview

Small Steps

NC Objectives

- Using ratio language
- Ratio and fractions
- Introducing the ratio symbol
- Calculating ratio
- Using scale factors
- Calculating scale factors
- Ratio and proportion problems

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.

Solve problems involving similar shapes where the scale factor is known or can be found.

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Using Ratio Language

Notes and Guidance

Children will understand that a ratio shows the relationship between two values and can describe how one is related to another.

They will start by making simple comparisons between two different quantities. For example, they may compare the number of boys to girls in the class and write statements such as “for every one girl, there are two boys”.

Mathematical Talk

How would your sentences change if there were 2 more blue flowers?

How would your sentences change if there were 10 more pink flowers?

Can you write a “for every...” sentence for the number of boys and girls in your class?

Varied Fluency

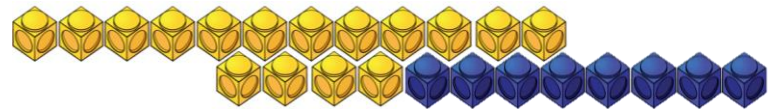
- 1 Complete the sentences.



For every blue flower there are pink flowers.



For every two blue flowers there are pink flowers.

- 2 Rearrange the same number of cubes as there are in the diagram to help you complete the sentences.

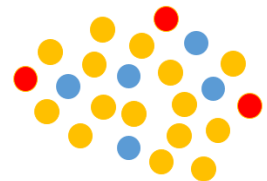


For every ____ , there are ____ .

For every 8 , there are ____ .

For every 1 , there are ____ .

- 3 How many “for every...” sentences can you write to describe the counters?



Using Ratio Language

Reasoning and Problem Solving

Tariq lays tiles in the following pattern:

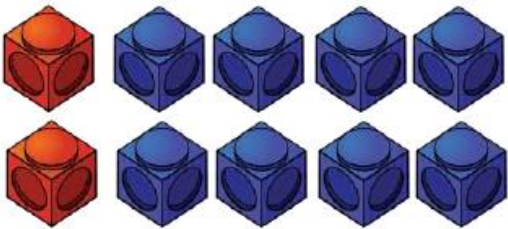


If he has 16 blue tiles and 20 purple tiles can he continue his pattern without there being any tiles left over?

Explain why.

Possible response: For every two blue tiles there are three purple tiles. If Tariq continues the pattern he will need 16 blue tiles and 24 purple tiles. He cannot continue the pattern without there being tiles left over.

True or False?



- For every red cube there are 8 blue cubes.
- For every 4 blue cubes there is 1 red cube.
- For every 3 red cubes there would be 12 blue cubes.
- For every 16 cubes, 4 would be red and 12 would be blue.
- For every 20 cubes, 4 would be red and 16 would be blue.

False
True
True
False
True

Ratio and Fractions

Notes and Guidance

Children are introduced to proportion by comparing a part to the whole.

They begin to see the link between to see the link between comparing quantities using ratio language (for every.....) and comparing quantities using fractions.

Mathematical Talk

How many apples are there compared to oranges?

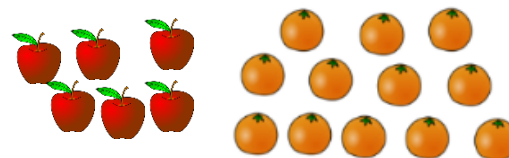
What fraction of the sweets are red, blue, orange?

Can I make a bar model to compare the quantities more efficiently?

What is the same and what is different about all the sentences you have written?

Varied Fluency

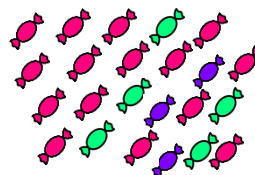
- 1 Complete the sentences to compare the apples and oranges.



For every 6 apples there are oranges.

$\frac{\square}{\square}$ of the fruit are apples, $\frac{\square}{\square}$ of the fruit are oranges.

- 2 Complete the sentences to compare the sweets.



The number of pink sweets is _____ times the number of green sweets.

The number of pink sweets is _____ times the number of purple sweets.

$\frac{\square}{\square}$ of the sweets are pink, $\frac{\square}{\square}$ of the sweets are green.

For every 3 purple sweets there are pink sweets.

For every 1 purple sweets there are pink sweets.

Ratio and Fractions

Reasoning and Problem Solving

Fabio plants flowers in a flower bed.
For every 2 red roses he plants 5 white roses.



He says,

$\frac{2}{5}$ of the roses are red.

Is Fabio correct?

Fabio is incorrect because $\frac{2}{7}$ of the roses are red. He has mistaken a part with the whole.

Which is the odd one out?
Explain your answer.

 $\frac{1}{3}$

There are some red and green cubes in a bag. $\frac{2}{5}$ of the cubes are red.

True or False?

- For every 2 red cubes there are 3 green cubes.
- For every 2 red cubes there are 5 green cubes.
- For every 3 green cubes there are 2 red cubes.
- For every 3 green cubes there are 5 red cubes.

Explain your answers.

True

False

True

False

Introducing the Ratio Symbol

Notes and Guidance

Children are introduced to the : notation and continue to link this with the language ‘for every..., there are...’

Children understand that the notation relates to the order of parts. For example, ‘For every 3 bananas there are 2 apples would be the same as 3 : 2 and for every 2 apples there are 3 bananas would be the same as 2 : 3

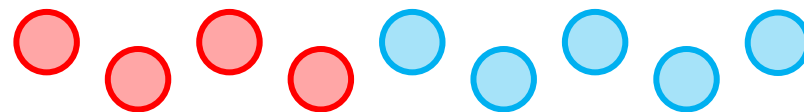
Mathematical Talk

What does the : symbol mean in the context of ratio?

Why is the order of the numbers important?

Varied Fluency

1 Complete.



The ratio of red counters to blue counters is :

The ratio of blue counters to red counters is :

2 Here are the ingredients for a smoothie.

Write down the ratio of:



- Bananas to strawberries
- Strawberries to bananas to blackberries
- Blackberries to strawberries to bananas
- Blackberries to strawberries

3 The ratio of red to green marbles is 3 : 7
Draw an image to represent the marbles.
What fraction of the marbles are red?
What fraction of the marbles are green?

Introducing the Ratio Symbol

Reasoning and Problem Solving

Tick the correct statements.



- There are two yellow tins for every three red tins.
- There are two red tins for every three yellow tins.
- The ratio of red tins to yellow tins is $2 : 3$
- The ratio of yellow tins to red tins is $2 : 3$

Explain which statements are incorrect and why.

The first and last statement are correct.

In a box there are some red, blue and green pens.

The ratio of red pens to green pens is $3 : 5$

For every 1 red pen there are two blue pens.

Write down the ratio of red pens to blue pens to green pens.

$3 : 6 : 5$

Calculating Ratio

Notes and Guidance

Children build on their knowledge of ratios and begin to calculate ratios. They answer worded questions in the form of 'for every... there are ...' and need to be able to find both a part and a whole.

They should be encouraged to draw bar models to represent their problems, and label clearly the information they have been given and what they want to calculate.

Mathematical Talk

Can we represent this ratio using a bar model?

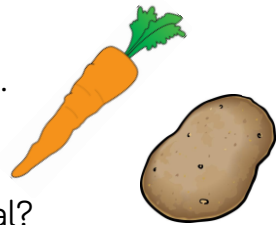
What does each part represent? What will each part be worth?

How can we share this quantity using the given ratio?

If we know what this part is worth, can we calculate the other parts?

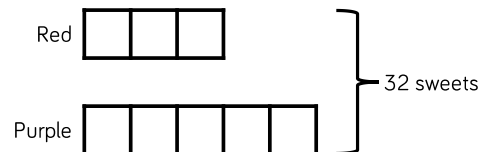
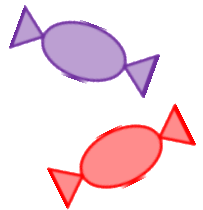
Varied Fluency

- 1 A farmer plants some crops in a field.
For every 12 carrots he plants 5 potatoes.
He plants 60 carrots in total.
How many potatoes did he plant?
How many vegetables did he plant in total?



- 2 Beth mixes 2 parts of red paint with 3 parts blue paint to make purple paint.
If she uses 12 parts blue paint, how much red paint did she use?

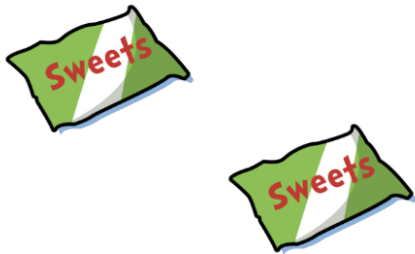
- 3 Emily has a packet of sweets.
For every 3 red sweets there are 5 purple sweets.
If there are 32 sweets in the packet in total, how many of each colour are there? You can use a bar model to help you.



Calculating Ratio

Reasoning and Problem Solving

David has two packets of sweets.



In the first packet, for every one strawberry sweets there are two orange sweets.

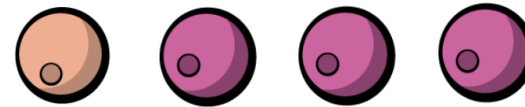
In the second packet, for every three orange sweets there are two strawberry.

Each packet contains 15 sweets in total.

Which packet has more strawberry sweets and by how many?

The first packet has 5 strawberry sweets and 10 orange sweets. The second packet has 6 strawberry sweets and 9 orange sweets. The second packet has 1 more strawberry sweet than the first packet.

Danielle is making some necklaces to sell. For every one pink bead, she uses three purple beads.



Each necklace has 32 beads in total.

The cost of the plain necklace is £2.80

The cost of a pink bead is 72 p

The cost of a purple bead is 65 p

How much does it cost to make one necklace?

Each necklace has 8 pink beads and 24 purple beads.

The cost of the pink beads is £5.76

The cost of the purple beads is £15.60

The cost of a necklace is £24.16

Using Scale Factors

Notes and Guidance

Once children are able to calculate ratio they can apply this knowledge to problems involving scale factors..

Children should be able to draw 2D shapes on a grid given a scale factor and be able to use vocabulary such as “shape A is three times as big as shape B”.

Mathematical Talk

What does enlargement mean?

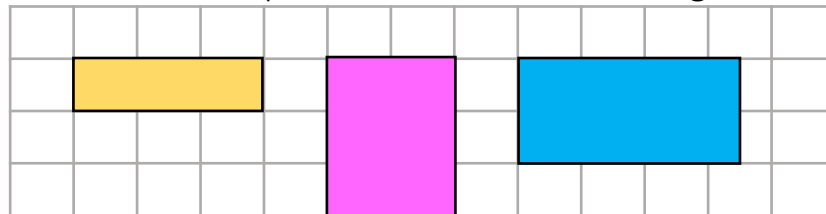
What does scale factor mean?

How much has the shape been increased by? How do you know?
Can you prove it?

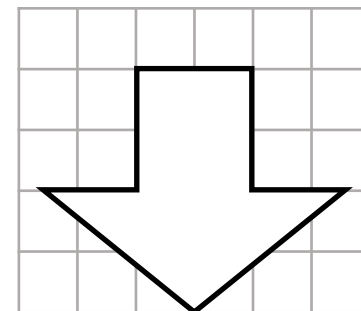
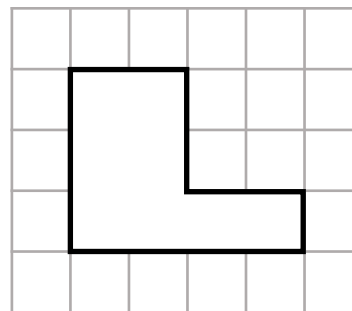
Have the angles changed size or not?

Varied Fluency

- Copy these rectangles onto squared paper then draw them double the size, triple the size and 5 times as big.

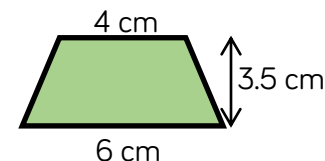
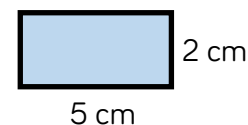


- Copy these shapes onto squared paper then draw them twice as big and three times as big.



- Enlarge the following shapes by

- Scale factor 2
- Scale factor 3
- Scale factor 4



Using Scale Factors

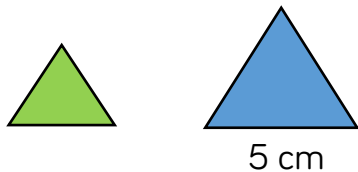
Reasoning and Problem Solving

Draw 3 rectangles with the same area where the length increases by the scale factor 2

Can you find more than one way of doing this?

Children could draw three rectangles with an area of 24 cm^2 where the length and width are 6 cm and 4 cm, 12 cm and 2 cm and 24 cm and 1 cm

Here are two equilateral triangles. The blue triangle is three times larger than the green triangle.



Find the perimeter of both triangles

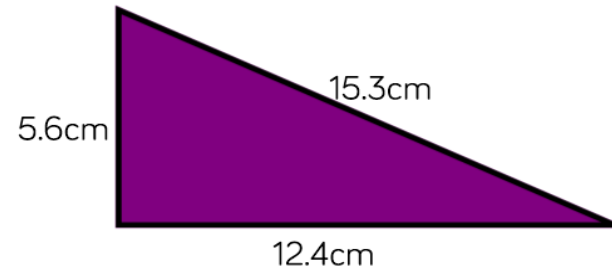
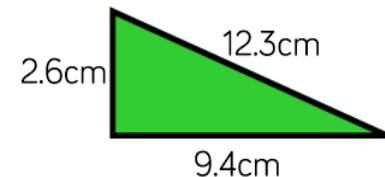
The blue triangle has a perimeter of 15 cm.

The green triangle has a perimeter of 5 cm

Brian says:



The purple triangle has been enlarged from the green triangle by scale factor 3



Do you agree?
Explain why.

Possible answer

I do not agree because Brian has increased the green shape by adding 3cm to each side, not increasing it by a scale factor of 3

Calculating Scale Factors

Notes and Guidance

Children find scale factors when given similar shapes. They continue to use scale factors to complete missing lengths.

Children use multiplication and division facts to accurately calculate missing information and scale factors.

Mathematical Talk

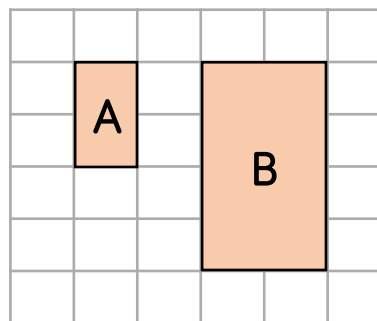
What do you notice about the length/width of each shape?
Can you draw them?

How much larger/smaller is shape A compared to shape B?

What does a scale factor of 2 mean?

Varied Fluency

- 1 Complete the sentences to describe the shapes.



Shape B is _____ as big as shape A.

Shape A has been enlarged by scale factor _____ to make shape B.

- 2 The rectangles in the table are similar. Fill in the missing lengths and widths and complete the sentences.

Rectangle	Length	Width
A	5cm	2cm
B		4cm
C	25cm	
D		18cm

To enlarge A to B, use the scale factor ____

To enlarge A to C, use the scale factor ____

To enlarge A to D, use the scale factor ____

To enlarge B to D, use the scale factor ____

Calculating Scale Factors

Reasoning and Problem Solving

One rectangle has a perimeter of 16 cm.
An enlarged version of this rectangle has a perimeter of 24 cm.

The length of the smaller rectangle is 6 cm.
Draw both rectangles.

Smaller rectangle:
length – 6 cm
width – 2 cm

Larger rectangle:
length – 9 cm
width – 3 cm

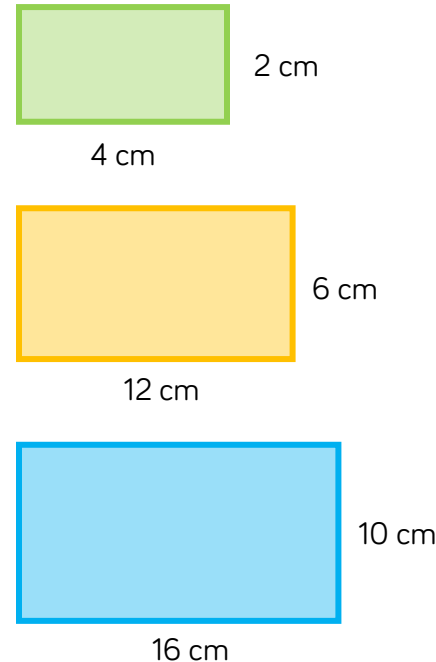
Scale factor: 1.5

Always, sometimes, never.

To enlarge a shape you just need to do the same thing to each of the sides.

Sometimes. This only works when we are multiplying or dividing the lengths of the sides, it does not work with addition and subtraction etc.

Tom says that each of these rectangles is an enlarged version of one of the others.



Do you agree?
Explain your answer.

Tom is wrong. The orange rectangle is an enlarged version of the green with scale factor 3, but the blue rectangle is not similar because the same amount has been **added** to the sides and they should be multiplied or divided to be enlarged.

Ratio and Proportion Problems

Notes and Guidance

Children will draw together all their experiences of ratio and proportion to answer a variety of problems which will include a range of contextualised problems.

Mathematical Talk

Which model can help us visualise this problem?

Can we represent this ratio using a bar model?

What does each part represent?

What is the same about the ratios?

What is different about them?

Varied Fluency

- The recipe to make soup for 6 people is given. How much of each ingredient will be needed to make the soup for:

- 3 people
- 9 people
- 1 person

Recipe for 6 people

- 1 onion
- 60g butter
- 2 tbsp plain flour
- 2.4 litres stock
- 480ml tomato juice

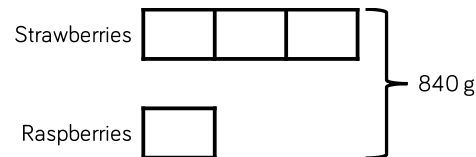
- Find the cost of one pen from each shop.

ASDI
4 pens £2.88

TESCU
7 pens £4.83

Which is better value?

- A smoothie contains three times as many strawberries as raspberries. The combined weight of the strawberries and raspberries is 840 g. What weight of strawberries is needed?



Ratio and Proportion Problems

Reasoning and Problem Solving

Here is the recipe for making flapjacks.

Flapjacks

Serves: 10

120 g butter

100 g dark brown soft sugar

4 tablespoons golden syrup

250 g rolled oats

40 g sultanas or raisins

Jonathan has 180 g butter.

What is the largest number of flapjacks he can make?

How much of everything else will he need?

He has enough butter to make 15 flapjacks.
He will need 150 g dark brown soft sugar, 6 tablespoons golden syrup, 375 g rolled oats and 60 g sultanas or raisins.

Jodie has two packets of sweets.



In the first packet, for every 2 strawberry sweets there are 3 orange.

In the second packet, for one strawberry sweet, there are three orange.

Each packet has the same number of sweets.

The second packet contains 15 orange sweets.

How many strawberry sweets are in the first packet?

Second packet:

15 orange

5 strawberry

So there are 20 sweets in each packet.

First packet:

8 strawberry

12 orange

The first packet contains 8 strawberry sweets.