



THIRD SPACE
LEARNING

GCSE Maths Intervention Pack

Working with Ratios

Grade 4

Teacher Notes

Question Sets

Set 1: Form and Simplify Ratios

Form and simplify ratios

Key words: Division, highest common factor, form (write), ratio, simplify

Set 2: Equivalent Ratios

Calculate the value of other parts in a ratio

Key words: Equivalent, part, ratio, scale up, share

Set 3: Share a Quantity into a Ratio

Divide a quantity into 2-part and 3-part ratios

Key words: Part, quantity, ratio, share



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“We now tell our staff that if Third Space Learning do a version of that resource, prioritise it over all of the alternatives, because we feel that they are always the best ones.”



Gabriel Ogbeifun,
Head of Mathematics, Regent High School

Slide 1: Cover Slide

Teaching Prompts

- Who do you think is correct?
 - How can you tell? (all other answers don't add to 20)
-

Answers

- Yohan is correct: $20 \div (2 + 3) = 4$, $4 \times 2 = 8$ for Amy, $4 \times 3 = 12$ for Sanjay
-

Teacher Reference Only

Common Misconceptions

- Students continue to divide by 2 and no other factor.
 - Students write the ratio without the colon.
 - Students write the ratio in the incorrect order.
 - Students do not understand that the parts in the ratio can get larger.
 - Students add to parts of a ratio instead of multiply.
 - Students divide a quantity by one part of the ratio, rather than the total of the shares when dividing a quantity into a ratio.
 - Students work out the value of all the parts rather than one part of the ratio.
-

Slide 2: Try this exam-style question...

Set 1: Simplifying Ratio.

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- Can you give an example where Amy's method wouldn't work? (any two values with a factor other than 2)
-

Mark Scheme

- (1 mark) Disagrees with Amy
 - (1 mark) gives an example or clear explanation why dividing by two doesn't always work
-

Watch out for

- Students continue to divide by 2 and no other factor.
- Students write the ratio without the colon.
- Students write the ratio in the incorrect order.

Slide 3: Let's go through it together...

Set 1: Simplifying Ratio.

Teaching Prompts

1) What is a common factor of 16 and 20?

1) Why does dividing by 2 work for some of these and not others? (for the first set, the common factors are multiples of 2, for 18:24 and 15:20 there are other common factors)

Answers

1. 4:5 3:4 3:4

2. Simplify the ratios by dividing by the HCF of the values in each ratio.

$$\begin{array}{ccc}
 16 : 20 & 18 : 24 & 15 : 20 \\
 \div 4 \quad \downarrow & \div 6 \quad \downarrow & \div 5 \quad \downarrow \\
 4 : 5 & 3 : 4 & 3 : 4
 \end{array}$$

3. 16:20 and 18:24, because common factor is a multiple of 2.

Mark Scheme

- (1 mark) Disagrees with Amy
- (1 mark) gives an example or clear explanation why dividing by two doesn't always work

Slide 4: Your turn...

Set 1: Simplifying Ratio.

Teaching Prompts

- Can you write the number of sweets Tom has to the number of sweets Fatima has? (30:45)
 - Can you simplify this by dividing by a common factor? (2:3)
-

Mark Scheme

Allow full marks for any other correct method

- (1 mark) 30:45
- (1 mark) 2:3

Slide 5: Try this exam-style question...

Set 2: Equivalent Ratios.

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- If stuck move on to the next slide.
-

Mark Scheme

Allow full marks for any other correct method

- (1 mark) identify that $3 \times 5 = 15$ (need to scale up by 5)
- (1 mark) 10

Watch out for

- Students write the ratio without the colon.
- Students write the ratio in the incorrect order.
- Students do not understand that the parts in the ratio can get larger.
- Students add to parts of a ratio instead of multiply.

Slide 6: Let's go through it together...

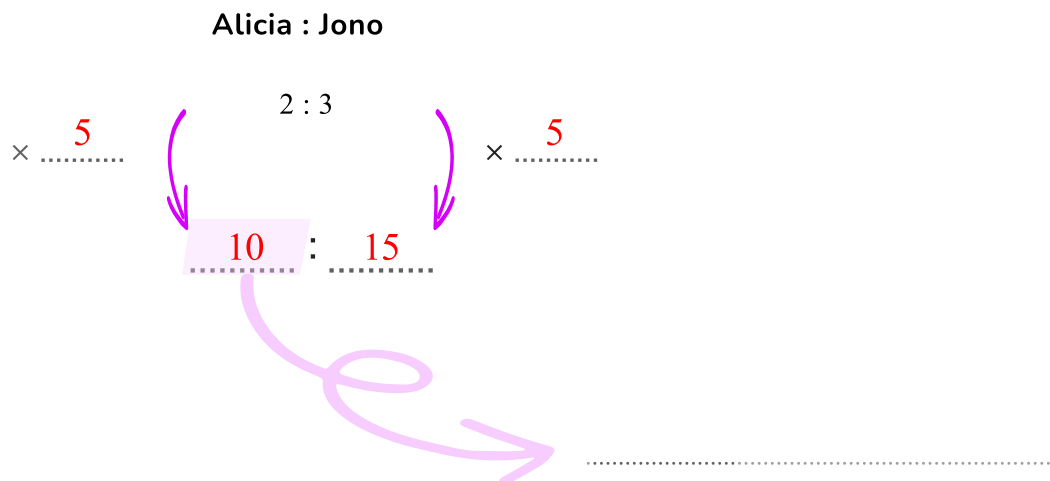
Set 2: Equivalent Ratios.

Teaching Prompts

- Can you fill in how many biscuits Jono has?
 - How much have we scaled up the ratio by to get 15 biscuits? (by 5)
 - If you do this for Alicia, how many biscuits will she have? (10)
-

Answers

1. Simplify the ratios by dividing by the HCF of the values in each ratio.



Mark Scheme

Allow full marks for any other correct method

- (1 mark) identify that $3 \times 5 = 15$ (need to scale up by 5)
- (1 mark) 10

Slide 7: Your turn...

Set 2: Equivalent Ratios.

Teaching Prompts

- Can you try this by yourself?
 - Can you underline the key information?
 - Can you work out how the ratio has been scaled up? ($\times 100$)
 - Can you do the same for the water? (700ml)
-

Mark Scheme

- (1 mark) identify that $2 \times 100 = 200$ (need to scale up by 100)
- (1 mark) 700ml

Slide 8: Try this exam-style question...

Set 3: Share a Quantity into a Ratio.

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- If stuck, move on to the next slide.
-

Mark Scheme

Allow full marks for any other correct method

- (1 mark) Adds together $2 + 3 + 5 = 10$
 - (1 mark) $200 \div 10 = 20$
 - (1 mark) Calculates Haran's share as $20 \times 2 = £40$
-

Watch out for

- Students do not understand that the parts in the ratio can get larger.
- Students divide a quantity by one part of the ratio, rather than the total of the shares when dividing a quantity into a ratio.
- Students work out the value of all the parts rather than one part of the ratio.

Slide 9: Let's go through it together...

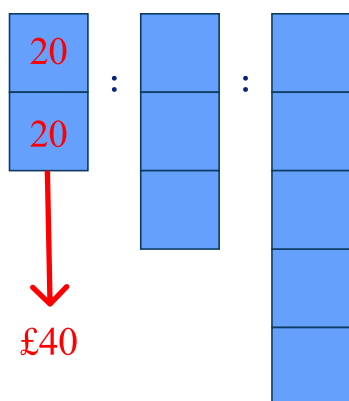
Set 3: Share a Quantity into a Ratio.

Teaching Prompts

- 1) How many parts are there in total? (10)
 - 2) What is the value of one part? ($200 \div 10 = £20$)
 - 3) How many parts does he have and what does this add up to? (£40)
-

Answers

Haran : Majid : Inzi



Total parts = 10

1 part = $£200 \div 10$

= 20

1. 10
 2. £20
 3. £40
-

Mark Scheme

Allow full marks for any other correct method

- (1 mark) Adds together $2 + 3 + 5 = 10$
- (1 mark) $200 \div 10 = 20$
- (1 mark) Calculates Haran's share as $20 \times 2 = £40$

Slide 10: Your turn...

Set 3: Share a Quantity into a Ratio.

Teaching Prompts

- Can you try this by yourself?
 - Can you underline the key information?
 - How many parts are there in total? (8)
 - How can you use this to find out how much each part is equal to? ($80 \div 8 = £10$)
 - Looking at how many parts each of them get can you work out how much money they each receive? (Oscar = 1 part = £10, Nina = 2 parts = £20, Ella = 5 parts = £50)
-

Mark Scheme

Allow full marks for any other correct method

- (1 mark) $1 + 2 + 5 = 8$
- (1 mark) $80 \div 8 = £10$
- (1 mark) Calculates two out of three of the shares correctly
- (1 mark) Oscar = 1 part = £10, Nina = 2 parts = £20, Ella = 5 parts = £50

Slide 11: Ready for a Challenge?

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- How many parts does the difference represent? (5)
 - How can we use this to find the value of one part? ($30 \div 5 = 6$)
 - If we know that one part = 6 flowers, how can we find the number of flowers she picked altogether? ($(6 + 1) \times 6 = 42$)
-

Mark Scheme

- Allow full marks for any other correct method
- (1 mark) 30 flowers = 5 parts
- (1 mark) 1 part = 6 flowers
- (1 mark) 42 flowers total

Slide 12: What have we learnt?

Teaching Prompts

- a) Can you see where the student has gone wrong? (they have used addition instead of multiplication)
- a) What should they have done instead?

Max : Pritesh

$$\begin{array}{c}
 \text{+8} \quad \left(\begin{array}{c} 2 : 5 \\ 10 : 13 \end{array} \right) \quad \text{+8} \\
 \text{x5} \quad \quad \quad \text{x25} \quad \quad \quad \text{x5}
 \end{array}$$

13 sweets

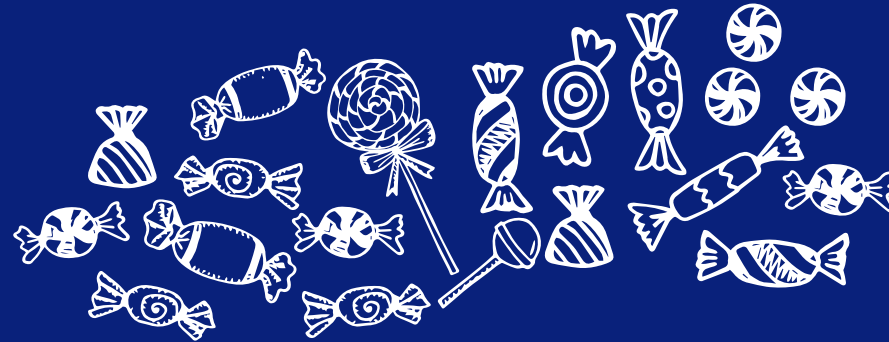
- b) Can you see where the student has gone wrong? (they forgot to divide 30 by 5 to find the value of one part)
- b) What should they have done instead?

2 : 3

$$\begin{array}{c}
 \text{x5} \quad \left(\begin{array}{c} 2 + 3 = 5 \\ 30 \div 5 = 6 \end{array} \right) \quad \text{x5} \\
 \text{x6} \quad \quad \quad \text{10 : 15} \quad \quad \quad \text{x6} \\
 \quad \quad \quad \text{12 : 18}
 \end{array}$$

£10, £15

Working with Ratio



Amy and Sanjay split 20 sweets in the ratio 2:3

Maxine says: “This will mean Amy gets two sweets and Sanjay gets three!”

Yohan says: “Amy will get 8 and Sanjay will get 12”

Zainab says: “Amy will get 10 sweets and Sanjay will get 15”

Who do you think has answered correctly?

Try this exam-style question...

Amy says "To simplify a ratio you need to keep dividing the values on each side by two until you can't do it anymore."

Is she correct? Justify your answer.

Amy says "To simplify a ratio you need to keep dividing the values on each side by two until you can't do it anymore."

Is she correct? Justify your answer.

We can **simplify** a ratio by dividing by the **highest common factor (HCF)** of the values in the ratio. Sometimes you can **divide** by lower common factors, but that can take longer.

- 1 Simplify the ratios by dividing by the HCF of the values in each ratio.

16 : 20

÷ ↓ : ↓ ÷
.....

18 : 24

÷ ↓ : ↓ ÷
.....

15 : 20

÷ ↓ : ↓ ÷
.....

- 2 For which of these would Amy's method work and why?

.....
(2)

Tom has 30 sweets and Fatima has 45 sweets.

What is the ratio of the number of sweets Tom has to the number Fatima has? Give the answer in its simplest form.

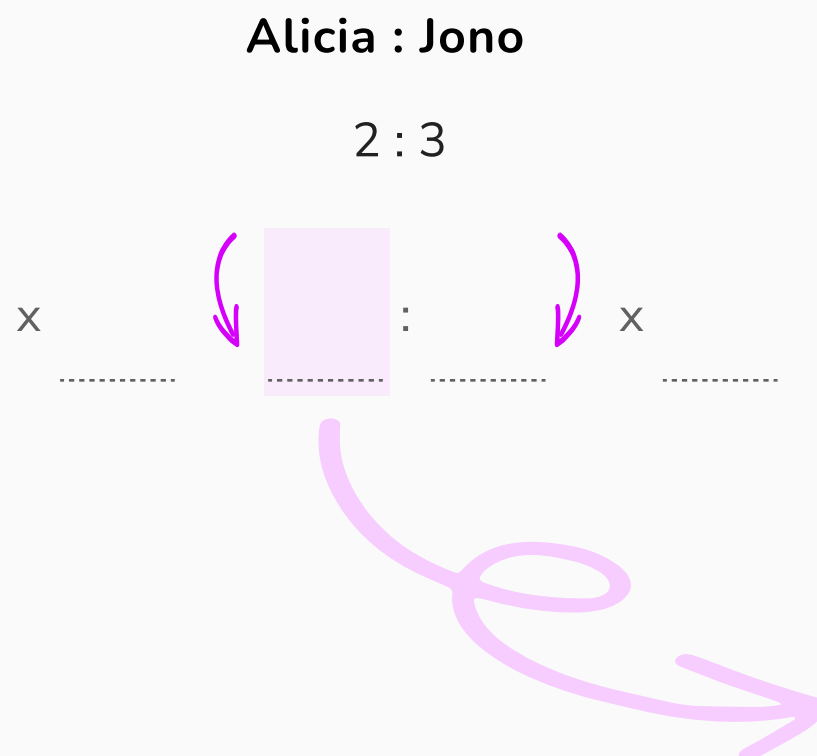
Try this exam-style question...

Alicia and Jono share some biscuits in the ratio 2:3.
If Jono has 15 biscuits, how many does Alicia have?

Alicia and Jono share some biscuits in the ratio 2:3.
If Jono has 15 biscuits, how many does Alicia have?

We can solve **simple** ratio problems by **scaling up** to find an **equivalent ratio**.
Given one quantity in a ratio we can find the other by **multiplying by the same amount**.

- 1 Complete the ratio diagram to find how many biscuits Alicia eats.



.....

Fruit squash is made by mixing squash and water in the ratio 2:7.
How much water needs to be added to 200ml of squash?

Try this exam-style question...

Haran, Majid and Inzi share some money in the ratio 2 : 3 : 5.
In total, they receive £200.
How much does Haran receive?

Haran, Majid and Inzi share some money in the ratio 2 : 3 : 5.
In total, they receive £200.
How much does Haran receive?

We can **share an amount** into a ratio using a combination of **addition**, **division** and **multiplication**. It is often helpful to use the diagrams to do this.

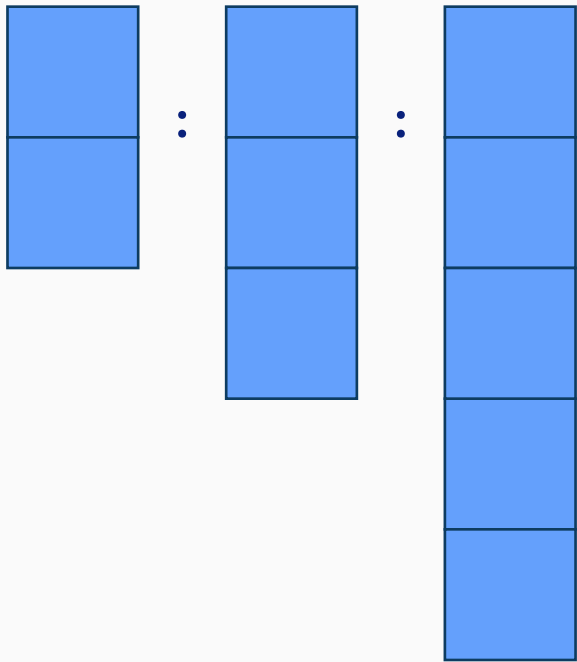
1 Find the **total number of parts shared**.

2 Find the value of one part.

3 Find how much Haran receives.

2 parts =
.....

Haran : Majid : Inzi



Total parts =
.....

1 part = £200 ÷
.....
=
.....

Oscar, Nina and Ella share £80 in the ratio 1 : 2 : 5.

How much do they receive?

Annabel picks daisies and dandelions. She arranges them in the ratio 6:1.
There are 30 more daisies than there are dandelions.
How many flowers did she pick altogether?

Sometimes we need to work out values in ratio, using **the difference** between two quantities.

e.g. If Tom and Matt share sweets in the ratio 1:3, and Matt gets 10 more sweets – how many sweets did they share?

1 Work out how many parts the difference represents

The difference in parts : $3 - 1 = 2$ parts
So, 10 sweets = 2 parts

2 Find the value of one part

2 parts = 10 sweets
So, 1 part = $10 \div 2 = 5$

3 Use this to find the original total

Tom and Matt shared $1 + 3 = 4$ parts,
so $4 \times 5 = 20$ sweets.

Can you correct the answers to the questions below?

Max and Pritesh share some sweets in the ratio 2:5.

If Max has 10 sweets, how many does Pritesh have?

Max : Pritesh

$$+8 \left(\begin{array}{c} 2 : 5 \\ 10 : 13 \end{array} \right) +8$$

13 sweets

Two people share £30 in the ratio 2:3.

Calculate each share.

$$\begin{array}{c} 2 : 3 \\ \times 5 \left(\begin{array}{c} 2 + 3 = 5 \\ 10 : 15 \end{array} \right) \times 5 \end{array}$$

£10, £15

Where to go next?

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