
Bridging Units: Resource Pocket 1

Work with fractions in ratio problems

Express a multiplicative relationship as a ratio

Relate ratios to fractions and linear functions

Students will be familiar with fractions and carrying out some general arithmetic such as adding, subtracting, multiplying and dividing fractions. Also they will have experience of converting between fractions, decimals and percentages as well as calculating a fraction of an amount. Students should also be able to write numerical relationships as ratios, simplify them and share amounts into given ratios.

Most will probably not be able to make the link between fractions and ratios at this stage though which is an important concept that should be introduced and explored prior to commencing a GCSE course if possible.

This resource pocket progresses through three sections: developing understanding, skills builders and problem solving activities. As with all 9 resource pockets there are a number of different learning styles and approaches used to cater for a variety of learners.

1. Developing Understanding

These are class based, teacher led questions with suggested commentary to get the most from a class or small group discussion. The boxed text can either be copied onto the whiteboard for class discussion, or printed onto cards and handed out to students to be used for paired or small group work.

2. Skills Builders

These are standard progressive worksheets that can be used to drill core skills in a particular area.

3. Problem Solving Activities

Extension activities for paired work or small group work to develop problem solving skills whilst focussing on a particular area of mathematics that students can learn to apply.

Developing Understanding 1

Emma and Isla are trying out for a netball team.
They both want to play the position of Goal Shooter.
During a target practice session,
Emma had 10 attempts and scored 3 goals.
Isla had 20 attempts and scored 5 goals.



Using the information, start a class discussion about what can be inferred from the numbers.

Some questions that would develop the discussion could be:

- Who scored the most goals?
- Who is the better goal shooter?
- Why are these questions different in this case? What would have to happen for these questions to be equivalent?
- How can you use mathematics to help the coach select the goal shooter? - Can we use fractions? - Can we use ratios?

The coach is unsure and decides to watch the two girls in another session.

This time Emma has 16 attempts and Isla has 20 attempts.

In pairs, decide on some numbers of goals that each girl could score that would mean that:

- (a) Emma performs better
- (b) Isla performs better
- (c) The girls both perform the same

Encourage the students to think of as many different pairs of values as they can.

For part c) they may stick with 8 and 10 respectively (half of attempts), discuss why this is an easy option and use this to develop a link between fractions and ratios:

- Can you write the ratio of goals to attempts for each girl using your solutions to (c)?
- What do you notice?

Ensure that students decide on another set of solutions for c) by using a different fraction, and then consider the ratios here also.

Developing Understanding 2

Lizzie has a big jar of sweets.

It has 14 cola cubes and 8 humbugs.



- Using this information, write as many ratios as you can.
- Can you write some fractions to represent the information?
- What effect does it have if you simplify the ratios and fractions?

For part (b) most students will only write the fraction of sweets that are cola cubes $\left(\frac{14}{22}\right)$ and the fraction of sweets that are humbugs $\left(\frac{8}{22}\right)$ and possibly the simplified fractions. Most will not be aware that ratios can also be written as fractions:

- Write the ratio of cola cubes to humbugs as a fraction

This is $\frac{14}{8}$ and can lead to a discussion about what else this shows: as a simplified mixed number this is $1\frac{3}{4}$ which shows that there are $1\frac{3}{4}$ as many cola cubes as humbugs, or for every one humbug there is $1\frac{3}{4}$ cola cubes.

- Write some more ratios as fractions.
Can you explain to your partner what each fraction shows?

Students/groups could use an A3 piece of paper to create a spider diagram of fractions and ratios and their meanings.

For part (c) it is important that students are clear that ratios and fractions represent relative amounts not absolute amounts.

Lizzie's mum has a bigger jar of sweets.

It contains cola cubes and humbugs in the same ratio as Lizzie's jar.



- How many of each sweet might be in Lizzie's mum's jar?
Come up with at least 4 different sets of values.
- Lizzie's mum eats one of each sweet. She now has 19 humbugs. How many cola cubes does she have?

Developing Understanding 3

Tyrone has a large book collection.

His favourite are horror novels, he has 30 of these.

He has 18 autobiographies, 10 are by sportsmen and 8 are by actors.

He also has some classic novels, but he doesn't know how many.



- Use the information to write some ratios

As the number of classic novels is unknown, students will be reluctant to include it in their ratios.

Encourage them to start by just using the word 'classic' then replace this with a sensible letter.

This will then create the opportunity to look at simplifying ratios including algebraic terms such as $\frac{n}{2}$

Tyrone has been working out some ratios himself.

He knows that the ratio of

autobiographies to horrors

is the same as the ratio of

classics to sportsmen autobiographies

Encourage the students to think about and process the information that they now have.

- Does this give enough information to allow us to calculate the number of classics?
- How can we use this information to work out the number of classics?

If this is done successfully, generalise the information a little more so that students are required to really understand and communicate what is happening, ask for both ratios and fractions to be included in their explanations:

- What would the effect be if the ratio of autobiographies to horrors is BIGGER than the ratio of classics to sportsmen autobiographies?
- What about if we replace 'bigger' with SMALLER?

Skills Builder 1: Fractions and ratios

1 Year 9 students at Rhombus High School have selected their options.

Here are their choices:

Art	32	Music	24	Statistics	36
Spanish	12	PE	24	History	18

Write the following ratios in their simplest form.

- (a) Art : PE
- (b) History : Statistics
- (c) Spanish : History
- (d) PE : Music
- (e) Art : Total
- (f) Statistics : Total

Giving your answers in their simplest form, write the fraction of the total number of students that chose:

- (a) Art
- (b) Music
- (c) Statistics
- (d) Spanish
- (e) PE
- (f) History

2 Jack has some coins in his money box.

He has counted the following:

Thirty
10p coins

Twelve
20p coins

Eight
50p coins

Jack also has
some £1 coins

Write the following ratios in their simplest form:

- (a) 10p coins : 50p coins
- (b) 20p coins : 10p coins
- (c) 50p coins : 20p coins

Let the number of £1 coins be x .

Write the following ratios:

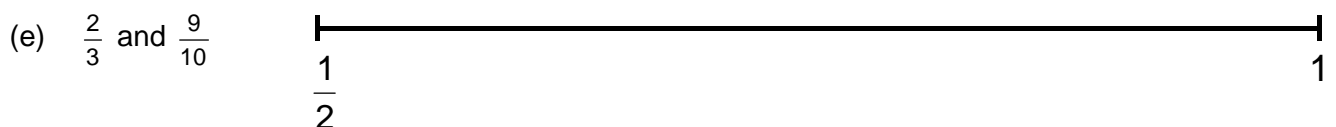
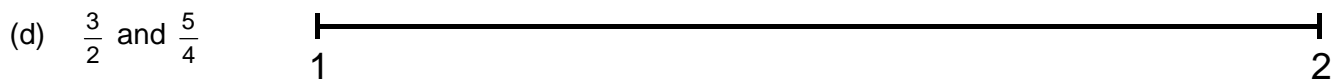
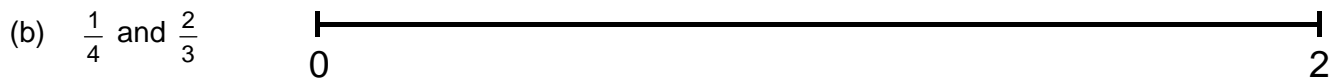
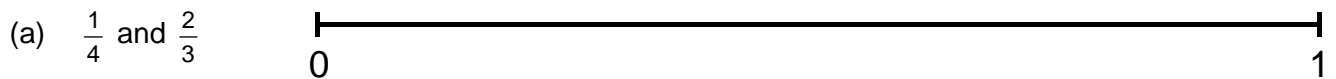
- (d) 50p coins : £1 coins
- (e) £1 coins : 10p coins
- (f) 20p coins : total coins
- (g) 10p coins : total coins

The ratio of 50p coins : 20p coins is the same as the ratio of £1 coins : 10p coins

- (h) How many £1 coins does Jack have?
- (i) Calculate how much money Jack has in his money box.
- (j) What fraction of Jack's coins are 50p coins?
- (k) What fraction of Jack's coins are round?
- (l) What fraction of Jack's coins are silver?

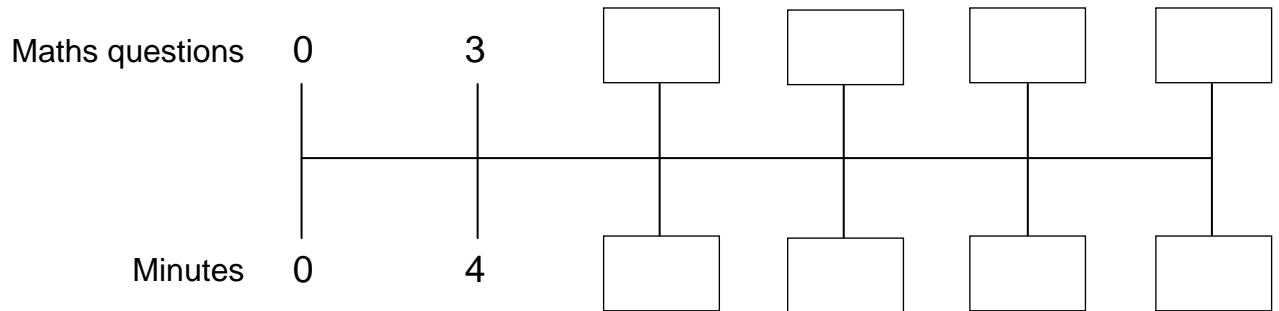
Skills Builder 2: Using number lines to represent a multiplicative relationship

1 By estimating, mark and label the given fractions on the number lines.



2 Zane has homework to do. He can complete 3 maths questions in 4 minutes.

(a) Complete the double number line.

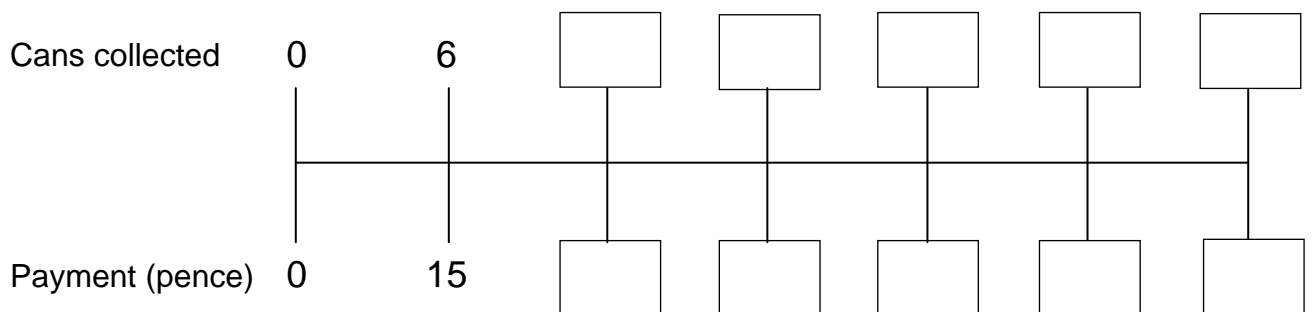


- (b) How long will it take Zane to do 9 questions?
- (c) How many questions can Zane do in 16 minutes?
- (d) Zane has a total of 15 questions to do for his homework, if he starts at 4:50pm, what time will he finish?
- (e) Zane has now started his homework.
14 minutes have passed since he began, which question number is he on now?

3 Lola is recycling.

For every 6 empty cans that she collects, she will be paid 15 pence.

(a) Complete the double number line.



- (b) Lola wants to earn 60 pence. How many empty cans must she collect?
- (c) If Lola collects 30 empty cans, how much will she earn?
- (d) How much will Lola earn for collecting 2 empty cans?
- (e) Lola needs to earn 50 pence. How many empty cans must she collect?

Skills Builder 3: Colouring necklaces

Kaylee makes necklaces out of black and white beads. Each necklace has a total of 24 beads.

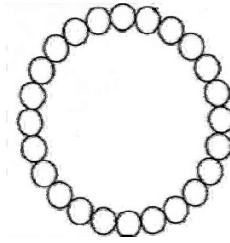
In each question the ratio of black beads to white beads is given.

Work out how many black beads and white beads are in the necklace, then colour it in.

1 1 : 5

Number of black beads =

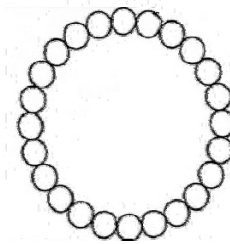
Number of white beads =



2 5 : 3

Number of black beads =

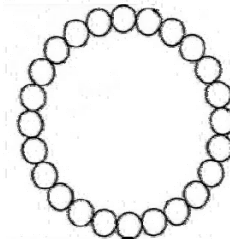
Number of white beads =



3 2 : 1

Number of black beads =

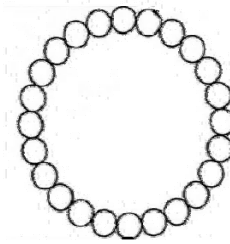
Number of white beads =



4 1 : 7

Number of black beads =

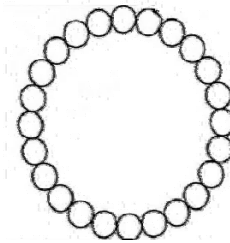
Number of white beads =



5 1 : 3

Number of black beads =

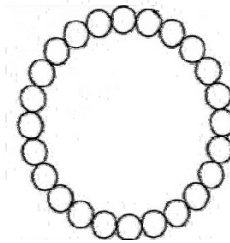
Number of white beads =



6 1 : 2

Number of black beads =

Number of white beads =



Problem solving 1: Ratios and Fractions

Print and cut out the cards.



Give one set to each pair or group of students.

The instructions are contained within one of the cards, so no teacher guidance is required.

Some Year 10 students are going on an activity holiday

$\frac{1}{10}$ of all students chose Canoeing

The ratio of Abseiling students to Rock Climbing students is **5 : 6**

The ratio of Football students to Total students is **3 : 20**

Work out how many students have chosen each activity

The ratio of Tennis students to Hockey students is **3 : 5**

The ratio of Canoeing students to Football students is **2 : 3**

Each students must select 1 of the 6 activities available

$\frac{1}{8}$ of all students chose Hockey

12 students chose Football

Problem solving 2: Ratios and Fractions

To make a particular shade of green paint called Forest Green, Andrew mixes blue and yellow paint in the ratio 2 : 3.

Look carefully at each of the statements on the cards, then decide if it is true or false.

To make a particular shade of green paint called Forest Green, Andrew mixes blue and yellow paint in the ratio 2 : 3

6 litres of blue paint must be mixed with 9 litres of yellow paint to make Forest Green paint.

2 litres of blue paint are needed to make 3 litres of Forest Green paint.

If Andrew wants 30 litres of Forest Green paint, he needs 20 litres of blue paint.

To make 20 litres of Forest Green paint, Andrew needs 12 litres of yellow paint.

Andrew has 5 litres of blue paint, to make Forest Green paint he needs 7.5 litres of yellow paint.

Andrew has 4 litres of yellow paint, to make Forest Green paint he needs 3 litres of blue paint.

Answers

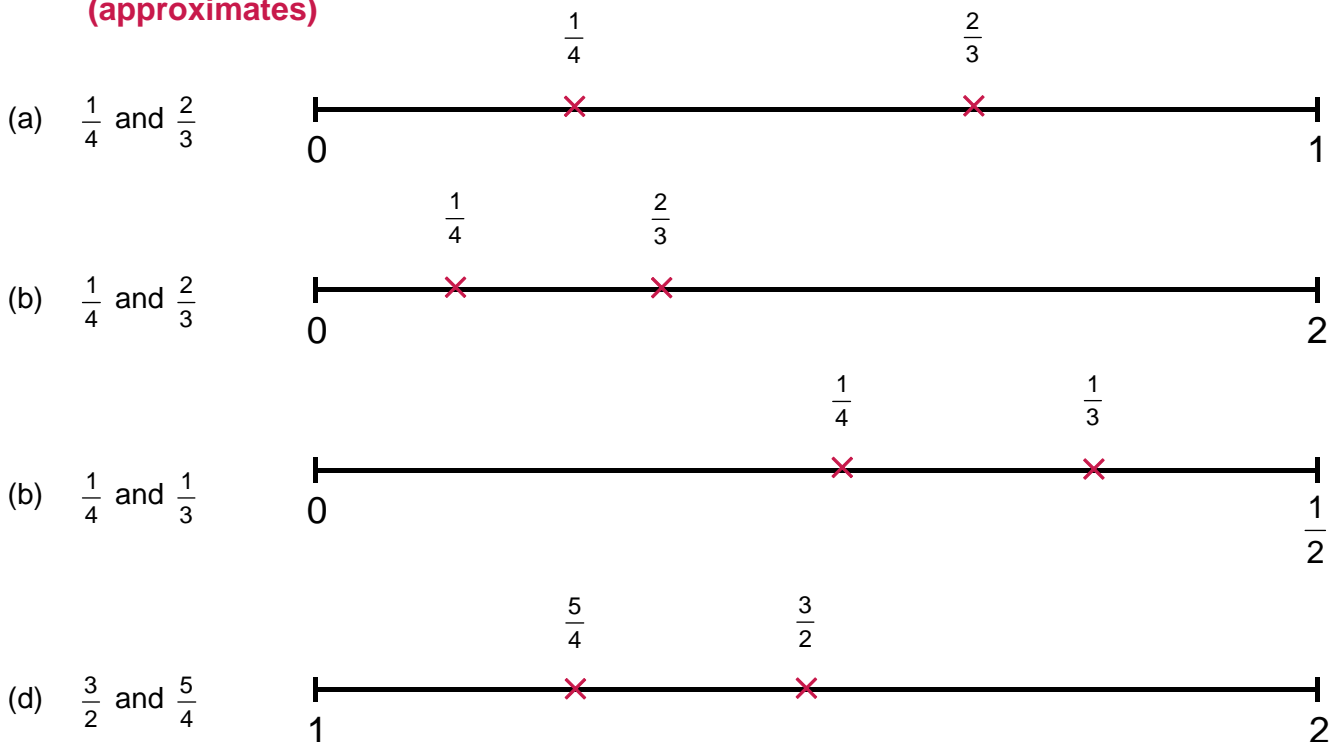
Skills builder 1: Fractions and Ratios

- 1 (a) 4 : 3 (b) 1 : 2 (c) 2 : 3
(d) 1 : 1 (e) 16 : 73 (f) 18 : 73
(g) $\frac{16}{73}$ (h) $\frac{12}{73}$ (i) $\frac{18}{73}$
(j) $\frac{6}{73}$ (k) $\frac{12}{73}$ (l) $\frac{9}{73}$

- 2 (a) 15 : 4 (b) 2 : 5 (c) 2 : 3
(d) 8 : x (e) x : 30 (f) 12 : (x + 50)
(g) 30 : (x + 50) (h) 20 (i) £29.40
(j) $\frac{8}{70}$ (k) $\frac{5}{7}$ (l) $\frac{5}{7}$

3 Skills builder 2: Using number lines to represent Multiplicative relationships

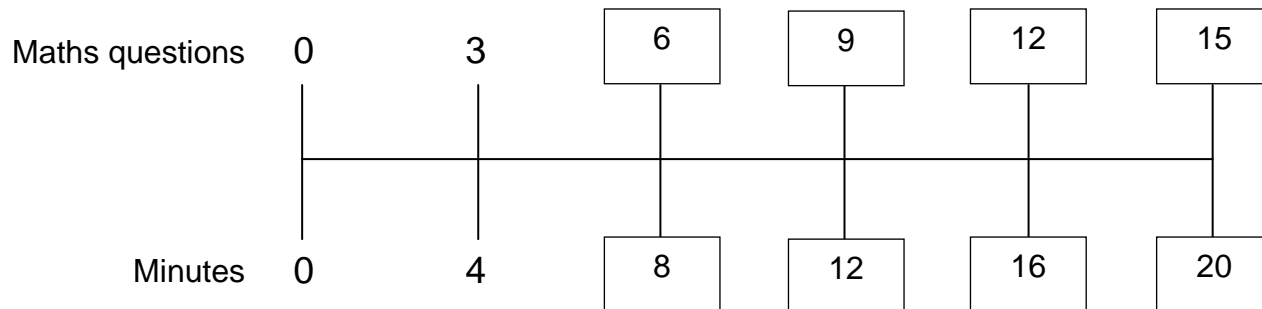
(approximates)



(e) $\frac{2}{3}$ and $\frac{9}{10}$



2



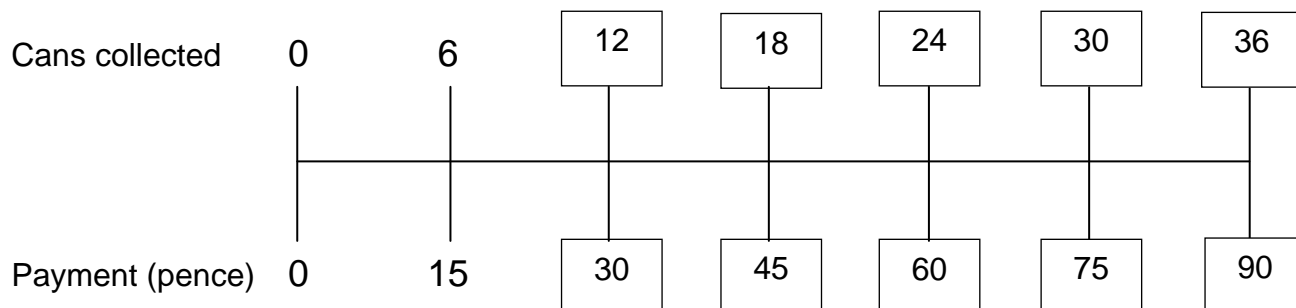
(b) 12

(c) 12

(d) 5.10 pm

(e) 10

3



(b) 24

(c) 75p

(d) 5p

(e) 20

Skills builder 3: Colouring necklaces

1 B = 4 W = 20

2 B = 15 W = 9

3 B = 16 W = 8

4 B = 3 W = 21

5 B = 6 W = 18

6 B = 8 W = 16

Problem Solving 1: Ratios and Fractions

Canoeing = 8 students

Abseiling = 20 students

Tennis = 6 students

Rock Climbing = 24 students

Football = 12 students

Hockey = 10 students

Problem Solving 2: Ratios and Fractions

6 litres of blue paint must be mixed with 9 litres of yellow paint to make Forest Green paint.

TRUE

2 litres of blue paint are needed to make 3 litres of Forest Green paint.

FALSE

If Andrew wants 30 litres of Forest Green paint, he needs 20 litres of blue paint.

FALSE

To make 20 litres of Forest Green paint, Andrew needs 12 litres of yellow paint.

TRUE

Andrew has 5 litres of blue paint, to make Forest Green paint he needs 7.5 litres of yellow paint.

TRUE

Andrew has 4 litres of yellow paint, to make Forest Green paint he needs 3 litres of blue paint.

FALSE