Fractions, Decimals and Percentages

Fractions 6

Go deeper investigations

Hilary Koll and Steve Mills

Schofield&Sims

Music festival investigation

Objectives

- Simplify fractions.
- Compare and order fractions with different denominators.
- Add and subtract any fractions and mixed numbers.
- Multiply pairs of proper fractions.

Introduction

Introduce the investigation as described on the worksheet. Look at the first row of the table and work through the calculations for the Go Go Festival with the class. Tell the pupils that, as shown on the worksheet, the Go Go Festival is $2\frac{1}{12}$ hours long and the band, New Direction, will play for $\frac{4}{5}$ of this time. Ask the pupils how long the band will play for. To work this out, convert the mixed number $2\frac{1}{12}$ to the improper fraction $\frac{25}{12}$ and explain that $\frac{4}{5}$ of $2\frac{1}{12}$ is the same as $\frac{25}{12} \times \frac{4}{5}$. Demonstrate how this can be simplified to give the answer $\frac{5}{3}$ hours which is $1\frac{2}{3}$ hours or 100 minutes. Ask the pupils to work in pairs to complete the table and answer the questions.

The maths

The pupils will need to multiply proper and improper fractions and convert between improper fractions and mixed numbers. They also need to convert fractions of an hour to minutes. To do this, encourage the pupils to convert the fraction to an equivalent fraction with the denominator 60, for example, $\frac{4}{5}$ hour = $\frac{48}{60}$ hour which is 48 minutes.

Ask:

- *How do you change this mixed number into an improper fraction? Can you explain your method?*
- *Could you divide a numerator and a denominator by the same number to make this multiplication easier?*
- *Can you simplify your answer?*

Solutions

a)

	Go Go Festival	Vicar's Picnic	Music Live	Listening Tree	Greengrass	Z Festival
length of set as fraction of an hour	$\frac{5}{3} = \frac{100}{60}$	$\frac{3}{5} = \frac{36}{60}$	$\frac{11}{20} = \frac{33}{60}$	$\frac{2}{3} = \frac{40}{60}$	$\frac{5}{2} = \frac{150}{60}$	$\frac{5}{4} = \frac{75}{60}$
length of set in minutes	100 min	36 min	33 min	40 min	150 min	75 min

b) 33 min, 36 min, 40 min, 75 min, 100 min, 150 min

c) 434 min

Support

If some pupils require more support, work down the **length of festival** column with them, helping them to change the mixed numbers to improper fractions and then write out each multiplication in the **multiplication workings** column.

Extension

Ask the pupils to add more festivals, making up the length of each and the fraction allowed for the band's set. Ask them to work out the length of the band's sets at these festivals. Alternatively, tell them that the band is paid, for example, £100 per hour and ask them to calculate how much they earn at each festival.

Music festival investigation

A pop group called New Direction are going to perform at some music festivals this summer. The table below shows how long each festival will be and for what fraction of each festival the band will play (the length of their 'set'). The band must plan their set for each festival to make sure they are on stage for the correct amount of time.

a) Complete the table to find the length of the band's set, in minutes, for each festival.

	length of festival	fraction allowed for set	multiplication workings	length of set as fraction of an hour	length of set in minutes
Go Go Festival	$2\frac{1}{12}$ hours	$\frac{4}{5}$ of festival	$\frac{\cancel{25}}{12} \times \frac{4}{\cancel{5}} = \frac{5}{\cancel{12}} \times \frac{\cancel{4}}{1} = \frac{5}{3} \times \frac{1}{1}$	$\frac{5}{3} = \frac{100}{60}$	100 min
Vicar's Picnic	$\frac{4}{5}$ hour	$\frac{3}{4}$ of festival		$= \frac{}{60}$	
Music Live	$\frac{11}{12}$ hour	$\frac{3}{5}$ of festival			
Listening Tree	$2\frac{1}{3}$ hours	$\frac{2}{7}$ of festival			
Greengrass	$4\frac{1}{6}$ hours	$\frac{3}{5}$ of festival			
Z Festival	$3\frac{3}{4}$ hours	$\frac{1}{3}$ of festival			

b) Write the length of the band's sets in ascending order.

_____ min, _____ min, _____ min, _____ min, _____ min, _____ min

c) What is the total length of the band's sets? _____ min

Sweet jar investigation

Objectives

- Solve problems involving fractions and decimals.
- Solve percentage problems including comparison.
- Convert between fractions, decimals and percentages.

Introduction

Read through the worksheet with the pupils. Ensure they understand that there are different numbers of different types of sweets in the bags and that a proportion of the sweets in each bag are put into a large jar. Explain that they are going to find out what percentage of each type of sweet makes up the sweets in the jar, once it is filled.

The maths

The pupils find fractions, decimals and percentages of quantities using mental or written methods to calculate how many of each type of sweet are put in the jar. They must then calculate the total number of sweets in the jar [50] and use this to help them find the proportion of each type as a percentage. Encourage the pupils to add up their percentages to check that the total is 100%.

Ask:

- *What is that fraction as a decimal?*
- *What is that decimal as a percentage?*
- *Would it be easier to calculate if the proportion was a fraction/decimal/percentage?*
- *How can you write 12 out of 50 as a percentage?*
- *How can you check if all your percentage answers are correct?*

Solutions

a)

	toffees	chews	humbugs	liquorice	gobstoppers	total number of sweets in jar
number of sweets put into the jar	12	9	6	14	9	50

b) Liquorice

c) Humbugs

d) 24%, 18%, 12%, 28%, 18%

Support

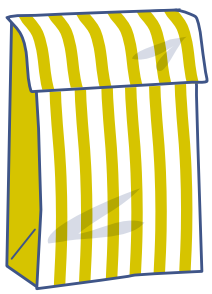
For question **a)**, less confident pupils will benefit from writing each proportion as a fraction, a decimal and a percentage first. This will ensure they have an idea of the size of each proportion. If necessary, provide these pupils with practical equipment such as coloured counters. They could, for example, sort 15 counters into five equal groups of three in order to establish that 4 × 3 = 12 toffees are put in the jar.

Extension

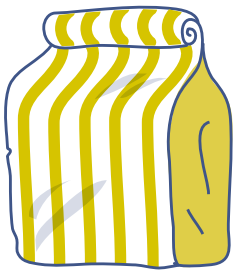
Ask the pupils to write their own set of instructions for a different jar of sweets, choosing what proportion of each type of sweet to put in the jar. Remind them that it will be easier to calculate the percentages for each type of sweet if the total number of sweets in the jar is a factor of 100.

Sweet jar investigation

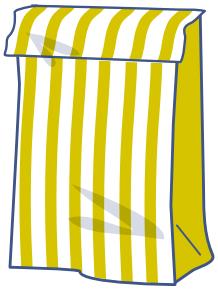
These bags hold different numbers of different types of sweets.



15 toffees

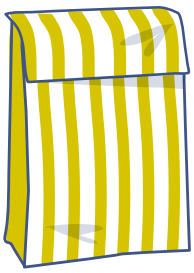


12 chews



18 humbugs

20 liquorice



25 gobstoppers

A proportion of the sweets in each bag are put into a large jar.

a) Read this description carefully and complete the table below.

Into the jar I put:

$\frac{4}{5}$ of the toffees 75% of the chews $\frac{1}{3}$ of the humbugs

0.7 of the liquorice 36% of the gobstoppers

	toffees	chews	humbugs	liquorice	gobstoppers	total number of sweets in jar
number of sweets put into the jar						

b) Which type of sweet do you have most of? _____

c) Which type of sweet do you have least of? _____

d) Now write the percentage of each type of sweet in the jar.

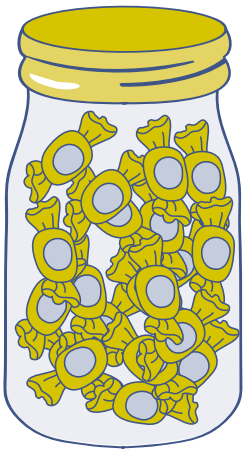
_____ % of the sweets in the jar are toffees.

_____ % of the sweets in the jar are chews.

_____ % of the sweets in the jar are humbugs.

_____ % of the sweets in the jar are liquorice.

_____ % of the sweets in the jar are gobstoppers.



Hospital investigation

Objectives

- Understand ratio and use a:b notation.
- Recognise numbers in the same ratio.
- Solve ratio problems involving two quantities.
- Solve problems involving unequal sharing and grouping.

Introduction

In this activity, the pupils investigate the materials required to build a colourful new hospital for the local area. Read carefully through the worksheet with the pupils – there is a lot of information for them to take in. Use ratio facts to guide them through each stage of the process.

The maths

The pupils begin by writing the ratios for the different materials used. They then use the ratios to solve problems. Revise sharing in ratio, reminding the pupils to add the number of parts and then divide by the total to find the value of one part. In question **b)**, for example, 5 + 1 = 6, so one part represents 60 ÷ 6, which is 10 bricks. Some of the problems are two-step, requiring the pupils to find the total number of items before they apply the relevant ratio. Questions **i)** and **j)**, for example, require the pupils to refer back to information from previous questions. Question **e)** asks the pupils to find the number of pink tiles for the surgeon's office, given the number of yellow tiles. Elicit the idea that if the ratio of pink to yellow is 1:3, the number of pink tiles is $\frac{1}{3}$ of the number of yellow tiles.

Ask:

- *If you had to write the ratio in a:b format, what would it look like?*
- *Which of the ratios does this problem relate to?*
- *Can you multiply the numbers in this ratio to help you find the answer? By which number should you multiply them?*

Solutions

a) bricks = 1:5, tiles = 1:3, windows = 1:2, beds = 1:6, chairs = 1:4

b) 50

c) 100

d) 300 blue and 1500 red

e) 90

f) 130 pink and 390 yellow

g) 9 red and 18 blue

h) 10 orange and 60 green

i) 28 black and 112 white

j) 24

Support

Less confident pupils will benefit from using coloured cubes to model the materials used in the building.

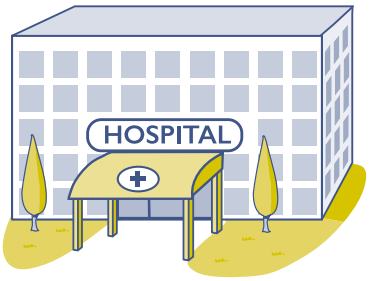
Extension

Ask the pupils to suggest other items for the hospital, making up their own ratios. Alternatively, challenge the pupils with different ratios, where the first number is not 1. The pupils could create similar questions of their own for others to solve.

Hospital investigation

A brand-new children's hospital is being built in your town. The chief surgeon wants a colourful and bright hospital for the children to visit. You have been asked to work out what materials will be needed to complete the job. You need to know the following ratios:

bricks	1 blue brick for every 5 red bricks
tiles	1 pink tile for every 3 yellow tiles
windows	1 red window for every 2 blue windows
beds	1 orange bed for every 6 green beds
chairs	1 black chair for every 4 white chairs



a) Write the ratio of:

blue to red bricks. _____ pink to yellow tiles. _____

red to blue windows. _____ orange to green beds. _____

black to white chairs. _____

b) 60 bricks will be used for the surgeon's office.

How many of them will be red? _____

c) There are 5 wards in the hospital. Each ward will use 120 bricks.

How many blue bricks will there be? _____

d) 1800 bricks are needed for the rest of the building.

How many will be blue and how many will be red? _____ blue and _____ red

e) The surgeon wants the roof of her office to be very colourful. She has worked out that 270 of the tiles will be yellow.

How many pink tiles will there be? _____

f) The roof for the rest of the building will use 520 tiles. How many will be pink and how many will be yellow?

_____ pink and _____ yellow

g) The hospital will have 27 windows. How many will be red and how many will be blue?

_____ red and _____ blue

h) Each ward will have 14 beds in it. How many orange beds and how many green beds will there be in the whole hospital? Remember that there are 5 wards.

_____ orange and _____ green

i) Each bed will have 2 chairs next to it. How many black chairs and how many white chairs will there be in all of the wards?

_____ black and _____ white

j) The hospital builder decides to add 9 more windows to each ward.

How many red windows will there be in the whole hospital? _____