LESSON

# 9N1.3 Fractions, decimals and percentages 3

## OBJECTIVES

- Begin to use the equivalence of fractions, decimals and percentages to compare proportions.
- Recall known facts, including fraction to decimal conversions; use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8.
- Consolidate and extend mental methods of calculation, working with decimals, fractions and percentages; solve word problems mentally.

## STARTER

**10 minutes**

**Vocabulary**
convert
equivalent
improper
mixed number

**Resources**
Operation cards (optional)

Draw a line on the board. Say that this line will be used to record equivalent operations. Label the ends with $\times 0$ and $\times 3$. Invite pupils to choose fraction, decimal or percentage operators to write on the line (or show where fraction, decimal and percentage operation cards should be placed on the line). Encourage pupils to use mixed number, proper and improper fraction, decimal and percentage operation equivalences.

**Q Where should you place $\times$ 0.8, $\times 1\frac{1}{3}$, $\times$ 1%, $\times$ 2.125, …?**

**Q How do you decide where the number should go?**

**Q Which operators does $\times$ 1.37 come between?**

**Q How can you write this as a fraction operator? As a decimal operator? As a percentage operator?**

## MAIN ACTIVITY

**40 minutes**

**Vocabulary**
convert
denominator
equivalent
numerator

**Resources**
Resource 9N1.3a, cut into cards for sorting; one set per three or four pupils
1–100 cards
Calculators (as support)
Framework examples, pages 73–75

Write $0.8 \times 35$ on the board. Referring to the operation line used in the starter, explain that you can ask the same question in different ways, such as 80% of 35 or $\frac{4}{5} \times 35$.

Ask pupils to answer the question and to explain their methods, encouraging mental strategies.

Repeat with different questions. Include questions that may lead to misconceptions, such as $\times$30% being seen as the equivalent of $\times\frac{1}{3}$.

**Q How else could you write 225% of 52? $1\frac{1}{3}$ of 210?**

Give out the sets of cards from **resource 9N1.3a**. Ask pupils to work in pairs to find which calculations are equivalent and to group the cards into sets. Ask pupils to answer the questions and to discuss different strategies for calculating proportions of 72.

***Support:*** *Use fewer cards. Using calculators may help some pupils identify groups of equivalent calculations.*

Collect answers and discuss pupils' approaches in a mini-plenary.

**Q Which calculations did you find difficult?**

**Q Were you surprised to find that any of the particular calculations were equivalent?**

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Write this or a similar list on the board:

| | |
|---|---|
| $\frac{4}{5}$ | 35 |
| 0.8 | 40 |
| 80% | 23 |

Pose questions from the list, for example:

**Q What is $\frac{4}{5} \times 35$, $\frac{4}{5} \times 40$, $\frac{4}{5} \times 23$?**

Ask two or three pupils to explain how they tackled the questions.

Repeat for 0.8 and for 80%.

**Q Are some questions easier to answer than others?**

Ask pupils, working in pairs, to use sets of 1–100 cards to practise making decisions. First ask them to write each of the three operations ($\times \frac{4}{5}$, $\times 0.8$, $\times 80\%$) on a blank piece of paper. Now they should choose a card in turn from the 1–100 number cards and decide which of the calculations, $\times \frac{4}{5}$, $\times 0.8$ or $\times 80\%$, they would use to tackle the question. They place the card in the appropriate pile.

In a mini-plenary, ask pupils to consider the connections between the numbers they have placed and the decisions they have made.

**Q What made you decide between using $\times \frac{4}{5}$, $\times 0.8$ and $\times 80\%$?**

**Q Would a different fraction change your decision?**

*Differentiate the activity by changing the range of 1–100 cards that pupils work with.*

## PLENARY

**10 minutes**

Ask pupils if they can explain the connection between fractions, decimals and percentages.

**Q Can you explain why 20% of 35, $\frac{1}{5} \times 35$ and $0.2 \times 35$ give the same answer?**

**Q Can you think of a new set of equivalent fraction, decimal and percentage operators which you did not know at the start of this lesson?**

### KEY IDEAS FOR PUPILS

- It is useful to remember some key equivalences. For example:
  $\frac{1}{10} = 0.1 = 10\%$ $\frac{1}{100} = 0.01 = 1\%$
  $\frac{1}{5} = 0.2 = 20\%$
- When you calculate with fractions, decimals or percentages, choose the operator that makes the calculation easy.

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RESOURCE

# 9N1.3a Matching 72

| | | | |
|---|---|---|---|
| $0.03 \times 72$ | 30% of 72 | 1.25 of 72 | $72 \times 100$ |
| $\frac{1}{10}$ of 72 | 3% of 72 | $\frac{3}{10}$ of 72 | $\frac{5}{4}$ of 72 |
| $72 \div \frac{1}{100}$ | $0.01 \times 72$ | $\frac{1}{100}$ of 72 | $33\frac{1}{3}$% of 72 |
| 125% of 72 | $72 \div 10$ | 1% of 72 | $0.3 \times 72$ |
| $\frac{1}{3}$ of 72 | $72 \div 0.01$ | 0.1 of 72 | $72 \div 100$ |

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LESSON

# 9N1.4 Fractions, decimals and percentages 4

## OBJECTIVES

- Begin to use the equivalence of fractions, decimals and percentages to compare proportions.
- Recall known facts, including fraction to decimal conversions; use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8.
- Consolidate and extend mental methods of calculation, working with decimals, fractions and percentages; solve word problems mentally.

## STARTER

**20 minutes**

**Vocabulary**
equivalent

**Resources**
Resource 9N1.4a

Write in the middle of the board:

$0.7 \times 6 = 4.2$

Invite pupils to give connected calculations, for example:

$0.07 \times 6 = 0.42$

$0.7 \times 3 = 2.1$

$42 \div 0.6 = 70$

Remind pupils that this is an example of using known facts to work out related facts.

Use the questions on **resource 9N1.4a** to revise mental calculation methods. Discuss alternative methods with pupils.

## MAIN ACTIVITY

**30 minutes**

**Vocabulary**
per
proportion

**Resources**
Resource 9N1.4b, cut into cards for sorting; one set per three or four pupils

Explain that in this lesson pupils are going to use their mental calculation strategies for decimals, fractions and percentages to solve some problems. As in most thinking skills activities, pupils will work collaboratively in groups.

Ask pupils to work in groups of four. Ask each group to nominate a recorder and a chair.

Share out a set of cards from **resource 9N1.4b** among the members of each group. Ask pupils to look together at the information on the cards and work out how much of each ingredient is used for a batch of ten cakes.

Circulate to observe the calculation strategies and to support the groups' working. Probe pupils' understanding and help them extend and refine their strategies.

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**PLENARY**

**10 minutes**

Use the plenary to discuss pupils' results and the strategies used.

**Q Which ingredients did you work out first?**

**Q Did it matter in which order you worked on the different ingredients?**

**Q Were any calculations difficult to do mentally?**

**Q What information did you use to check that your results were right?**

**KEY IDEAS FOR PUPILS**

- Read the question (say it to yourself) and decide what information you need to use.
- Choose a calculation strategy that is easy to use with the numbers in the problem.
- Decide how you will check your work.

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RESOURCE

# 9N1.4a Simple problems

**1** A bag of raisins costs £1.20.
How much do 60 bags cost?

**2** Fish costs £16 per kilogram.
How much does $3\frac{3}{4}$kg of fish cost?

**3** Gold costs £160 per ounce.
How much does $\frac{3}{8}$ of an ounce cost?

**4** $66.\dot{6}$% of £90

**5** 125% of £48

**6** A chocolate bar costs £0.30.
How much do 200 chocolate bars cost?

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RESOURCE

# 9N1.4b Ten cakes

| | | |
|---|---|---|
| In total the cakes weigh 7200 grams. | An egg weighs about 50 grams. | Butter weighs 1.7 times as much as the eggs. |
| The chocolate weighs $\frac{1}{9}$ of the cake. | Raisins weigh 60% of the chocolate. | The flour weighs 175% of the chocolate. |
| Sugar weighs 225% of the nuts. | Flour weighs $\frac{7}{36}$ of the total. | The nuts weigh 0.7 of the chocolate. |
| Eggs weigh 125% of the chocolate. | The recipe contains 20 eggs. | The raisins weigh $\frac{6}{7}$ of the nuts. |

**Note:** In science mass is measured in grams. Weight is the force of gravity on an object and is measured in newtons. However, it is common practice to refer to 'weighing' as a process when determining the mass of an object.

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