# Number 4

## contents

There are eight lessons in this unit, **Number 4**.



## objectives

The objectives covered in this unit are:

- Recall multiplication facts to 10 × 10 and derive associated division facts.
- Find doubles and halves of numbers.
- Multiply and divide decimals by 10 or 100.
- Convert one metric unit to another.
- Change mixed numbers to improper fractions and vice versa.
- Compare two or more simple fractions.
- Add and subtract simple fractions.
- Multiply a fraction by an integer.
- Understand percentages as ‘the number of parts per 100’.
- Find simple equivalent fractions, decimals and percentages.
- Calculate simple percentages of whole-number quantities.
- Enter numbers into a calculator and interpret the display in different contexts.
- Solve word problems.
- Solve simple problems involving direct proportion.
- Divide a quantity into two parts in a given ratio.

## Using the lesson plans in this unit

These lesson plans supplement the *Springboard 7* materials for Key Stage 3 pupils working toward level 4 in mathematics. All the lessons are examples only. There is no requirement to use them. If you decide to use the lessons, you will need to prepare overhead projector transparencies (OHTs) and occasional resource sheets for pupils to use.

The lessons consolidate work at level 3 and extend into level 4. They are suitable for a group of pupils or a whole class. Whatever the size of the group, the pupils are referred to as 'the class'.

Each lesson will support about 30 to 40 minutes of direct teaching. To help match the time to your timetable, each plan refers to 'other tasks' for pupils, based on *Springboard 7* resources. Select from these, textbook exercises or your own materials to provide practice and consolidation in the main part of a lesson and to set homework. Aim to choose tasks that vary in their level of demand, to suit pupils' knowledge, confidence and rate of progress.

Although the 'other tasks' are listed for convenience at the end of the main part of the lesson, they can be offered at any point, especially between the 'episodes' that form the main activity.

The lesson starters are of two kinds: practice starters and teaching starters. The former are opportunities to rehearse skills that will be needed later in the lesson. Teaching starters introduce an idea that is then developed in the main activity.

You will need to tell pupils what they will learn in the lesson, either in the starter or at the beginning of the main activity. Use the plenary to check pupils' learning against the lesson's objectives and to draw attention to the key points that pupils should remember.

## Interactive teaching programs (ITPs)

Interactive teaching programs are interactive animated visual aids that can be used with a laptop and data projector, or with an interactive whiteboard. As extra support for this unit, you may find it useful to download and use this ITP from the website www.standards.dfes.gov.uk/numeracy:

for lesson N4.2: *Fractions*

# N4.1 Multiplying and dividing decimals by 10 or 100

## objectives

- Multiply and divide decimals by 10 or 100.
- Convert one metric unit to another.

## starter

**Vocabulary**
multiply
divide
value
digit
place

**Resources**
mini-whiteboards

Write 41 × 10 = 410 on the board. Remind pupils that when a number is multiplied by 10, the value of each digit is made ten times bigger. The digits move one place to the left and a nought or zero is put in as a place holder.

| hundreds | tens | units | tenths |
|---|---|---|---|
| | 4 | 1 • | |
| 4 | 1 | 0 • | |

Write 41 × 20 on the board.

**Q Can you work this out and explain how you did it?**

Point out that 20 = 2 × 10, so that 41 × 20 = 41 × 2 × 10.

Record the interim step as 82 × 10, and work this out mentally. Ask pupils to work out 41 × 30 and 41 × 60, and show the answer on their whiteboards. Encourage them to jot down interim steps on their whiteboards.

Write 240 ÷ 10 = 24.0 on the board. Stress that when a number is divided by 10, the digits move one place to the right. Noughts or zeros at the end of the number after the decimal point are not needed, so the answer is written as 24.

Write 240 ÷ 20 on the board.

**Q How can we work this out?**

Establish that 240 ÷ 20 = 240 ÷ 10 ÷ 2 or 24 ÷ 2. Ask pupils to work out mentally the answers to 240 ÷ 30 and 240 ÷ 60, using jottings to help.

Write 300 × 20 on the board, with four possible answers: 60, 600, 6000, 60 000. Ask the class:

**Q Which answer is correct?**

Check by multiplying 300 by 2, then by 10. Repeat with 210 × 50 and 150 × 300.

## main activity

**Vocabulary**
equivalent

**Resources**
OHT N4.1a, a place value board
mini-whiteboards

Write 3.27 on the place value board on **OHT N4.1a**. Get pupils to read the number aloud in words.

**Q What is 3.27 multiplied by 10?**

Demonstrate how to find the answer by making the value of each digit ten times bigger and moving all the digits one place to the left. Get pupils to read the answer aloud. Repeat by demonstrating how to multiply 32.7 by 10.

Repeat once more by multiplying 327 by 10.

**Q What do we have to do about the empty place?**

Check that pupils know that the empty place gets filled with a nought or zero (saying 'add a nought' is not helpful, as it does not work with decimals).

Now start again with 3.27. This time multiply by 100. Make the value of each digit one hundred times bigger and move all the digits two places to the left.

**Q What do you notice?** (this time the digits move two places to the left)

Check that pupils are aware that $3.27 \times 10 \times 10$ is equivalent to $3.27 \times 100$. Repeat with $3.27 \times 1000$; move the digits three places to the left, and fill the empty place with a 0. Stress that this is equivalent to $3.27 \times 10 \times 10 \times 10$.

**Q How would you explain to a friend how to multiply a decimal number by 10? By 100? By 1000?**

Establish that when multiplying a number by 10, the digits move left by one place. To multiply by 100, or $10 \times 10$, the digits move left by two places, and to multiply by 1000, or $10 \times 10 \times 10$, the digits move left by three places.

Ask pupils to answer some questions using their whiteboards.

**Q What is 4.6 multiplied by 10? By 100? By 1000?**

**Q What is 0.46 multiplied by 10? By 100? By 1000?**

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Demonstrate for division. Start with 5.9, divide by 10, and then by 10 again. Check that pupils know that the empty place gets filled with a nought or zero. Demonstrate that the result is equivalent to $5.9 \div 100$.

Establish that when dividing a number by 10, the value of each digit is made ten times smaller. The digits move one place to the right. To divide by 100, the digits move right by two places, and to divide by 1000, the digits move right by three places.

Remind pupils that dividing a number by 10 is the same as finding one tenth of it, dividing by 100 is the same as finding one hundredth of it, and dividing by 1000 is the same as finding one thousandth of it.

Ask pupils to answer some questions using their whiteboards.

**Q What is 46 divided by 10? 46 divided by 100? 46 divided by 1000?**

**Q What is 4.6 divided by 10? 4.6 divided by 100?**

---

Remind pupils of the abbreviations for kilometre (km), metre (m), centimetre (cm) and millimetre (mm). Write on the board:

1 km = 1000 m
1 m = 100 cm
1 cm = 10 mm

Explain that because there are 100 centimetres in every metre and 10 millimetres in every centimetre, there are $100 \times 10 = 1000$ millimetres in every metre. Add this to the list.

1 m = 1000 mm

**Q How can we convert or change kilometres to metres?** (multiply by 1000)

**Q How can we convert or change metres to kilometres?** (divide by 1000)

Ask similar questions about changing metres to centimetres, centimetres to millimetres and metres to millimetres, and vice versa. Demonstrate a few examples, changing these to metres: 1.3 km, 254 cm, 2100 mm, using the place value board on **OHT N4.1a** in support.

Add to the list on the board, pointing out the abbreviations for the units:

1 kg = 1000 g
1 litre = 1000 ml

**Q How can we convert or change kilograms to grams?** (multiply by 1000)

**Q How can we convert or change millilitres to litres?** (divide by 1000)

Demonstrate a few examples. Change 3.5 litres to millilitres, 250 g to kg.

## other tasks

**Springboard 7**
Units 3, 6 and 11

**Unit 3 section 3: Metres and centimetres**

| | |
|---|---|
| 1 Equivalent measurements | page 119 |
| Star challenge 6: Petro's tower | page 121 |

**Unit 6 section 5: Multiplication**

| | |
|---|---|
| 2 Multiples of 10 and 100 | page 231 |

**Unit 11 section 1: Mass**

| | |
|---|---|
| 1 Kilograms and grams | page 365 |
| 2 Grams and kilograms | page 366 |
| Star challenge 1: Equivalent measurements | page 367 |

**Unit 11 section 3: Capacity**

| | |
|---|---|
| Star challenge 8: Centilitres | page 378 |

## plenary

**Resources**
self-prepared OHT of numbers (optional)

Prepare an OHT of the set of numbers below, scattered randomly, or write them on the board.

4.6  0.64  406  6.4

4060  0.46  640  460

40.6  64  46  4.06

Ask the class to identify as many pairs of numbers as possible where one number is 10 times or 100 times the other. Each pair of numbers must be different but a number can be used in more than one pair.

Give pupils two or three minutes to work with a partner to find and jot down as many pairs of numbers as they can, then take feedback. There are 15 possible pairs in the set of numbers above: nine pairs where one number is 10 times another, and six pairs where one number is 100 times the other.

**Remember**

- Multiplying by 10 moves the digits one place to the left; dividing by 10 moves the digits one place to the right. An empty place is filled with 0.
- When you multiply or divide by 100, the digits move two places.
- When you multiply or divide by 1000, the digits move three places.

# N4.2 Equivalence of fractions

**objectives**

- Recall multiplication facts to 10 × 10 and derive associated division facts.
- Find simple equivalent fractions.
- Change mixed numbers to improper fractions and vice versa.

**starter**

**Vocabulary**
multiplied by
divided by
product
quarters
fifths
numerator
denominator
mixed number
improper fraction

**Resources**
mini-whiteboards

Chant the four times table, forwards and backwards: one four is four, two fours are eight, three fours are twelve, and so on. Ask a few questions, varying the wording. Ask pupils to write answers on their whiteboards.

**Q What is 8 multiplied by 3? What is 32 divided by 4? 6 times 4? Seven fours? 8 shared between 2? The product of 3 and 4? How many fours make 28?**

Remind pupils that the numerator is the 'top number' and the denominator is the 'bottom number' of a fraction. The line that separates the numerator from the denominator represents division. The fraction $\frac{1}{4}$ means one whole divided into four equal parts.

**Q How many quarters are equivalent to one whole?** (four)

Write $1 = \frac{4}{4}$ on the board.

**Q How many quarters are equivalent to one and one quarter?** (five)

Write $1\frac{1}{4} = \frac{5}{4}$ on the board.

**Q How many quarters are equivalent to one and a half?** (six)

Write $1\frac{1}{2} = \frac{6}{4}$ on the board.

Explain that numbers like $1\frac{1}{4}$ and $1\frac{1}{2}$ are called *mixed numbers*. A mixed number is the sum of a whole number and a fraction: $2\frac{1}{2}$ and $3\frac{2}{5}$ are examples of mixed numbers. A fraction whose numerator is greater than its denominator is called an *improper fraction*: $\frac{8}{3}$ and $\frac{9}{4}$ are examples of improper fractions.

Demonstrate how to change a mixed number to an improper fraction. Write $3\frac{2}{5}$ on the board. Explain that in each of the three wholes there are five fifths. Altogether, in the three wholes there are 3 × 5 fifths. So in $3\frac{2}{5}$ there are (3 × 5) + 2 fifths or 17 fifths. Write $3\frac{2}{5} = \frac{17}{5}$ on the board.

Ask pupils to change the following mixed numbers to improper fractions, and to write the answers on their whiteboards: $4\frac{1}{4}$ and $2\frac{5}{8}$.

**Q How could we change an improper fraction to a mixed number?**

Remind the class that the line that separates the numerator from the denominator represents division. To change $\frac{17}{5}$, or 17 fifths, back to a mixed number, 17 is divided by 5. Since 17 ÷ 5 = 3 r 2, the answer will be three whole ones and two fifths, or $3\frac{2}{5}$.

Ask pupils to change these improper fractions to mixed numbers, and to write the answers on their whiteboards: $\frac{13}{4}$ and $\frac{73}{10}$.

## main activity

**Vocabulary**
equivalent
multiple
simplify
cancelling

**Resources**
OHT or poster of multiplication square
OHP calculator
ITP *Fractions* (optional)

Draw on the board two circles, marked in quarters, side by side. Write $\frac{1}{4}$ on one of the quarters on the circle on the left. Point to the other circle and invite a pupil to mark one eighth of it. Establish that one eighth can be found by halving each quarter, making eight eighths altogether.

**Q How many eighths are equivalent to one quarter?** (two)

Draw a third circle, marked in quarters. Invite a pupil to mark one twelfth of the circle. Establish that one twelfth can be found by finding one third of each quarter, making twelve twelfths altogether.

**Q How many twelfths are equivalent to one quarter?** (three)

Write on the board $\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$. Remind the class that these are equivalent fractions. Repeat for $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$.

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You may wish to support the main activity of this lesson by using the ITP *Fractions* downloaded from www.standards.dfes.gov.uk/numeracy. Select options and ask questions to consolidate pupils' understanding.

Ask the class:

**Q Which fractions are equivalent to one half?**

Take pupils' suggestions, then write on the board:

$$\frac{1}{2} \quad \frac{2}{4} \quad \frac{3}{6} \quad \frac{4}{8} \quad \frac{\square}{10} \quad \frac{6}{\square} \quad \frac{\square}{14} \quad \frac{8}{\square}$$

**Q What are the missing numbers?**

Refer to a poster of a multiplication square, or show one on an OHT.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 |
| 3 | 6 | 9 | 12 | 15 | 18 | 21 |
| 4 | 8 | 12 | 16 | 20 | 24 | 28 |
| 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 6 | 12 | 18 | 24 | 30 | 36 | 42 |
| 7 | 14 | 21 | 28 | 35 | 42 | 49 |

Explain that the rows are multiples. Show how to use the square to find fractions equivalent to one half by looking at the first and the second rows of the square.

Now find fractions equivalent to one quarter, using the first and fourth rows of multiples. Write on the board:

$$\frac{1}{4} \quad \frac{2}{8} \quad \frac{\square}{\square} \quad \frac{4}{\square} \quad \frac{\square}{20} \quad \frac{6}{\square} \quad \frac{\square}{28} \quad \frac{\square}{\square}$$

Find fractions equivalent to one third by looking at the first and third rows. Explain that the fractions are produced by multiplying the numerator and the denominator of the first fraction by 2, then by 3, then by 4, and so on.

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Write $\frac{4}{20}$ on the board.

**Q What is the simplest fraction equivalent to this?**

Demonstrate how to show that the simplest equivalent fraction is one fifth. Point to 4 in the first row, and move down the column to find 20 in the fifth row. Look back to the beginning of the two rows, to point at 1 and 5. Write on the board: $\frac{4}{20} = \frac{1}{5}$. Repeat for $\frac{6}{36}$ and $\frac{7}{21}$ , showing that the simplest equivalent fractions are $\frac{1}{6}$ and $\frac{1}{3}$ respectively.

Explain that a simpler equivalent fraction is produced by dividing the numerator and the denominator by the same number, and that this process is known as *cancelling*.

## other tasks

**Springboard 7**
Units 5 and 13

**Unit 5 section 2: Fractions and whole numbers**

4 Changing whole numbers into improper fractions page 182
5 Changing mixed numbers into improper fractions page 182
Star challenge 2: Thirds, fifths and tenths page 183

**Unit 5 section 6: Equivalent fractions**

1 Simple equivalent fractions page 197
Star challenges 9, 10, 11, 12: Halves, Thirds, Quarters, Fifths page 198

**Unit 13 section 1: Fractions of quantities**

Star challenge 2: Fractions in action page 426

## plenary

**Resources**
OHT N4.2a
mini-whiteboards

Write on the board:

$$\frac{\square\square}{\square}$$

Explain that this improper fraction has a two-digit numerator and a one-digit denominator. Ask pupils to work in pairs and to use their whiteboards. They should make improper fractions of this form that are whole numbers. For each fraction, they should use each of the digits 2, 3 and 4 once and only once.

Give the pairs a few minutes to work on the problem, then take feedback. The complete set of fractions is $\frac{34}{2}$, $\frac{24}{3}$, $\frac{42}{3}$ and $\frac{32}{4}$.

Finish by working through the problems on **OHT N4.2a** with the class.

### Remember

- Fractions in which the numerator is greater than the denominator are called ‘improper fractions’. They can be changed into mixed numbers so that they have a whole-number part and a fraction part.
- You can convert any fraction into another equivalent fraction by multiplying the numerator and the denominator by the same number.
- You can simplify a fraction by dividing the numerator and the denominator by the same number. This process is known as ‘cancelling’.

# N4.3 Comparing fractions

## objectives

- Enter numbers into a calculator and interpret the display in different contexts.
- Compare two or more simple fractions.

## starter

**Vocabulary**
fraction

Ask some questions about fractions of 24.

Q **What is one half of 24? One quarter of 24? One third of 24?**

Q **A boy had 24 grapes. He ate one third of them. What fraction of the 24 grapes was left?**

Q **What is one eighth of 24? How did you work it out? Three eighths of 24? How did you work it out?**

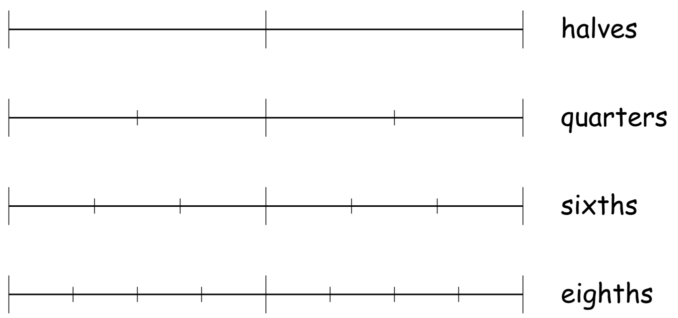
Remind pupils that one way to find one eighth is to halve, halve again, then halve again. Repeat similar questions with 48 and 72.

## main activity

**Vocabulary**
numerator
denominator
common denominator

**Resources**
OHP calculator
OHTs N4.3a, N4.3b, N4.3c and N2.7c
mini-whiteboards
ITP *Fractions* (optional)

Show **OHT N4.3a**. Divide the first line into two, and mark one half, but without labelling it. Divide the second line into four, and mark one quarter, two quarters and three quarters, without labelling them. Similarly, divide the third line into sixths and the fourth line into eighths.




Discuss the resulting diagram.

Q **On which line is one third marked?**

Establish that one third lies on the line marked in sixths, because two sixths are equivalent to one third. Similarly, two thirds are equivalent to four sixths.

Q **On which lines is one quarter marked?**

Agree that one quarter is marked on the line for quarters and also on the line for eighths, since two eighths are equivalent to one quarter. Similarly, six eighths are equivalent to three quarters.

Q **Which fraction is smaller, one third or one quarter?**

Q **Which fraction is bigger, two thirds or three quarters?**

Q **Can you tell me a fraction that lies between one quarter and three eighths? Between five sixths and 1?**

You may wish to reinforce the activity above by using the ITP *Fractions* downloaded from www.standards.dfes.gov.uk/numeracy.

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Show **OHT N4.3b**. Ask pupils to discuss in pairs their estimates of the positions of the pupils on the ropes. Take feedback, asking pupils to justify their estimates.

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Show **OHT N4.3c**.

**Q How many intervals are there on this line?** (12)

**Q What is the value of one interval?** (one twelfth)

Invite pupils to position the fractions on the fraction line. Acknowledge that it is not easy to locate three fifths.

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**Q Without a diagram, how can we find out which fraction is greater, $\frac{1}{2}$ or $\frac{3}{5}$?**

Show pupils how to generate systematically the fractions equivalent to $\frac{1}{2}$ and $\frac{3}{5}$ by multiplying the numerator and the denominator by the same number:

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$

$\frac{3}{5} = \frac{6}{10} = \frac{9}{15} = \frac{12}{20} = \frac{15}{25}$

Circle the two fractions, one in each row, whose denominators are the same. Say that they have a *common denominator*.

By changing the two fractions into fractions with a common denominator, it is possible to compare them. Since $\frac{1}{2} = \frac{5}{10}$ and $\frac{3}{5} = \frac{6}{10}$, $\frac{3}{5}$ is the greater of the two fractions.

Repeat by comparing $\frac{3}{5}$ with $\frac{2}{3}$.

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**Q How can a calculator be used to convert fractions to decimals?**

Remind pupils that the numerator is the ‘top number’ and the denominator is the ‘bottom number’ of a fraction. The fraction $\frac{1}{2}$ means one whole divided into two equal parts. Calculate 1 ÷ 2 on the OHP calculator and point out the decimal result: 0.5.

**Q How do we convert one fifth into a decimal using a calculator?**

**Q What do you think that the calculator display will show?**

Repeat with $\frac{3}{5}$, $\frac{4}{5}$, $\frac{1}{100}$, $\frac{25}{100}$ and $\frac{75}{100}$. Ask pupils to predict the result each time and to explain their thinking.

**Q What will the calculator show if we convert these improper fractions to decimals: $\frac{5}{2}$, $\frac{9}{4}$, $\frac{13}{10}$, $\frac{127}{100}$? Can you explain why?**

Again, ask pupils to predict the result by writing it on their whiteboards. Ask them to justify their reasoning.

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Work through this problem with the whole class.

*A rich woman gave $\frac{9}{20}$ of her income to the Save the Children fund.*
*She gave $\frac{11}{25}$ of her income to Cancer Research.*
*Which charity received the greater amount?*

Discuss and demonstrate different ways to compare the fractions:

- by using a calculator to change each of the fractions into a decimal, then deciding which of the two decimals is larger;
- by finding a common denominator;
- by positioning the fraction on a 0 to 1 line with 100 divisions (see **OHT N2.7c**).

Discuss with pupils which method they prefer, and why.

## other tasks

**Springboard 7**
Unit 13

**Unit 13 section 3: Changing fractions to decimals**

| | |
|---|---|
| 1 Changing fractions into decimals | page 430 |
| Star challenge 5: The first fraction–decimal challenge | page 431 |
| Star challenge 6: The second fraction–decimal challenge | page 431 |

## plenary

**Resources**
OHT N4.3d

Show **OHT N4.3d**, and work through the problem with the class.

**Q What is a quick way to tell whether a fraction is less than a half?**

Establish that the numerator must be less than half of the denominator.

**Remember**

- You can convert any fraction into another equivalent fraction by multiplying the numerator and the denominator by the same number.
- You can convert a fraction to a decimal by dividing the numerator by the denominator. You can use a calculator to do this.
- You can compare fractions by representing them on a diagram, by converting them to decimals, or by changing them into equivalent fractions with a common denominator.

# N4.4 Fractions and percentages

## objectives

- Understand percentages as 'the number of parts per 100'.
- Find simple equivalent fractions, decimals and percentages.

## starter

**Vocabulary**
fraction
equivalent
simplify

**Resources**
OHT N4.4a
mini-whiteboards

Show **OHT N4.4a**, with a selection of fractions with a denominator of 100.

**Q Which is the smallest of these fractions? Which is the largest? How do you know?**

**Q Which fraction is equivalent to one half? One quarter? Three quarters? Explain why.**

**Q Could any other fractions on the OHT be written in a simpler form? Which are they? Simplify them.**

Ask pupils to answer the next few questions using their whiteboards.

**Q Which fraction lies halfway between $^{25}/_{100}$ and $^{75}/_{100}$? Explain your reasoning.**

**Q Which two fractions on the OHT could add together to make a third fraction on the OHT? Are there any other possibilities?**

Gather the complete set of solutions to the last question:

| | | |
|---|---|---|
| $^{20}/_{100} + ^{25}/_{100} = ^{45}/_{100}$ | $^{20}/_{100} + ^{30}/_{100} = ^{50}/_{100}$ | $^{20}/_{100} + ^{60}/_{100} = ^{80}/_{100}$ |
| $^{25}/_{100} + ^{50}/_{100} = ^{75}/_{100}$ | $^{30}/_{100} + ^{45}/_{100} = ^{75}/_{100}$ | $^{30}/_{100} + ^{50}/_{100} = ^{80}/_{100}$ |

## main activity

**Vocabulary**
percentage
equivalent
fraction
decimal

**Resources**
OHT N4.4b
mini-whiteboards

Explain that *percentage* means per hundred, or in every hundred. 100% means 100 in every 100, which is the same as one whole. 50% means 50 in every hundred, and is written as $^{50}/_{100}$ or $^{1}/_{2}$.

Show the class how to convert fractions to percentages. Display **OHT N4.4b**, with four number lines. Say that these represent a tenths fraction line, a 0 to 1 decimal line, a 0 to 1 empty line, and a 0 to 100% percentage line. Remind the class that 100% represents one whole, so it is equivalent to 1.

Locate $^{1}/_{10}$ on the fraction line. Draw a straight line from $^{1}/_{10}$ on the fraction line, through 0.1 on the decimal line to the equivalent percentage 10% on the percentage line. Stress the three equivalents: $^{1}/_{10}$, 0.1 and 10%.

Invite pupils to the projector to do the same with $^{1}/_{2}$, $^{3}/_{10}$ and $^{7}/_{10}$.

Ask pupils where to mark $^{1}/_{4}$ on the fraction line. Establish that this is halfway between 0 and $^{1}/_{2}$.

**Q What is $^{1}/_{4}$ as a percentage?**

Confirm that this is 25%. Repeat with $^{3}/_{4}$, confirming this as 75%.

**Q How can we use the same method to find $^{3}/_{5}$ as a percentage?**

 

Ask pupils to start by converting $\frac{3}{5}$ to tenths. Draw the vertical line from $\frac{6}{10}$, to establish that $\frac{3}{5} = \frac{6}{10} = 60\%$. Repeat for $\frac{2}{5}$ and $\frac{4}{5}$.

Explain to the class that it is sometimes easier to convert fractions to percentages rather than to decimals and to use what they know to work out other percentages.

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Show the class how to convert percentages to fractions or decimals.

**Q What is 25% in hundredths?** ($\frac{25}{100}$) **Is there a simpler way of writing this fraction?** ($\frac{1}{4}$) **How would we write $\frac{1}{4}$ as a decimal?** (0.25) **What do you notice?**

Establish that $25\% = \frac{25}{100} = \frac{1}{4} = 0.25$. Write this on the board. Make sure that pupils notice that the two digits after the decimal point are the same as the two digits immediately before the percentage sign.

**Q What is 75% in hundredths?** ($\frac{75}{100}$) **Is there a simpler way of writing this fraction?** ($\frac{3}{4}$) **How would we write $\frac{3}{4}$ as a decimal?** (0.75) **What do you notice?**

Confirm that $75\% = \frac{75}{100} = \frac{3}{4} = 0.75$, and that the two digits after the decimal point match the two digits immediately before the percentage sign.

**Q Is it also the case for 50% that the two digits after the decimal point are the same as the two digits immediately before the percentage sign?**

Confirm that 50% is $\frac{50}{100}$ and that this could be written as 0.50. Remind the class that it is not necessary to write the trailing zeros at the end of a decimal, so 0.50 is written as 0.5.

**Q How many hundredths is 10%? How would we write this as a fraction? Is there a simpler way to write it? How would we write it as a decimal?**

Establish that $10\% = \frac{10}{100}$ and can be written as $\frac{1}{10}$ or 0.1.

Ask similar questions to establish that $20\% = \frac{20}{100}$ and can be written as $\frac{1}{5}$ or 0.2, and that $30\% = \frac{30}{100}$ and can be written as $\frac{3}{10}$ or 0.3.

**Q What is 33% as a fraction?**

Write the answer of $\frac{33}{100}$ on the board. Ask pupils to find $33 \times 3$. Draw out that $33\% \times 3 = 99\%$, which is very nearly 100%. So 33% is almost one third.

**Q What is two thirds as a percentage?**

Establish by doubling that the answer is about 66% or 67%. Discuss why both answers are reasonable estimates for two thirds.

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Ask a series of short questions, asking pupils to answer them by writing on their whiteboards.

**Q What fraction is equivalent to 40%?**

**Q What decimal is equivalent to 90%?**

**Q What percentage is equivalent to seven tenths?**

## other tasks

**Springboard 7**
Unit 5



## plenary

**Resources**
OHT N4.4c

Show **OHT N4.4c**, which displays the 27 fractions, decimals or percentages shown below, scattered randomly.

| | | |
|---|---|---|
| 0.1 | $^1/_{10}$ | 10% |
| 0.25 | $^1/_4$ | 25% |
| 0.75 | $^3/_4$ | 75% |
| 0.3 | $^3/_{10}$ | 30% |
| 0.7 | $^7/_{10}$ | 70% |
| 0.2 | $^1/_5$ | 20% |
| 0.4 | $^2/_5$ | 40% |
| 0.6 | $^3/_5$ | 60% |
| 0.8 | $^4/_5$ | 80% |

Tell the class that there are nine ‘families’ of equivalent fractions, decimals and percentages on the OHT. Invite individual pupils to identify one of these families and to cross out the trio on the OHT.

Ask pupils to suggest more ‘families’ (e.g. 0.9, $^9/_{10}$, 90%), including some that are greater than 1 (e.g. 1.25, $1^1/_4$, 125%).

### Remember

- Percentage means per hundred, or in every hundred. Percentages like 47% and 83% can be written as $^{47}/_{100}$ and $^{83}/_{100}$ .
- One half can be written as $^1/_2$ , 0.5 or 50%.
- Since one quarter is one half of one half, one quarter is $^1/_4$, 0.25 or 25%. One eighth is half of one quarter, so one eighth is 12.5%.
- One tenth can be written as $^1/_{10}$, 0.1 or 10%. From this, you can work out that $^7/_{10}$ = 70% or that $^3/_{10}$ = 30%.
- One third is about 33% and two thirds is about 66%.

# N4.5 Finding percentages of whole-number quantities

**objectives**

- Understand percentages as 'the number of parts per 100'.
- Calculate simple percentages of whole-number quantities.

**starter**

**Vocabulary**
equivalent
percentage

**Resources**
mini-whiteboards

Remind the class that 50%, 0.5 and $^1/_2$ are equivalent. Ask pupils to use their whiteboards to answer some questions.

Q **What is 50% of 24? Of 70? Of 120? Of 250? Of 9000? Of 15?**

Q **If we know 50% of something, how do we find 25%?** (halve 50%)

Q **What is 25% of 40? Of 60? Of 100? Of 1200? Of 10?**

Remind the class that 10%, 0.1 and $^1/_{10}$ are equivalent.

Q **How do we find 10% of something?** (find one tenth, or divide it by 10)

Q **What is 10% of 560? Of 1000? Of 53? Of 4.7?**

Q **If we know 10% of something, how do we work out 5%?** (halve 10%)

Work through with the class finding 15% of 240, by first finding 10%, then 5%, then adding 5% to 10%. Show how to jot down the interim steps.

Ask pupils to use their whiteboards for interim jottings and to answer these questions.

Q **What is 15% of 300? Of 60?**

Stress that 100% is equivalent to one whole.

Q **45% of a class are boys. What percentage are girls?**

Q **36% of the shapes in a box are red. What percentage of the shapes in the box are not red?**

**main activity**

**Vocabulary**
method

**Resources**
OHP calculator
calculators
OHT N4.5a

Remind the class that 1%, 0.01 and $^1/_{100}$ are equivalent. To find 1% of a number means finding one hundredth of the number, or dividing it by 100.

Ask pupils:

Q **What might weigh about 500 grams?** (e.g. a large potato, a small bag of flour, a baby kitten)

Q **What is 1% of 500 g?**

Demonstrate the calculation with the OHP calculator and record the result on the board: 1% of 500 g = 5 g. Stress that the units must be included in the answer.

Repeat by finding 1% of £200, 3500 millilitres, 250 metres. Record on the board:

1% of £200 = £2, 1% of 3500 ml = 35 ml, 1% of 250 m = 2.5 m

Ask pupils to use this information to work out the answers to the following.

5% of 500 g, 8% of £200, 2% of 3500 ml, 4% of 250 m

Take feedback on each question. Ask the class how they used the information to calculate the percentages. Draw out that the *method* is to find 1% by dividing by 100, then to multiply the result by the relevant percentage.

Demonstrate on the OHP calculator how to find 28% of £540. Ask pupils to use their own calculators at the same time. Enter 540, and divide by 100. Ask:

**Q How do we interpret the 5.4 in the display?** (it means £5.40)

Multiply by 28.

**Q How do we interpret the 151.2 in the display?** (it means £151.20)

Record on the board: 28% of £540 = £151.20.

Ask pupils to use their calculators to work out 13% of £550 (£71.50) and 4% of £33.25 (£1.33).

---

Ask the class:

**Q You know that 10% of a quantity is 8 kg. So 5% is 4 kg. What other percentages can you work out easily using this information?**

Establish that:

20% is 10% × 2, 30% is 10% × 3, and so on;

15% is 10% + 5%, 25% is 20% + 5%, and so on.

Write randomly on the board a selection of percentages such as:

50%, 25%, 75%, 10%, 1%, 20%, 60%, 90%, 33%

Point to one of them and ask:

**Q What strategy or method could you use for calculating this percentage of a given amount? Could you work it out in a different way?**

Stress any alternative methods. For example:

90% is 100% – 10% or 10% × 9;

60% is 50% + 10% or 10% × 6;

75% is 50% + 25% or 25% × 3.

Work through with the class the questions on **OHT N4.5a**.

---

## other tasks

**Springboard 7**
Unit 13

**Unit 13 section 2: Fractions and percentages**


| | |
|---|---|
| 1 Using fractions to find percentages | page 427 |
| 2 10% and its multiples | page 427 |
| Star challenge 3: Reducing prices | page 428 |
| Star challenge 4: Percentages and fractions | page 428 |

## plenary

**Vocabulary**
chance
interest rate
discount

Ask the class what they think these statements mean and to explain them in their own words.

- This shirt is 70% cotton and 30% polyester.
- We spend about 33% of our lives asleep.
- There is a 10% chance of rain today.
- The interest rate on my savings account is 3% per annum.
- I got a 30% discount on these shoes in a sale.

Supplement with questions such as:

- The shirt weighs 200 grams.
  About how much is cotton?
- About how many hours do we sleep in a day? In a week?
- It is twice as likely to rain tomorrow.
  What is the chance of rain tomorrow?
- I have £50 in my savings account.
  How much interest will I get in a year?
- The original cost of the shoes was £30.
  What did I pay for them in the sale?

Finish by asking questions such as:

**Q Would you prefer to climb 20% of a 3000 m mountain, or 30% of a 2000 m mountain?**

**Q Would you prefer to lose 40% of £80, or 80% of £40?**

### Remember

- A quick way to find 20% of a quantity is to find 10% by dividing by 10, then multiply by 2 to find 20%. You can find 30%, 40%, 50%, … similarly.
- If there is no quick method for finding a percentage of a quantity, first find 1%, then multiply by the percentage.
- Always include any units in the answer.

# N4.6 Working with fractions

## objectives

- Enter numbers into a calculator and interpret the display in different contexts.
- Compare two or more simple fractions.
- Add and subtract simple fractions.
- Multiply a fraction by an integer.

## starter

**Vocabulary**
fraction
decimal
percentage
third

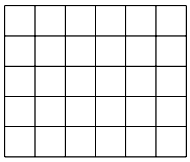
**Resources**
OHT N4.6a
squared paper

Display the first diagram on **OHT N4.6a**. Explain that the top left rectangle has one third shaded. Point out that the top right rectangle is the same rectangle. Ask:

**Q What fraction of the rectangle on the right is shaded? Explain why.**

Invite two pupils to the projector to shade one third of the other two rectangles in different ways. Stress that exactly one third has been shaded in each case.

Give each pupil a sheet of squared paper. Ask them to sketch three 6 by 5 rectangles. They should shade 30% of the first rectangle, one third of the second rectangle and 0.4 of the third rectangle. You may need to remind them that 30% is equivalent to three tenths, and 0.4 to four tenths.



Ask pupils to show their rectangles to a friend, who should pick one of them. The friend should then explain whether one third, more than one third or less than one third of the selected rectangle is shaded, and why. Invite one or two pupils to justify their decisions to the whole class.

## main activity

**Vocabulary**
problem

**Resources**
OHP calculator

Tell the class that you are going to change one third to a decimal on your calculator. Use the OHP calculator and divide 1 by 3. Ask:

**Q What do you think the display will show?** (pupils might suggest 0.33)

Press the equals key, to display 0.3333333, then ask:

**Q What answer would you get if you had a wider calculator?**

Establish that the 3s would continue for ever.

**Q Can you predict what the display will show if we divide 3 by 3? 4 by 3? 5 by 3? 6 by 3?**

Check each prediction with the calculator.

Divide 2 by 3 on the calculator and leave the result displayed on the screen. Ask pupils to take their own calculators and to get the same result by doing other calculations. They should look for interesting ways of getting the same answer. Allow a few minutes for the activity, then take feedback. Discuss one or two of the more interesting calculations.

Say that you will now look at some numbers that are close to but different from one third. Write these numbers on the board.

0.33 0.34 0.335 0.333 0.334

**Q Which of these numbers is more than one third?**

Give pupils a minute to discuss the question in pairs. Take feedback and establish that 0.34, 0.334 and 0.335 are all more than one third.

Write these numbers on the board.

20% $\frac{1}{4}$ $\frac{1}{2}$ 40% 0.3

**Q Which of these numbers is less than one third?**

Give pupils a minute to discuss the question in pairs and, if needed, to use their calculators. Take feedback and establish that 20%, $\frac{1}{4}$ and 0.3 are less than one third.

Write these numbers on the board.

50% 60% 0.7 75% 0.6

**Q Which of these numbers is less than two thirds?**

Allow the pairs a minute for discussion, then take feedback. Establish that 50%, 60% and 0.6 are less than two thirds.

---

Write on the board $\frac{1}{2} + \frac{2}{3}$ .

**Q How can we add these fractions to find their sum?**

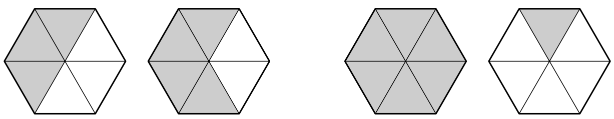
Show pupils how to generate systematically the fractions equivalent to $\frac{1}{2}$ and $\frac{1}{3}$ by multiplying the numerator and the denominator by the same number:

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$

$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}$

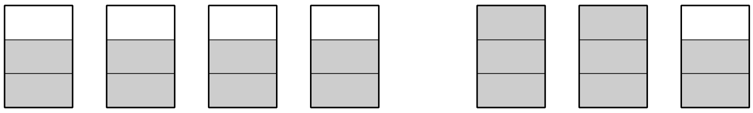
Circle the two fractions, one in each row, that have a common denominator.

Explain that, by changing the two fractions into fractions with a common denominator, it is possible to add them. Since $\frac{1}{2} = \frac{3}{6}$ and $\frac{2}{3} = \frac{4}{6}$, their sum is $\frac{7}{6}$ or $1\frac{1}{6}$ . Illustrate with diagrams.



Repeat with $\frac{3}{4} + \frac{7}{8}$ and $\frac{11}{12} - \frac{3}{4}$.

Write on the board $\frac{2}{3} \times 4 = 4 \times \frac{2}{3}$. Remind the class that $\frac{2}{3} \times 4$ means $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ . The sum of these fractions is $\frac{8}{3}$ or $2\frac{2}{3}$ . Illustrate with diagrams.



Repeat with $\frac{7}{8} \times 3$ and $5 \times \frac{2}{7}$ .

## other tasks

**Springboard 7**
Unit 5



## plenary

**Resources**
OHT N4.6b
Resource N4.6c

Show **OHT N4.6b** and discuss the questions with the class. For each question, ask pupils to explain how they decided on their estimates for the sizes of the patches. Make sure that pupils appreciate that the three percentages should add up to 100%, and that the three fractions should add up to 1. Encourage pupils to explain how they could use these facts.

Finish the lesson by reading out a selection of the oral questions on **Resource N4.6c**. Explain that pupils may make jottings if they wish. For each answer, ask a pupil to explain the method used to the class.

### Remember

- You can convert any fraction into another equivalent fraction by multiplying the numerator and the denominator by the same number.
- You can compare fractions by representing them on a diagram.
- You can add or subtract fractions with different denominators by first changing them to equivalent fractions with a common denominator.

# N4.7 Problems involving direct proportion

**objectives**

- Find doubles and halves of numbers.
- Solve simple problems involving direct proportion.
- Solve word problems.

**starter**

**Vocabulary**
halves
quarters

**Resources**
counting stick

Use a counting stick and count along and back in halves from zero.

Q **What are 7 halves? 36 halves? How did you work it out?**

Q **How many halves are there in 9? In 54? How did you work it out?**

Q **What fractions do you know that are equivalent to one half?**

Encourage pupils to use doubling and halving strategies.

Now count on and back along the stick in quarters.

Q **What are 8 quarters? 32 quarters? How did you work it out?**

Q **How many quarters are there in 11? In 23? How did you work it out?**

Q **What fractions do you know that are equivalent to one quarter? To three quarters?**

**main activity**

**Vocabulary**
multiply
divide
estimate
problem

**Resources**
OHP calculator
calculators
OHTs N4.7a, N4.7b

Write on the board: 1 bowl → 6 tomatoes. Explain that to make one bowl of soup you need 6 tomatoes.

Q **How many tomatoes do you need to make 2 bowls of soup?**

Q **What operation do you need to do to find out?** (multiply 6 by 2)

Write on the board: 2 bowls → 12 tomatoes.

Q **How many tomatoes do you need to make 3 bowls of soup?**

Q **What operation do you need to do to find out?**

Quickly build up a table to 6 bowls → 36 tomatoes.

Ask questions such as:

Q **How many bowls of soup can you make with 48 tomatoes? How do you know?**

Encourage pupils to consider different strategies for working out the answer to the question, making sure that the strategy of dividing 48 by 6 is included.

Record on the board: 48 tomatoes → 6 bowls.

Q **Can you predict how many tomatoes you will need for 10 bowls of soup? How did you work it out? What about 100 bowls of soup? 1000 bowls of soup?**

Record on the board:

1 bowl → 6 tomatoes
100 bowls → 6 × 100 tomatoes

**Q Can you predict how many bowls of soup you can make with 66 tomatoes? With 120 tomatoes? With 6 million tomatoes?**

Record on the board:

6 tomatoes ➞ 1 bowl
66 tomatoes ➞ 66 ÷ 6 bowls

---

Show the first problem on **OHT N4.7a**. Show pupils how to solve the problem and how to show their working.

*There are 9 pencils in a box.*
*A school buys 24 boxes.*
*How many pencils does the school buy?*

Start by recording a statement about one thing, based on the information given in the question:

1 box ➞ 9 pencils

Underneath, record what the question is asking, making sure that the item to be found is on the right.

24 boxes ➞ ? pencils

**Q What operation do we need to do to find the answer?** (multiply 9 by 24)

**Q What is an estimate of the answer?** (10 × 20 = 200)

Record 24 × 9 and ask pupils to work it out using their preferred method (using a calculator only if time in the lesson is short). Compare the answer of 216 pencils with the estimate and check that it makes sense in the context of the question.

Read through the second part of the first problem:

*Another school has ordered 126 pencils.*
*How many boxes of pencils has the school ordered?*

Record again the statement about one thing, and write below it what the question is asking, making sure that the unknown is on the right.

9 pencils ➞ 1 box

126 pencils ➞ ? boxes

**Q What operation do we need to do to find the answer?** (divide 126 by 9)

**Q What is an estimate of the answer?** (130 ÷ 10 = 13)

**Q Does the answer of 14 boxes make sense in the context of the question?**

Work though the second and third problems on **OHT N4.7a** in a similar way, stressing how pupils should show their working.

---

Show **OHT N4.7b** and ask pupils to work through the problems in pairs. Assist the pairs, making sure that they identify the operation needed and an estimate for the calculation. Make sure that they ‘show their working’ by recording the complete calculation.

## other tasks

**Springboard 7**
Unit 15

**Unit 15 section 1: Mental calculations – multiplication**
Star challenge 2: Two-star mental challenge page 477

**Unit 15 section 3: Multiplication – written methods**
Star challenge 5: Multiplication problems page 483

**Unit 15 section 4: Division – written methods**
3 Problems page 485
Star challenge 6: Mental challenges page 485

## plenary

**Resources**
OHT N4.7c
OHP calculator

Show **OHT N4.7c**. Work through each problem to identify the calculation needed.

**Q Which of these calculations could be done without a calculator, and which would need a calculator?**

Ask an individual pupil to use an OHP calculator to demonstrate to the class the steps they would take to do one of the calculator calculations. Ask the same pupil to write on the board what they would do to 'show your working'. Stress that this needs to show the complete calculation. Stress also the use of approximation to check the answer.

### Remember

- Read the question carefully. Look for key words in the question to help decide what operation to use and what calculations to do.
- Decide what information you need for your calculations. It is often useful to write down the information given in the problem, for example a statement about one thing.
- Write down the calculation that you did to show your working.

# N4.8 Ratio and proportion

## objectives

- Divide a quantity into two parts in a given ratio.
- Solve simple problems involving direct proportion.

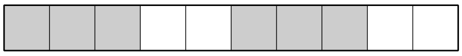
## starter

**Vocabulary**
proportion
ratio
fraction
percentage

**Resources**
interlocking cubes

Count together in multiples of 5, to 50.

Use 6 blue and 4 yellow interlocking cubes to make a stick like this.



Hold up the stick and tell the class that you have made a pattern where, for every 3 blue cubes, there are 2 yellow cubes. Ask:

**Q What colour would the next cube in the pattern be?** (blue) **What colour would the 15th cube be?** (yellow) **How do you know?**

**Q What colour would the 31st cube be?** (blue) **How do you know?**

Establish that the cubes are grouped in fives, and that the first cube in every five will be blue. Draw this table on the board.

| Blue cubes | Yellow cubes | Total cubes |
|---|---|---|
| 3 | 2 | 5 |
| | | |
| | | |
| | | |

Rearrange the stick of cubes to look like this.

**Q What proportion of the stick is blue?**

Explain that *proportion* means the same as 'fraction' or 'percentage'. Establish that $\frac{6}{10}$ or $\frac{3}{5}$ of the stick is blue.

**Q In a stick of 10 cubes, how many are blue?** (6) **How many are yellow?** (4)

Say that the pattern could also be described as 'for every 6 blue cubes, there are 4 yellow cubes' or 'for every 4 yellow cubes, there are 6 blue cubes'. Add 6, 4 and 10 to the table.

**Q If the stick had 9 blue cubes, how many yellow cubes would there be?**

Establish that 3 more blue and 2 more yellow cubes would be needed, and add 9, 6 and 15 to the table.

**Q If the stick had 18 blue cubes, how many yellow cubes would there be? How do you know?**

Discuss pupils' responses and add 18, 12 and 30 to the table.

**Q** **If the stick had 60 blue cubes, how many yellow cubes would there be? How do you know?**

Discuss pupils' responses and add 60, 40 and 100 to the table.

Point to all the numbers in the first column.

**Q** **What are all these numbers?** (multiples of 3)

Establish that the numbers in the second column are all multiples of 2. Explain that the *ratio* of blue cubes to yellow cubes is 3 to 2, and is written as 3 : 2. A ratio can be simplified in the same way as a fraction, by dividing each side by the same number. For example, a ratio of 5 : 10 is equivalent to a ratio of 1 : 2.

---

## main activity

**Vocabulary**
problem
recipe

**Resources**
OHTs N4.8a, N4.8b

Show **OHT N4.8a,** a recipe for fish pie for two people.

**Q** **What is the ratio of butter to fish in the recipe?**

Establish that for every 25 g of butter 250 g of fish are needed. The ratio of butter to fish is 25 : 250, or 1 : 10.

**Q** **What is the problem asking us to do?**
**Q** **How shall we begin to tackle it?**

Ask pupils to discuss these questions in pairs, then take their suggestions. Establish that a good way to start would be to halve the recipe to make enough for one person. Ask the pairs to do this, then write it up on the board.

**Q** **How much fish would be needed for 3 people?**

Establish that 125 g × 3 would be needed for 3 people.

**Q** **What fraction of 1 kg is 375 g?** (three eighths of a kilogram) **How can we write this as a decimal?** (0.375 kg)

**Q** **How much potato would be needed for 3 people?** (600 g) **What is 600 grams in kilograms?** (0.6 kg)

**Q** **How much butter would be needed for 3 people?** (37.5 g)

Read though the second part of the problem.

**Q** **How many grams is 2 kg?** (2000 grams)
**Q** **How many grams of potato are needed for 1 person?** (200 g)
**Q** **How many people would need 2000 grams of potato?**

Record on the board:

200 g → 1 person
2000 g → ? people

**Q** **What operation do we need to do to find the answer?** (2000 ÷ 200)

**Q** **Does the answer of 10 people seem appropriate?**

**Q** **How much butter would be needed for 10 people? What operation do we need to do?** (multiply 25 g by 5)

**Q How much fish would be needed for 10 people? What operation do we need to do?** (multiply 250 g by 5)

**Q What is 1250g in kilograms?** (1.25 kg)

Show **OHT N4.8b**, a recipe for raspberry ice cream. Ask:

**Q What is the ratio of sugar to raspberries?**

Establish that both amounts must be in the same units, and that the ratio is 250 : 1000 or 1 : 4.

Ask pupils to work in pairs to tackle the problem. Establish that one way to start might be to halve the recipe to make enough for four people.

Collect and discuss solutions, inviting pupils to the board to explain their methods. Stress what they need to do to show their working.

## other tasks

**Springboard 7**
Unit 13

**Unit 13 section 5: Ratio and proportion**


1 In every … and for every … page 436
2 Ratio and the words that go with it page 437
3 Proportion page 438
Star challenge 9: Ratio and proportion problems page 439


## plenary

**Resources**
OHTs N4.8c, N4.8d

Show **OHT N4.8c**. Discuss the ratios and proportions illustrated.

Show **OHT N4.8d** and complete the table.

### Remember

- Ratio is a way of comparing two quantities. For example, the ratio of a 2 cm rod to a 3 cm rod is 2 : 3.
- A proportion is similar to a fraction or percentage. If 1 in every 4 beads in a necklace is red, then the proportion of red beads is $\frac{1}{4}$ or 25%.
- '2 for every 3' means that 5 units are being shared out, and the fractional parts are $\frac{2}{5}$ and $\frac{3}{5}$. The ratio of these two parts is 2 : 3.
- '2 in every 3' means that 3 units are being divided up, and the fractional parts are $\frac{2}{3}$ and $\frac{1}{3}$. The ratio of these two parts is 2 : 1.
- When changing a recipe, work out the quantities for one person, then increase the quantities by multiplying by the number of people involved.

| thousands | hundreds | tens | units | tenths | hundredths | thousandths |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**OHT N4.2a**

Draw a line to join two fractions with the same value.

$\frac{4}{7}$ $\frac{1}{2}$ $\frac{2}{8}$ $\frac{2}{5}$ $\frac{1}{3}$ $\frac{1}{4}$

Fill in the missing numbers in the boxes.

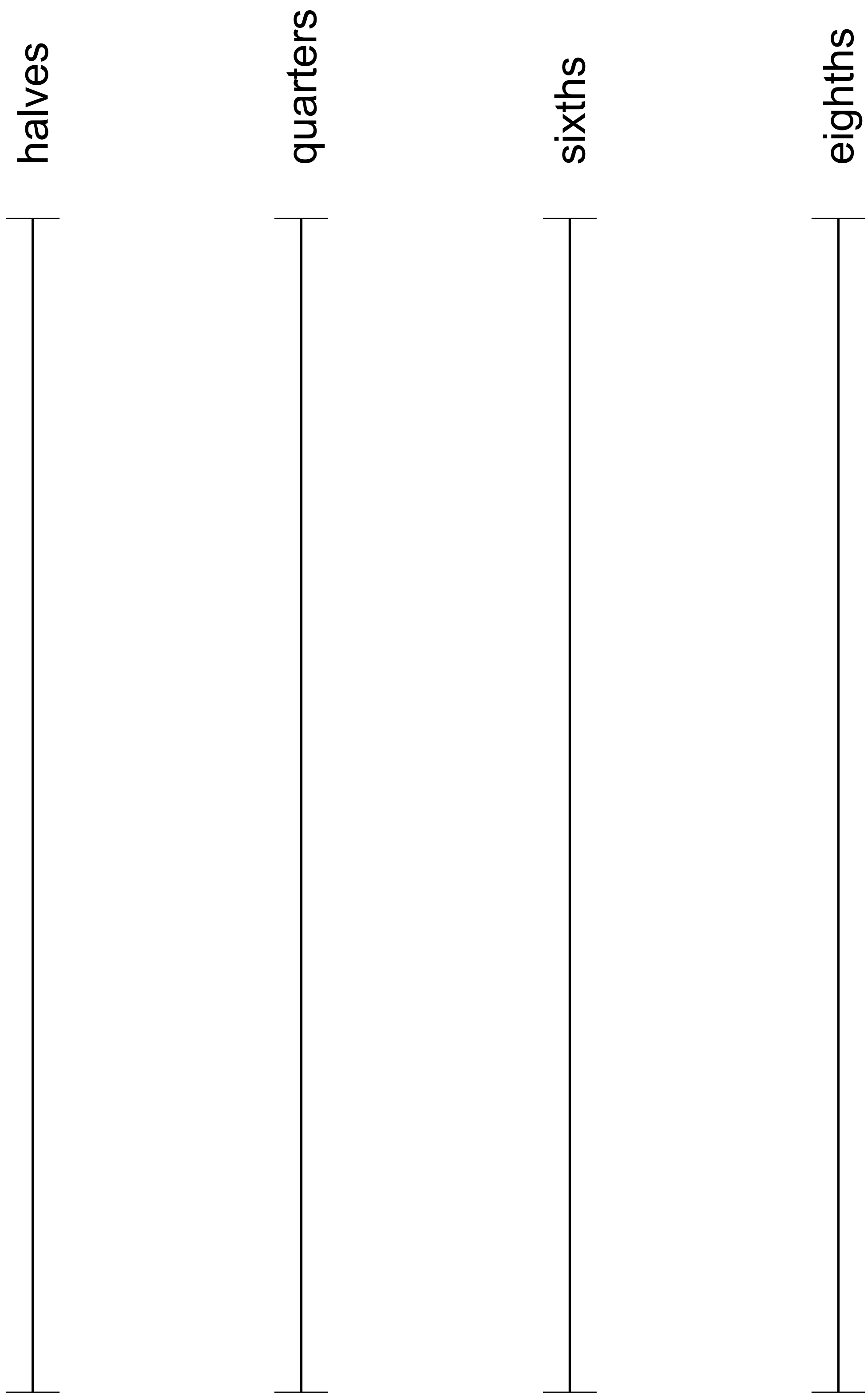
$$\frac{2}{12} = \frac{\square}{6}$$

$$\frac{1}{2} = \frac{12}{\square} \qquad \frac{1}{\square} = \frac{6}{24}$$

Make each fraction equivalent to $\frac{3}{5}$.

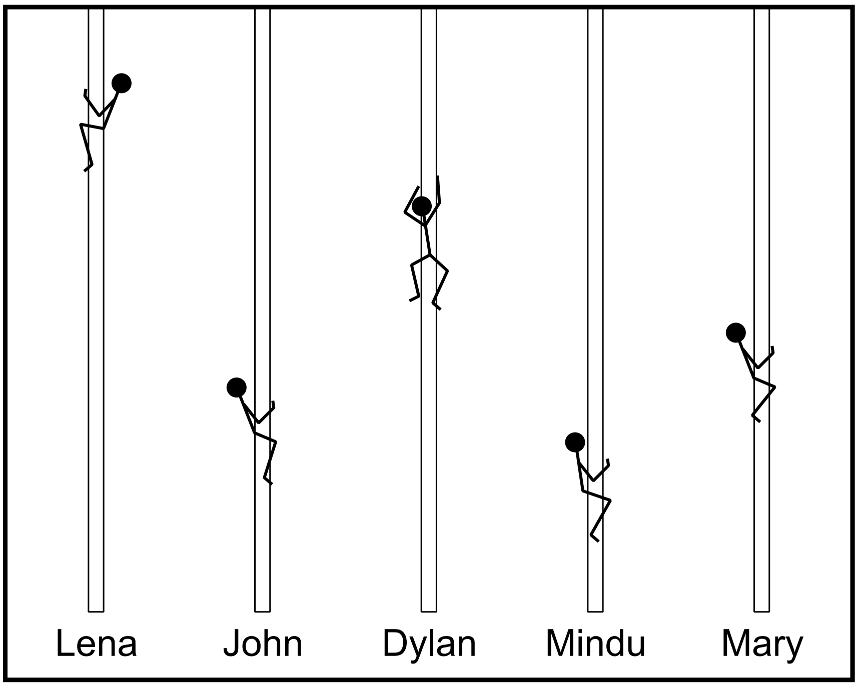
$$\frac{\square}{10} \qquad \frac{\square}{15} \qquad \frac{12}{\square}$$

# OHT N4.3a



**OHT N4.3b**

Some pupils are climbing up the ropes in the gym.
These are their positions.




Fill each gap with a fraction.

Lena is about of the way up the rope.

John is about of the way up the rope.

Dylan is about of the way up the rope.

Mindu is about of the way up the rope.

Mary is about of the way up the rope.

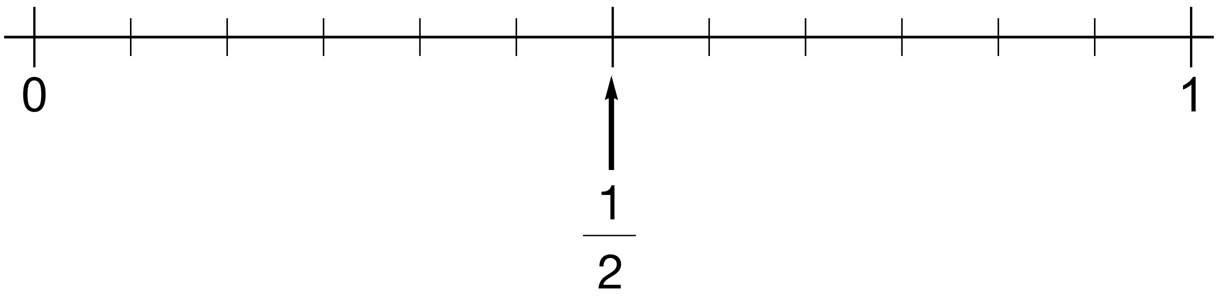
 

Look at these fractions:

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{6}$ $\frac{3}{5}$ $\frac{2}{3}$ $\frac{5}{12}$

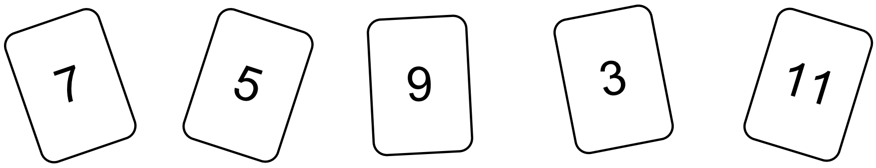
Mark each fraction on the number line.

The first one is done for you.

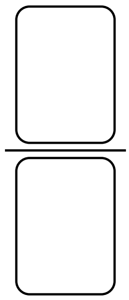


**OHT N4.3d**

Here are some number cards.




Use two of the cards to make a fraction less than $\frac{1}{2}$ .



How many different fractions less than $\frac{1}{2}$ can you make from the cards?

For each of your fractions, how much less than 1 is it?

$\frac{50}{100}$

$\frac{30}{100}$

$\frac{45}{100}$

$\frac{80}{100}$

$\frac{75}{100}$

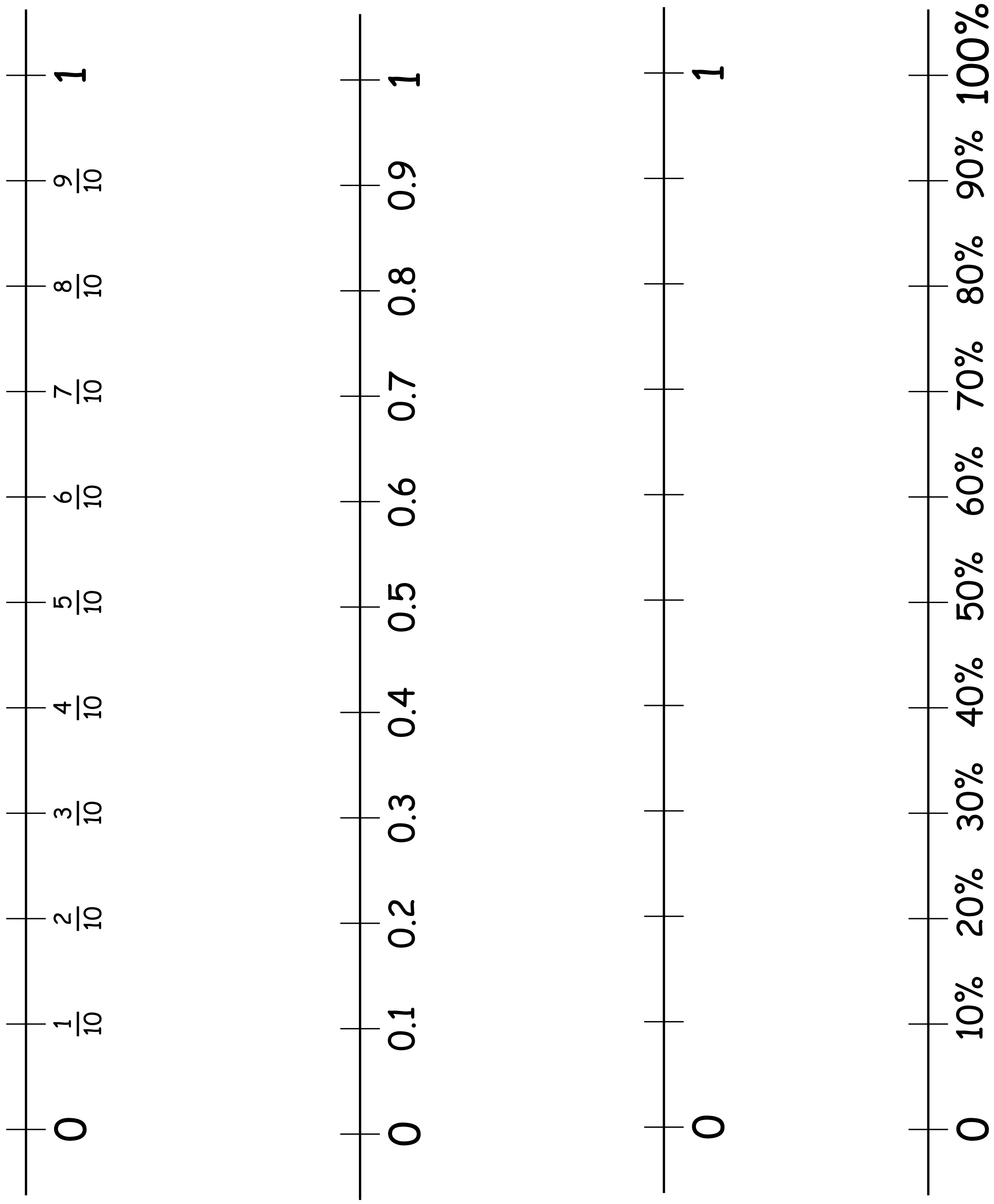
$\frac{20}{100}$

$\frac{60}{100}$

$\frac{25}{100}$

OHT N4.4b


0
1/10
2/10
3/10
4/10
5/10
6/10
7/10
8/10
9/10
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
0
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

0.3

$\frac{1}{5}$

$\frac{7}{10}$

25%

30%

$\frac{2}{5}$

0.7

0.6

10%

0.8

40%

0.1

$\frac{4}{5}$

$\frac{3}{5}$

$\frac{3}{4}$

60%

20%

0.4

$\frac{1}{4}$

0.25

75%

70%

$\frac{1}{10}$

0.2

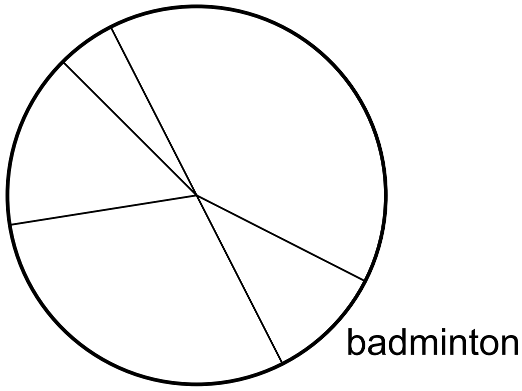
$\frac{3}{10}$

0.75

80%

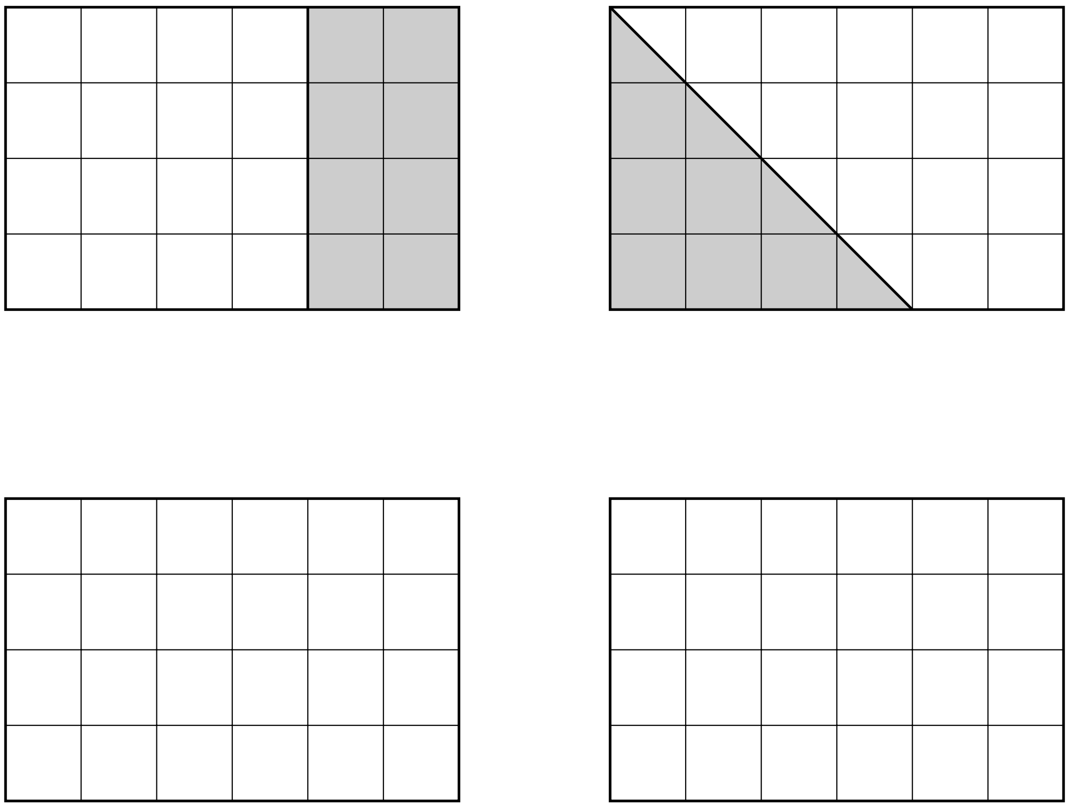
The table shows the percentage of people who took part in sports at a sports centre. Label the correct two sections of the pie chart **football** and **squash**.

| | |
|---|---|
| Badminton | 10% |
| Football | 40% |
| Squash | 5% |
| Swimming | 30% |
| Tennis | 15% |

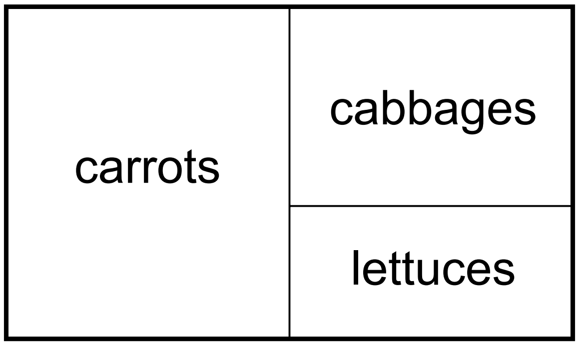



Altogether 260 people took part. Complete this table.

| Sport | Percentage | Number of people |
|---|---|---|
| Badminton | 10% | |
| Football | 40% | |
| Squash | 5% | |
| Tennis | 15% | |
| Swimming | 30% | |



About 50% of this vegetable patch is for carrots.

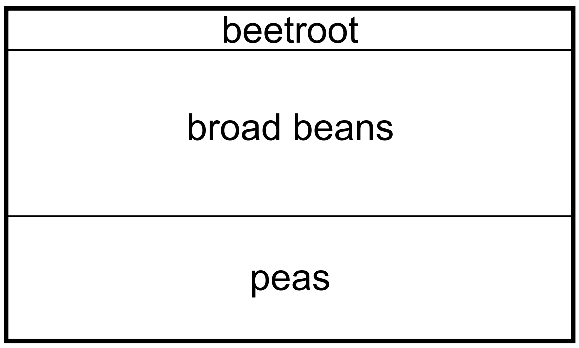



Fill in each gap with a percentage.

About .......................... % of the patch is for cabbages.

About .......................... % of the patch is for lettuces.

About $\frac{1}{8}$ of this vegetable patch is for beetroot.




Fill in each gap with a fraction.

About .......................... of the patch is for broad beans.

About .......................... of the patch is for peas.

## Resource N4.6c

1 What is seven squared?

2 Subtract eighteen from one hundred.

3 Write down an even number that is also a multiple of nine.

4 What is one half added to three quarters?

5 A side of a square is six centimetres long.
What is the area of the square?

6 Forty-six per cent of the members of a sports club are male.
What percentage are female?

7 In a survey, one quarter of the people liked tennis.
What percentage of people liked tennis?

8 What is forty-two divided by six?

9 Change 130 millimetres to centimetres.

10 Write the number four and a half million in figures.

11 A book cost twenty pounds.
The price went up by ten per cent.
What is the new price of the book?

12 In a group of four hundred pupils, two hundred were girls.
What percentage of the group was girls?

13 What is half of six point three?

14 Write three fifths as a decimal.

15 What is seventy-five per cent of forty pounds?

**OHT N4.7a**

1 There are 9 pencils in a box.
A school buys 24 boxes.
How many pencils does the school buy?

Another school has ordered 126 pencils.
How many boxes of pencils has the school ordered?

Show your working.

2 Plants are sold in trays of 20.
David wants 240 plants.
How many trays of plants does he need to buy?

Ivana buys 7 trays of plants.
How many plants is this?

Show your working.

3 One length of a swimming pool is 25 metres.
How many lengths are there in a 150 metre race?

Laura swims 14 lengths.
How many metres does she swim?

Show your working.

1 Apples are sold in packets of 4.
How many apples are in 72 packets?

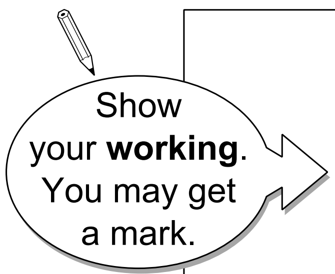
Alex buys 96 apples.
How many packets does she buy?

2 There is 60 g of rice in one portion.
How many portions are there in a 3 kg bag of rice?

Harry cooked 8 portions of rice.
How many grams of rice did he cook?

3 A spoonful of medicine is 5 ml.
How many spoonfuls of medicine can you get from a bottle holding 375 ml?

Tim had 32 spoonfuls of medicine when he was ill.
How many millilitres of medicine did he have?



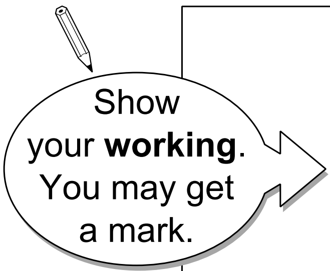
## OHT N4.7c

1 Sue went camping for 6 nights.
It cost £2.20 to camp each night.
How much did Sue pay to camp?

Ram paid £26.40 to camp.
For how many nights did Ram stay at the camp?

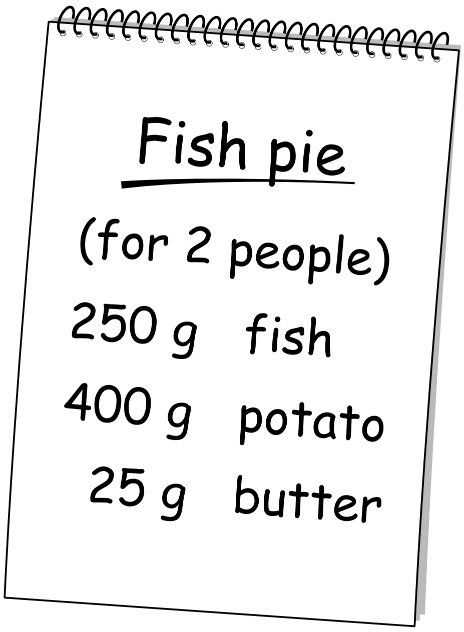
2 Emma saves £3.50 each week.
How much has she saved after 16 weeks?

Paul has saved £4.50 each week.
Altogether he has saved £40.50.
For how many weeks has he saved?



**OHT N4.8a**

Here are the ingredients for fish pie for 2 people.




Omar makes fish pie for 3 people.

How many grams of fish should he use? .................. grams

Mary used 2 kg of potato to make a fish pie.

How many people did her fish pie feed? ..................

How much butter was in her fish pie? .................. grams

How much fish was in her fish pie? .................. grams

Here is a recipe for raspberry ice cream for 8 people.

**Raspberry ice cream for 8 people**

$\frac{1}{2}$ litre of cream

1 kg raspberries

250 g sugar

Josie makes enough raspberry ice cream for 12 people.

How much cream does she use? .................. litre

Fred makes raspberry ice cream in the same way.

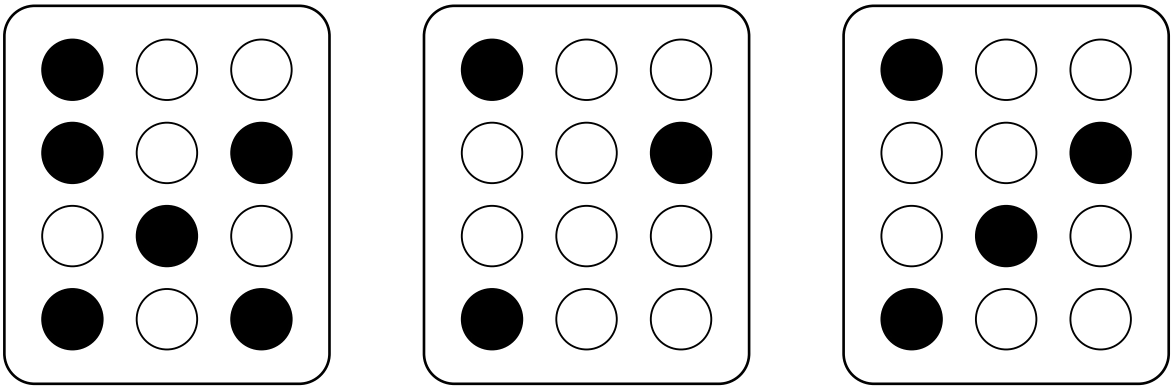
He uses $2\frac{1}{2}$ kg of raspberries.

How much sugar does he use? .................. grams

# OHT N4.8c

For each set of circles, complete the statements below.



☐ in every ☐ circles is black.

Write this proportion as:

a fraction ☐

a decimal ☐

a percentage ☐

The ratio of black circles to white circles is ☐ to ☐ .

Complete this table.

| in every | fraction | decimal | percentage |
|---|---|---|---|
| 1 in every 5 | | | |
| | | | 75% |
| | $\frac{2}{3}$ | | |
| 3 in every 8 | | | |