

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 $\frac{25}{100}$ and $\frac{75}{100}$? 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:

$$\frac{20}{100} + \frac{25}{100} = \frac{45}{100}$$

$$\frac{20}{100} + \frac{30}{100} = \frac{50}{100}$$

$$\frac{20}{100} + \frac{60}{100} = \frac{80}{100}$$

$$\frac{25}{100} + \frac{50}{100} = \frac{75}{100}$$

$$\frac{30}{100} + \frac{45}{100} = \frac{75}{100}$$

$$\frac{30}{100} + \frac{50}{100} = \frac{80}{100}$$

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 $\frac{50}{100}$ or $\frac{1}{2}$.

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, and a 0 to 100% percentage line. Remind the class that 100% represents one whole, so it is equivalent to 1.

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

Invite pupils to the projector to do the same with $\frac{1}{2}$, $\frac{3}{10}$ and $\frac{7}{10}$.

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

- Q What is $\frac{1}{4}$ as a percentage?**

Confirm that this is 25%. Repeat with $\frac{3}{4}$, confirming this as 75%.

- Q How can we use the same method to find $\frac{3}{5}$ 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.

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 33×3 . 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.

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

Unit 5 section 5: Percentages

1 Percentages	page 193
2 Equivalent fractions and percentages	page 193
3 How much petrol?	page 194
4 Football fans	page 194
Star challenge 7: Favourite sports	page 195
Star challenge 8: The TV survey	page 195

Unit 5 section 6: Equivalent fractions

Star challenge 13: Fraction search for a half	page 199
Star challenge 14: Fraction search for a quarter	page 199

plenary

Resources

OHT N4.4c

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

0.1	$\frac{1}{10}$	10%
0.25	$\frac{1}{4}$	25%
0.75	$\frac{3}{4}$	75%
0.3	$\frac{3}{10}$	30%
0.7	$\frac{7}{10}$	70%
0.2	$\frac{1}{5}$	20%
0.4	$\frac{2}{5}$	40%
0.6	$\frac{3}{5}$	60%
0.8	$\frac{4}{5}$	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, $\frac{9}{10}$, 90%), including some that are greater than 1 (e.g. 1.25, $1\frac{1}{4}$, 125%).

Remember

- Percentage means per hundred, or in every hundred. Percentages like 47% and 83% can be written as $\frac{47}{100}$ and $\frac{83}{100}$.
- One half can be written as $\frac{1}{2}$, 0.5 or 50%.
- Since one quarter is one half of one half, one quarter is $\frac{1}{4}$, 0.25 or 25%. One eighth is half of one quarter, so one eighth is 12.5%.
- One tenth can be written as $\frac{1}{10}$, 0.1 or 10%. From this, you can work out that $\frac{7}{10} = 70\%$ or that $\frac{3}{10} = 30\%$.
- 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 $\frac{1}{2}$ 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 $\frac{1}{10}$ 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 $\frac{1}{100}$ 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:

$$1\% \text{ of } \pounds 200 = \pounds 2, \quad 1\% \text{ of } 3500 \text{ ml} = 35 \text{ ml}, \quad 1\% \text{ of } 250 \text{ m} = 2.5 \text{ m}$$

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

$$5\% \text{ of } 500 \text{ g}, \quad 8\% \text{ of } \pounds 200, \quad 2\% \text{ of } 3500 \text{ ml}, \quad 4\% \text{ of } 250 \text{ m}$$

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 $10\% \times 2$, 30% is $10\% \times 3$, 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 $10\% \times 9$;

60% is $50\% + 10\%$ or $10\% \times 6$;

75% is $50\% + 25\%$ or $25\% \times 3$.

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.

$$\frac{50}{100}$$

$$\frac{30}{100}$$

$$\frac{45}{100}$$

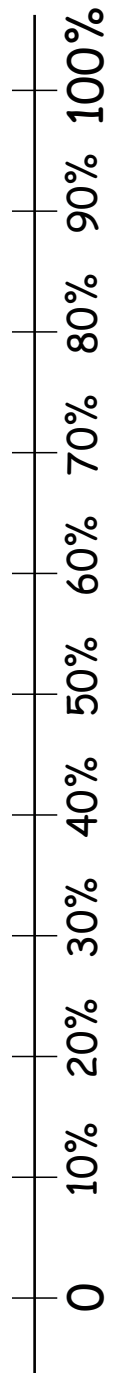
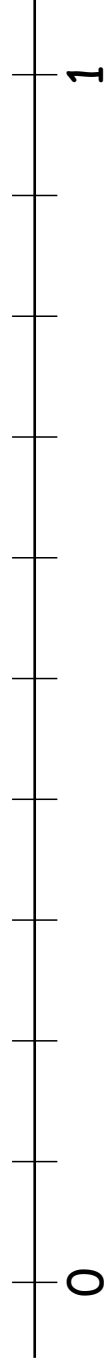
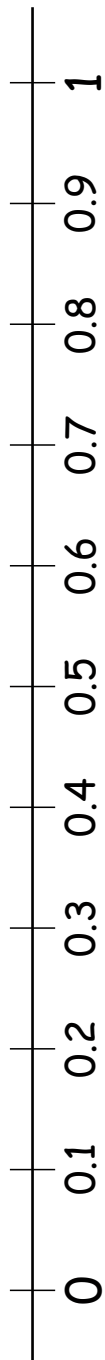
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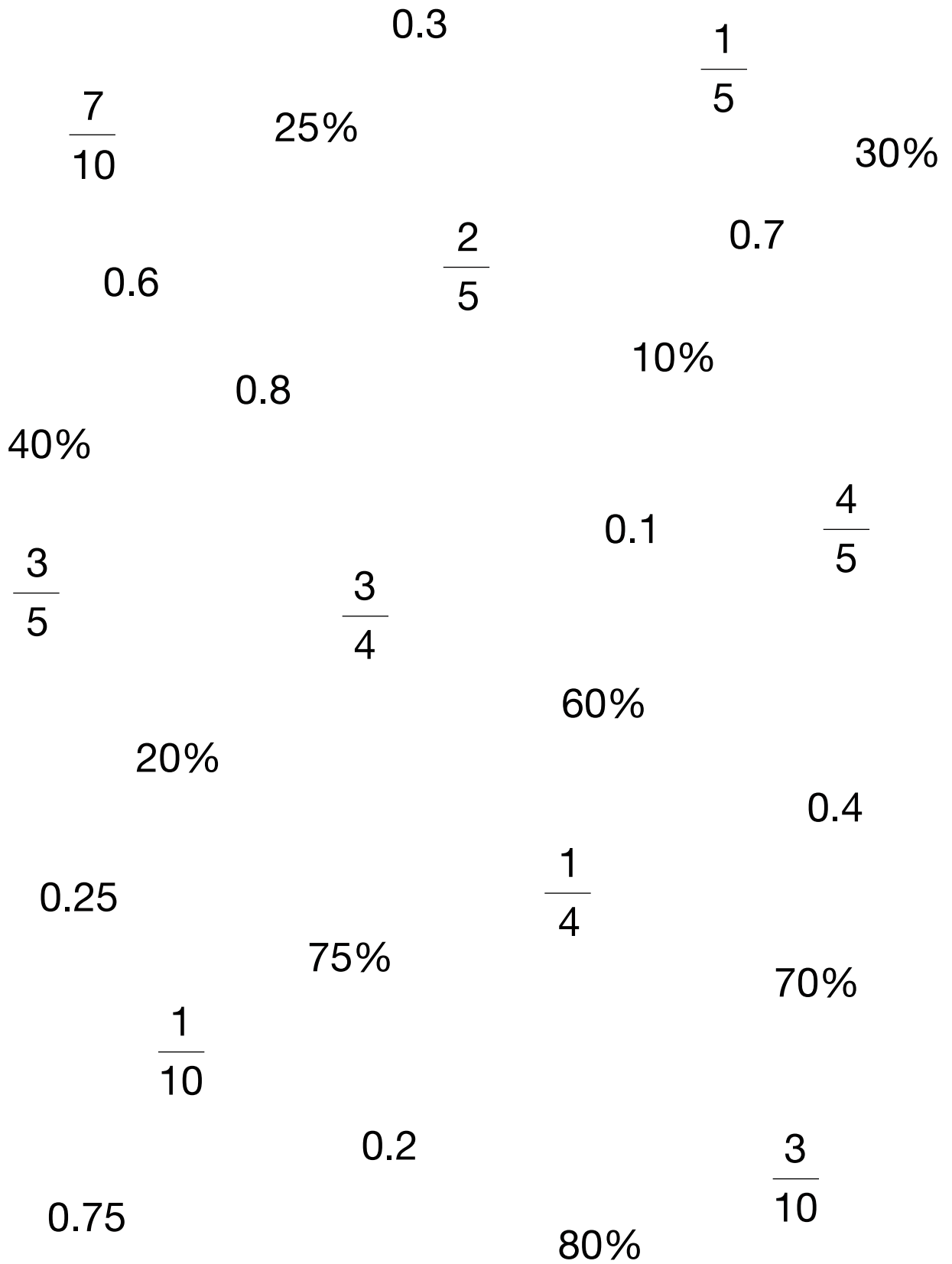
$$\frac{75}{100}$$

$$\frac{20}{100}$$

$$\frac{25}{100}$$

$$\frac{60}{100}$$

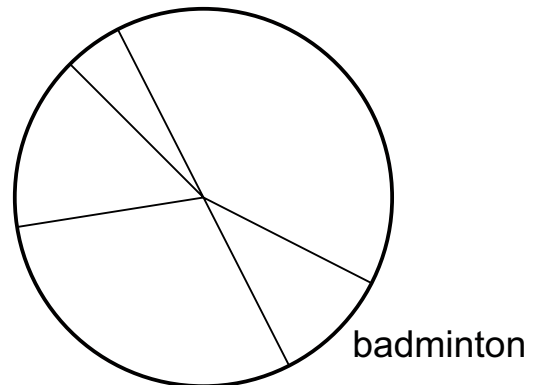




OHT N4.5a

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%	