



## Using fractions and percentages

- Expressing one number as a percentage of another
- Increasing and decreasing an amount by a percentage
- Solving problems involving percentage changes

Keywords

You should know

explanation 1a

explanation 1b

For questions 1–13, only use a calculator if you are asked to.

**1** Which fraction is bigger?

**a**  $\frac{3}{4}$  or  $\frac{5}{8}$

**b**  $\frac{3}{8}$  or  $\frac{1}{4}$

**c**  $\frac{2}{3}$  or  $\frac{3}{4}$

**d**  $\frac{11}{16}$  or  $\frac{5}{8}$

**e**  $\frac{5}{12}$  or  $\frac{17}{36}$

**f**  $\frac{2}{3}$  or  $\frac{7}{12}$

**g**  $\frac{4}{5}$  or  $\frac{7}{9}$

**h**  $\frac{13}{20}$  or  $\frac{5}{8}$

**2** Convert these into equivalent fractions, then state which is the smallest and which is the largest in each group.

**a**  $\frac{2}{3}, \frac{11}{15}, \frac{3}{5}$

**b**  $\frac{8}{9}, \frac{7}{8}, \frac{31}{36}$

**c**  $\frac{4}{7}, \frac{5}{8}, \frac{15}{28}$

**3** Convert these fractions into decimals using a calculator, then put them in order from smallest to largest.

**a**  $\frac{9}{25}, \frac{19}{50}, \frac{28}{75}$

**b**  $\frac{4}{5}, \frac{8}{11}, \frac{3}{4}$

**c**  $\frac{1}{6}, \frac{2}{13}, \frac{1}{3}$

**4** Write each of these as a fraction in its simplest form.

**a** 28 out of 72 people opposed the building of a new supermarket in the village.

**b** 34 out of 72 people were in favour of the supermarket.

**c** 10 out of 72 had no views on the subject.

**5** Write each of these as a fraction in its simplest form.

- a** 90 out of 105 people said their cats preferred new Tuna Treats.
- b** 10 out of 105 people said their cats preferred the old brand.
- c** 5 out of 105 people said they didn't know because their cats had been eating next door.

**6** This table shows the number of people crossing a new bridge at certain times of day.

Time	Number
08 00–10 00	38
10 00–12 00	20
12 00–14 00	17
14 00–16 00	10
16 00–18 00	23
18 00–20 00	42

Give your answers to these questions in their simplest form.

- a** What was the total number of people who crossed the bridge between 08:00 and 20:00?
- b** What fraction of the total number crossed the bridge at the most popular time?
- c** What fraction of the total number crossed the bridge when it was least busy?
- d** Work out the fraction who crossed the bridge between 08:00 and 14:00.

explanation 2a

explanation 2b

explanation 2c

**7** Convert these percentages into fractions.

- a** 75%
- b** 10%
- c** 50%
- d** 40%
- e** 1%

**8** Convert these fractions into percentages rounded to the nearest whole per cent.

- a**  $\frac{7}{10}$
- b**  $\frac{3}{20}$
- c**  $\frac{5}{35}$
- d**  $\frac{85}{95}$
- e**  $\frac{7}{200}$

**9** Convert these percentages into fractions and simplify where possible.

- a** 35%      **b** 28%      **c** 11%      **d** 65%      **e** 99%  
**f** 64%      **g** 32%      **h**  $7\frac{1}{2}\%$       **i**  $17\frac{1}{2}\%$       **j**  $12\frac{1}{2}\%$

**10** Write each of these decimals as a fraction in its simplest form.

- a** 0.37      **b** 0.62      **c** 0.74      **d** 0.05      **e** 0.01

**11** Write each of these fractions as a decimal (to 3 d.p. where necessary).

- a**  $\frac{8}{25}$       **b**  $\frac{1}{8}$       **c**  $\frac{5}{8}$       **d**  $\frac{19}{50}$       **e**  $\frac{43}{60}$

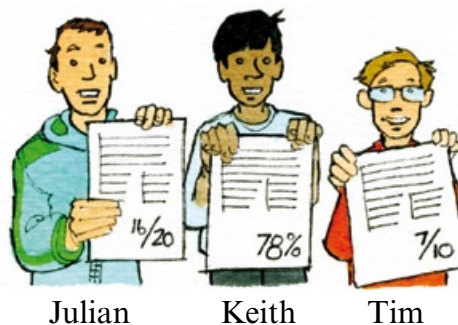
**12** Which is larger in each pair? Show your working.

- a**  $\frac{3}{4}$  or 80%      **b** 0.45 or  $\frac{9}{10}$       **c** 0.33 or 32%  
**d** 30% or  $\frac{3}{11}$       **e**  $\frac{1}{7}$  or 0.1      **f** 9% or  $\frac{1}{10}$

**13** Three boys, Julian, Keith and Tim, are in different classes for design and technology.

They were given these marks.

- a** Who got the highest score?  
**b** Who got the lowest score?



**explanation 3a**

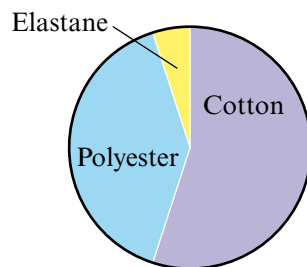
**explanation 3b**

For questions **14** onwards, calculators may be used, but try to use a mental method if you can.

**14** Work these out.

- a** 15% of 75      **b** 30% of 150      **c** 80% of 70  
**d** 45% of 120      **e** 65% of 3000      **f** 35% of 140  
**g** 32% of 180      **h** 17% of 200 kg      **i** 29% of 600 cm  
**j** 54% of 142 km      **k** 69% of 88 litres      **l** 87% of 365 g

- 15** A fabric is made of 55% cotton, 40% polyester and 5% elastane. Give each of these percentages as a fraction in its simplest form.



- 16** There are 20 classes in a school.
- a** 35% of them went to the dress rehearsal of the school musical. How many classes went?
  - b** In total, 205 students went to the rehearsal. 60% of them said they would buy a ticket to see it again. How many said they would buy a ticket to see it again?

explanation 4a

explanation 4b

- 17** Write these as percentages.

- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| <b>a</b> 20 out of 100              | <b>b</b> 20 out of 80             |
| <b>c</b> 5 out of 20                | <b>d</b> 9 out of 45              |
| <b>e</b> 30 out of 200              | <b>f</b> 30 out of 150            |
| <b>g</b> $12\frac{1}{2}$ out of 100 | <b>h</b> $2\frac{1}{2}$ out of 10 |

- 18** Write these as percentages. Give your answers to 1 d.p.

- |                            |                            |
|----------------------------|----------------------------|
| <b>a</b> 7.5 out of 11     | <b>b</b> 13 out of 25.6    |
| <b>c</b> 0.7 out of 0.8    | <b>d</b> 116 out of 253    |
| <b>e</b> 78.9 out of 102.6 | <b>f</b> 94.7 out of 114.2 |

- 19** A questionnaire about breakfast eating habits was answered by 75 people.

Of these 75 people, 24 did not eat breakfast that morning. What percentage did eat breakfast?



- 20 a** Katherine was organising the cooking for a meeting at her church. There were 72 people coming and 9 of them were vegetarian. What percentage of those coming were vegetarian?
- b** Ramal had 45 hens. 25 of them were laying eggs every day. What percentage of hens were laying eggs each day?
- c** Out of a group of 120 pupils at Greendale School, 25 named pizza as their favourite meal. What percentage is this?
- 21 a** In a group of 64 people, 27 had been to watch a sporting event in the last two months. What percentage of the group is this?
- b** There are 12.3 g of fruit in a 125 g pot of yogurt. What percentage of the yogurt is fruit?
- c** Hanri's garden has an area of  $48 \text{ m}^2$ .  $35 \text{ m}^2$  is grass. What percentage of the garden is *not* grass?

explanation 5a

explanation 5b

explanation 5c

**22** Work these out without using a calculator.

- |  |                               |
|--|-------------------------------|
| <b>a</b> Increase 80 by 25%.                 | <b>b</b> Increase 12 by 50%.  |
| <b>c</b> Increase 120 by 30%.                | <b>d</b> Increase 65 by 20%.  |
| <b>e</b> Increase 140 by 15%.                | <b>f</b> Increase 70 by 4%.   |
| <b>g</b> Decrease 75 by 20%.                 | <b>h</b> Decrease 800 by 20%. |
| <b>i</b> Decrease 9 by 33%.                  | <b>j</b> Decrease 250 by 3%.  |
| <b>k</b> Decrease 160 by $12\frac{1}{2}\%$ . | <b>l</b> Decrease 45 by 5%.   |

**23** A clock and watch shop increased all of its prices by 10%.

What is the new price of each item?

- a** a child's watch
- b** a grandfather clock
- c** a man's watch

Clock or watch	Old price
Child's watch	£29
Grandfather clock	£750
Man's watch	£89

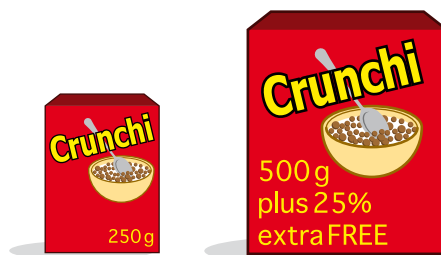
**24** The original price of a lamp was £89. If the price is reduced by 20%, what is the new price?

**25** In the Moneymaker Building Society, the current interest rate for savings is 6.95% per year.  
Stephen invests £800. How much money does he have in the account after one year?

**26** The population of parakeets on a remote tropical island increased by 4% one year.  
If there were 500 parakeets initially, how many were there at the end of the year?



**27** Which is better value:  
a 250 g packet of cereal for 60p  
or a 500 g + 25% extra packet for £1.40?



**28** Chandra bought a digital camera in a 20% off sale.  
The original price of the camera was £1650.

- a** How much did Chandra pay for the camera?
- b** Chandra sold the camera 3 months later at a 15% loss.  
For how much did she sell the camera?

**29** Copy and complete these statements to work out VAT at 17.5% on £360.

	10% of £360 is £ <input type="text"/>
	5% of £360 is £ <input type="text"/>
	2.5% of £360 is £ <input type="text"/>
TOTAL	17.5% of £360 is £ <input type="text"/>

**30** Work out each increase as a percentage.

**a** From 12 to 21

**b** From 90 to 99

**c** From 100 to 140

**d** From 18 to 25

**31** Work out, without using a calculator, each percentage decrease.

**a** From 15 to 9

**b** From 110 to 99

**c** From 45 to 36

**d** From 150 to 100

**32** Chelsea increased her average runs in cricket from 20 runs per match last season to 25 runs per match this season.  
What percentage increase is this?

**33** Dresses are bought in a batch from the wholesaler at a cost of £23.50 each and sold at £30.55 each.  
What is the percentage mark-up on each dress?

**34** Over a two-year period the population of a town increased from 145 000 to 205 000. What percentage increase is this?

**35** The Birch's living room was  $14\text{ m}^2$ .  
They thought it was too small and so they extended it so the area became  $30\text{ m}^2$ .  
By what percentage has the area increased?

**36** A newborn baby dropped in weight from 4500 g to 3200 g.  
What percentage loss is this?

**37** Thomas was studying expansion in science.  
He heated a metal bar and noticed it increased in length from 1.16 m to 1.18 m.  
What percentage increase is this?

**38** Membership numbers at the Trooper Squash Club dropped from 3402 to 1558 last season when a new club opened. What percentage decrease is this?