

# 4 Fractions and Percentages

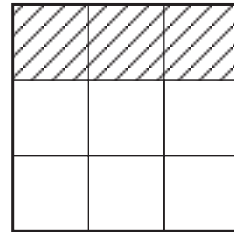
## 4.1 Equivalent Fractions

Equivalent fractions are revisited in this section.



### Example 1

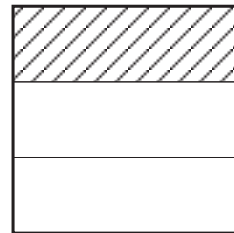
Write down in 2 different ways, the fraction of this large square which been shaded.



### Solution

$\frac{3}{9}$ , as 3 of the 9 squares are shaded.

$\frac{1}{3}$ , as the shape could have been drawn like this:



### Example 2

Complete each of the following expressions:

(a)  $\frac{3}{4} = \frac{\square}{12}$

(b)  $\frac{2}{3} = \frac{\square}{15}$

(c)  $\frac{5}{6} = \frac{\square}{18}$

(d)  $\frac{4}{12} = \frac{\square}{3}$



### Solution

(a)  $\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$

(b)  $\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$

(c)  $\frac{5}{6} = \frac{5 \times 3}{6 \times 3} = \frac{15}{18}$

(d)  $\frac{4}{12} = \frac{4 \div 4}{12 \div 4} = \frac{1}{3}$



### Example 3

Write each of the following fractions in their simplest form:

(a)  $\frac{8}{18}$

(b)  $\frac{5}{40}$

(c)  $\frac{12}{32}$



### Solution

(a)  $\frac{8}{18} = \frac{4}{9}$  (dividing top and bottom by 2)

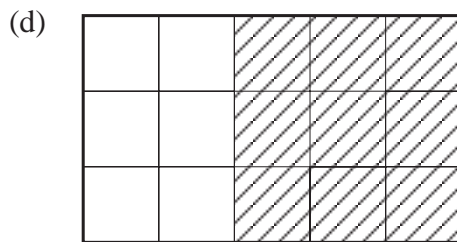
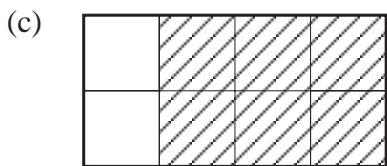
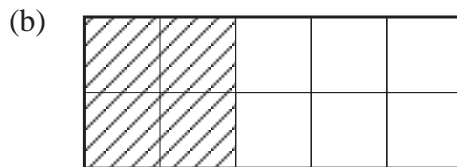
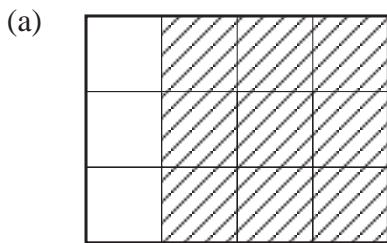
(b)  $\frac{5}{40} = \frac{1}{8}$  (dividing top and bottom by 5)

(c)  $\frac{12}{32} = \frac{3}{8}$  (dividing top and bottom by 4)



### Exercises

1. Write, in two different ways the fraction of each shape which has been shaded:



2. Fill in the missing number in each of the following statements:

(a)  $\frac{3}{5} = \frac{\square}{20}$

(b)  $\frac{3}{4} = \frac{\square}{12}$

(c)  $\frac{4}{7} = \frac{\square}{35}$

(d)  $\frac{5}{9} = \frac{\square}{18}$

(e)  $\frac{3}{7} = \frac{\square}{28}$

(f)  $\frac{3}{8} = \frac{\square}{40}$

(g)  $\frac{4}{5} = \frac{\square}{30}$

(h)  $\frac{2}{9} = \frac{\square}{36}$

(i)  $\frac{9}{10} = \frac{\square}{60}$

(j)  $\frac{4}{7} = \frac{\square}{28}$

(k)  $\frac{7}{11} = \frac{\square}{66}$

(l)  $\frac{5}{8} = \frac{\square}{64}$

3. Fill in the missing numbers in the following statements:

(a)  $\frac{10}{15} = \frac{\square}{3}$

(b)  $\frac{11}{44} = \frac{\square}{4}$

(c)  $\frac{20}{60} = \frac{\square}{3}$

(d)  $\frac{10}{16} = \frac{\square}{8}$

(e)  $\frac{30}{36} = \frac{\square}{6}$

(f)  $\frac{10}{50} = \frac{\square}{5}$

(g)  $\frac{4}{28} = \frac{\square}{7}$

(h)  $\frac{18}{24} = \frac{\square}{4}$

(i)  $\frac{14}{100} = \frac{\square}{50}$

(j)  $\frac{24}{56} = \frac{\square}{7}$

4. Write each of the following fractions in its simplest form:

(a)  $\frac{4}{8}$       (b)  $\frac{6}{9}$       (c)  $\frac{20}{25}$       (d)  $\frac{3}{18}$

(e)  $\frac{20}{100}$       (f)  $\frac{20}{50}$       (g)  $\frac{16}{40}$       (h)  $\frac{32}{40}$

(i)  $\frac{21}{28}$       (j)  $\frac{16}{24}$       (k)  $\frac{15}{21}$       (l)  $\frac{28}{35}$

5. Write each of the following fractions in *two* different ways:

(a)  $\frac{2}{7}$       (b)  $\frac{3}{8}$       (c)  $\frac{5}{9}$

6. Is each of the following statements *true* or *false*:

(a)  $\frac{4}{7} = \frac{16}{21}$

(b)  $\frac{3}{8} = \frac{12}{32}$

(c)  $\frac{4}{5} = \frac{16}{20}$

(d)  $\frac{5}{9} = \frac{25}{45}$

7. (a) Fill in the missing number in each of the following statements:

$$\frac{4}{5} = \frac{\square}{40}$$

$$\frac{5}{8} = \frac{\square}{40}$$

(b) Which of the fractions  $\frac{4}{5}$  and  $\frac{5}{8}$  is the *larger*?

8. (a) Fill in the missing number in each of the following statements:

$$\frac{5}{7} = \frac{\square}{21}$$

$$\frac{2}{3} = \frac{\square}{21}$$

(b) Which of the fractions  $\frac{5}{7}$  and  $\frac{2}{3}$  is the *smaller*?

9. Which of these fractions is the *largest*?

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

10. Write the following fractions in order of size, with the *smallest* first:

$$\frac{1}{5} \quad \frac{1}{4} \quad \frac{2}{9} \quad \frac{1}{2} \quad \frac{5}{9}$$

## 4.2 Fractions of Quantities

In this section we review how to find fractions of quantities; for example,  $\frac{3}{4}$  of 60.



### Example 1

Calculate:

- (a)  $\frac{1}{3}$  of £60,                      (b)  $\frac{1}{5}$  of £40.



### Solution

(a)  $60 \div 3 = 20$

So  $\frac{1}{3}$  of £60 = £20.

(b)  $40 \div 5 = 8$

So  $\frac{1}{5}$  of £40 = £8.



### Example 2

Calculate:

- (a)  $\frac{3}{4}$  of 700,                      (b)  $\frac{5}{7}$  of 21.



### Solution

(a)  $700 \div 4 = 175$

$175 \times 3 = 525$

So  $\frac{3}{4}$  of 700 = 525.

(b)  $21 \div 7 = 3$

$5 \times 3 = 15$

So  $\frac{5}{7}$  of 21 = 15.



## Exercises

1. Calculate:

(a)  $\frac{1}{5}$  of 10

(b)  $\frac{1}{3}$  of 12

(c)  $\frac{1}{4}$  of 20

(d)  $\frac{1}{7}$  of 28

(e)  $\frac{1}{6}$  of 24

(f)  $\frac{1}{5}$  of 30

(g)  $\frac{1}{9}$  of 18

(h)  $\frac{1}{3}$  of 24

(i)  $\frac{1}{8}$  of 32

2. Calculate:

(a)  $\frac{3}{4}$  of 20

(b)  $\frac{2}{5}$  of 15

(c)  $\frac{3}{8}$  of 24

(d)  $\frac{2}{3}$  of 24

(e)  $\frac{3}{7}$  of 28

(f)  $\frac{3}{5}$  of 40

(g)  $\frac{5}{8}$  of 32

(h)  $\frac{4}{5}$  of 30

(i)  $\frac{5}{9}$  of 36

3. In a class there are 28 pupils;  $\frac{1}{2}$  of these pupils are girls.

How many girls are in the class?

4. A can holds 330 ml of drink. Javinda drinks  $\frac{1}{3}$  of the contents of the can.

(a) How much has Javinda drunk?

(b) How much drink is left in the can?

5. There are 320 sweets in a large tin. Laura eats  $\frac{3}{8}$  of the sweets.

(a) How many sweets does she eat?

(b) How many sweets are left?

6. A car journey is 120 miles. Richard has driven  $\frac{3}{5}$  of this distance.

(a) How far has Richard driven?

(b) How much further does he have to drive to complete the journey?

7. There are 300 passengers on a train. At a station,  $\frac{3}{5}$  of the passengers get off.
- How many people get off the train?
  - How many passengers are left on the train?
8. Alison has £30. She decides to save  $\frac{2}{5}$  of this and to spend  $\frac{1}{6}$  on books.
- How much money does she save?
  - How much does she spend on books?
  - How much does she have left?
9. A farmer owns 360 hectares of land. He plants potatoes on  $\frac{3}{10}$  of his land.  
How many hectares are planted with potatoes?
10. An engineer tests a box of 120 floppy disks. He finds that  $\frac{1}{20}$  of the disks are damaged. How many of the disks are damaged?
11. Sue and Ben each have 12 biscuits.
- Sue eats a quarter of her biscuits. How many biscuits does Sue eat?
  - Ben eats 6 of his biscuits. What fraction of his biscuits does Ben eat?
  - How many biscuits are left altogether?

(KS3/97/Ma/Tier 3-5/P1)



## 4.3 Operations with Fractions

Here we review how to *add*, *subtract*, *multiply* and *divide* fractions.



### Example 1

Calculate:

(a)  $\frac{3}{5} + \frac{1}{4}$

(b)  $\frac{5}{7} - \frac{2}{3}$



### Solution

Before fractions can be added or subtracted, they must each have the same denominator (known as a *common denominator*).

$$\begin{aligned} \text{(a)} \quad \frac{3}{5} + \frac{1}{4} &= \frac{12}{20} + \frac{5}{20} \\ &= \frac{17}{20} \end{aligned}$$

$$(b) \quad \frac{5}{7} - \frac{2}{3} = \frac{15}{21} - \frac{14}{21}$$

$$= \frac{1}{21}$$



### Example 2

Calculate:

$$(a) \quad \frac{4}{5} \times \frac{3}{7}$$

$$(b) \quad \frac{5}{8} \times \frac{2}{7}$$



### Solution

$$(a) \quad \frac{4}{5} \times \frac{3}{7} = \frac{4 \times 3}{5 \times 7}$$

$$= \frac{12}{35}$$

$$(b) \quad \frac{5}{8} \times \frac{2}{7} = \frac{5 \times 2}{8 \times 7}$$

$$= \frac{10}{56}$$

$$= \frac{5}{28}$$

OR

$$\frac{5}{8} \times \frac{2}{7} = \frac{5 \times 1}{4 \times 7}$$

$$= \frac{5}{28}$$



### Example 3

Calculate:

$$(a) \quad \frac{3}{5} \div \frac{2}{3}$$

$$(b) \quad \frac{5}{7} \div \frac{3}{4}$$



### Solution

$$(a) \quad \frac{3}{5} \div \frac{2}{3} = \frac{3}{5} \times \frac{3}{2}$$

$$= \frac{9}{10}$$

$$(b) \quad \frac{5}{7} \div \frac{3}{4} = \frac{5}{7} \times \frac{4}{3}$$

$$= \frac{20}{21}$$



### Example 4

Calculate:

$$(a) \quad 1\frac{1}{2} \times 1\frac{1}{4}$$

$$(b) \quad 1\frac{1}{5} \div 2\frac{1}{4}$$



### Solution

$$\begin{aligned} (a) \quad 1\frac{1}{2} \times 1\frac{1}{4} &= \frac{3}{2} \times \frac{5}{4} \\ &= \frac{15}{8} \\ &= 1\frac{7}{8} \end{aligned}$$

$$\begin{aligned} (b) \quad 1\frac{1}{5} \div 2\frac{1}{4} &= \frac{6}{5} \div \frac{9}{4} \\ &= \frac{6}{5} \times \frac{4}{9} \\ &= \frac{24}{45} \\ &= \frac{8}{15} \end{aligned}$$

(You could cancel at this stage to give

$$\frac{2}{5} \times \frac{4}{3}, \text{ etc.})$$



### Exercises

1. Calculate:

$$(a) \quad \frac{1}{7} + \frac{4}{7}$$

$$(b) \quad \frac{3}{8} + \frac{5}{8}$$

$$(c) \quad \frac{3}{10} + \frac{1}{10}$$

$$(d) \quad \frac{1}{5} + \frac{3}{5}$$

$$(e) \quad \frac{4}{9} + \frac{2}{9}$$

$$(f) \quad \frac{1}{6} + \frac{5}{6}$$

2. Calculate:

$$(a) \quad \frac{1}{2} + \frac{1}{3}$$

$$(b) \quad \frac{1}{5} + \frac{1}{4}$$

$$(c) \quad \frac{1}{7} + \frac{1}{3}$$

$$(d) \quad \frac{2}{5} + \frac{3}{4}$$

$$(e) \quad \frac{1}{7} + \frac{3}{8}$$

$$(f) \quad \frac{1}{6} + \frac{2}{3}$$

(g)  $\frac{3}{4} + \frac{2}{3}$

(h)  $\frac{3}{5} + \frac{2}{3}$

(i)  $\frac{4}{7} + \frac{2}{5}$

(j)  $\frac{5}{6} + \frac{2}{3}$

(k)  $\frac{1}{8} + \frac{2}{3}$

(l)  $\frac{4}{5} + \frac{5}{6}$

3. Calculate:

(a)  $\frac{1}{2} \times \frac{1}{3}$

(b)  $\frac{4}{5} \times \frac{2}{3}$

(c)  $\frac{1}{8} \times \frac{2}{3}$

(d)  $\frac{5}{6} \times \frac{3}{4}$

(e)  $\frac{4}{5} \times \frac{5}{7}$

(f)  $\frac{3}{8} \times \frac{1}{4}$

(g)  $\frac{4}{5} \times \frac{1}{2}$

(h)  $\frac{2}{3} \times \frac{3}{4}$

(i)  $\frac{5}{8} \times \frac{2}{3}$

(j)  $\frac{3}{7} \times \frac{2}{3}$

(k)  $\frac{4}{8} \times \frac{3}{4}$

(l)  $\frac{7}{8} \times \frac{2}{3}$

4. Calculate:

(a)  $\frac{1}{2} \div \frac{1}{3}$

(b)  $\frac{3}{4} \div \frac{2}{3}$

(c)  $\frac{4}{5} \div \frac{2}{3}$

(d)  $\frac{2}{3} \div \frac{2}{5}$

(e)  $\frac{3}{7} \div \frac{3}{4}$

(f)  $\frac{5}{8} \div \frac{3}{4}$

(g)  $\frac{4}{15} \div \frac{2}{3}$

(h)  $\frac{2}{3} \div \frac{5}{7}$

(i)  $\frac{3}{7} \div \frac{3}{5}$

(j)  $\frac{4}{9} \div \frac{2}{3}$

(k)  $\frac{3}{8} \div \frac{6}{7}$

(l)  $\frac{7}{9} \div \frac{2}{3}$

5. Calculate:

(a)  $1\frac{1}{2} \times 2\frac{1}{4}$

(b)  $2\frac{1}{2} \times 1\frac{1}{3}$

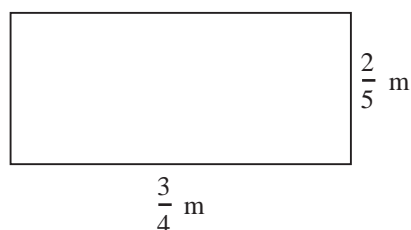
(c)  $2\frac{1}{3} \times 1\frac{3}{4}$

(d)  $3\frac{1}{4} \times 1\frac{1}{3}$

(e)  $2\frac{1}{2} \times 1\frac{1}{2}$

(f)  $1\frac{1}{5} \times 1\frac{1}{2}$

6. Calculate the area and perimeter of the rectangle shown:



7. Julie has a vegetable plot that has an area of  $\frac{2}{3}$  of an acre.

She plants potatoes on  $\frac{1}{4}$  of the plot.

What fraction of an acre does she plant with potatoes?

8. Which is the *larger*

$$\frac{3}{4} \times \frac{1}{2} \quad \text{or} \quad \frac{3}{4} \div \frac{1}{2} ?$$

9. Solve these equations:

(a)  $\frac{2}{3}x = \frac{4}{9}$

(b)  $\frac{3}{5}x = \frac{9}{4}$

10. If the area of the rectangle shown is  $1\frac{1}{2} \text{ m}^2$ , what is the length of the rectangle?



11. (a) In a magazine there are three adverts on the same page.

Advert 1 uses  $\frac{1}{4}$  of the page

Advert 2 uses  $\frac{1}{8}$  of the page

Advert 3 uses  $\frac{1}{16}$  of the page

In total, what fraction of the page do the three adverts use? Show your working.

- (b) The cost of an advert is £10 for each  $\frac{1}{32}$  of a page.

An advert uses  $\frac{3}{16}$  of a page. How much does the advert cost?

(KS3/99/Ma/Tier 4-6/P1)



12. (a) Alan had this special rectangle.



He cut off  $\frac{1}{3}$  of the rectangle.

↓ subtract  $\frac{1}{3}$

He had this square left.



↓ add on ?

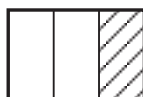
Alan put back the piece he had cut off.

He said:

"I've added on  $\frac{1}{3}$  of the square."

He was wrong. Explain why.

What fraction of the square did he add on?



(b) Look at shape 1 and shape 2.

shape 1



↓ subtract  $\frac{1}{4}$   
of shape 1

shape 2



What fraction of shape 2 is added on to get back to shape 1?

↓ add on . . . .  
of shape 2

shape 1



(c) Look at the numbers on the bottom of the fractions in (a) and (b).

Suppose you subtract  $\frac{1}{8}$  of a shape.

You want to get back to the shape you started with.  
What fraction of the new shape would you add on?

(d) Suppose you subtract  $\frac{1}{n}$  of a shape.

You want to get back to the shape you started with.  
What fraction of the new shape would you add on?



**Solution**

$$\begin{aligned} \text{(a)} \quad 0.72 &= \frac{72}{100} \\ &= 72\% \quad \text{as a percentage} \end{aligned}$$

$$\begin{aligned} 0.72 &= \frac{72}{100} \\ &= \frac{18}{25} \quad \text{as a fraction in its simplest form} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 0.08 &= \frac{8}{100} \\ &= 8\% \quad \text{as a percentage} \end{aligned}$$

$$\begin{aligned} 0.08 &= \frac{8}{100} \\ &= \frac{2}{25} \quad \text{as a fraction in its simplest form} \end{aligned}$$

**Example 3**

Write each of the following fractions as a decimal and as a percentage:

$$\text{(a)} \quad \frac{3}{10} \qquad \text{(b)} \quad \frac{4}{25} \qquad \text{(c)} \quad \frac{3}{8}$$

**Solution**

$$\begin{aligned} \text{(a)} \quad \frac{3}{10} &= \frac{30}{100} \quad (\text{multiply top and bottom by } 10) \\ &= 0.3 \quad \text{as a decimal} \\ &= 30\% \quad \text{as a percentage} \end{aligned}$$

$$\begin{aligned} \frac{4}{25} &= \frac{16}{100} \quad (\text{multiply top and bottom by } 4) \\ &= 0.16 \quad \text{as a decimal} \\ &= 16\% \quad \text{as a percentage} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{3}{8} &= \frac{37.5}{100} \quad (\text{multiply top and bottom by } 12.5) \\ &= 0.375 \quad \text{as a decimal} \\ &= 37.5\% \quad \text{as a percentage} \end{aligned}$$



## Exercises

1. Write each of the following percentages as a decimal:

- |         |         |         |
|---------|---------|---------|
| (a) 60% | (b) 70% | (c) 20% |
| (d) 45% | (e) 31% | (f) 82% |
| (g) 14% | (h) 4%  | (i) 63% |
| (j) 2%  | (k) 1%  | (l) 19% |

2. Write each of the following percentages as a fraction in its simplest form:

- |         |         |         |
|---------|---------|---------|
| (a) 80% | (b) 25% | (c) 40% |
| (d) 35% | (e) 65% | (f) 4%  |
| (g) 64% | (h) 82% | (i) 28% |
| (j) 6%  | (k) 7%  | (l) 92% |

3. Write each of the following decimals as a percentage:

- |          |           |           |
|----------|-----------|-----------|
| (a) 0.74 | (b) 0.99  | (c) 0.5   |
| (d) 0.06 | (e) 0.26  | (f) 0.02  |
| (g) 0.3  | (h) 0.002 | (i) 0.042 |

4. Write each of the following decimals as a fraction in its simplest form:

- |          |          |          |
|----------|----------|----------|
| (a) 0.5  | (b) 0.25 | (c) 0.4  |
| (d) 0.7  | (e) 0.62 | (f) 0.44 |
| (g) 0.37 | (h) 0.04 | (i) 0.05 |
| (j) 0.24 | (k) 0.1  | (l) 0.74 |

5. Write each of the following fractions as a decimal:

- |                      |                     |                     |
|----------------------|---------------------|---------------------|
| (a) $\frac{1}{2}$    | (b) $\frac{3}{4}$   | (c) $\frac{4}{5}$   |
| (d) $\frac{9}{20}$   | (e) $\frac{7}{10}$  | (f) $\frac{3}{100}$ |
| (g) $\frac{19}{100}$ | (h) $\frac{23}{50}$ | (i) $\frac{7}{25}$  |
| (j) $\frac{8}{25}$   | (k) $\frac{1}{8}$   | (l) $\frac{5}{8}$   |

6. Write each of the following fractions as a percentage:

(a)  $\frac{9}{10}$

(b)  $\frac{17}{100}$

(c)  $\frac{14}{25}$

(d)  $\frac{3}{20}$

(e)  $\frac{2}{5}$

(f)  $\frac{3}{5}$

(g)  $\frac{9}{20}$

(h)  $\frac{9}{100}$

(i)  $\frac{1}{100}$

(j)  $\frac{3}{50}$

(k)  $\frac{7}{8}$

(l)  $\frac{7}{200}$

7. Copy and complete this table of equivalent fractions, decimals and percentages:

<i>Fraction</i>	<i>Decimal</i>	<i>Percentage</i>
$\frac{4}{5}$		
	0.68	
		85%
	0.76	
$\frac{8}{25}$		
		3%
	0.005	

8. In a survey, 400 people were asked how they would vote at the next election. The results are listed below:

*Labour*                      220

*Conservative*              160

*Other*                            20

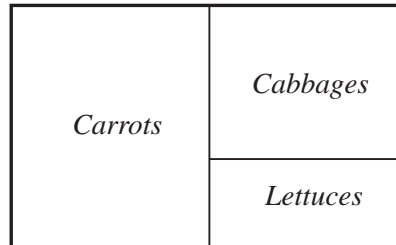
Express these results as percentages.

9. In a school there are 50 Manchester City supporters out of a total of 2000 pupils.

(a) What percentage of the pupils support Manchester City?

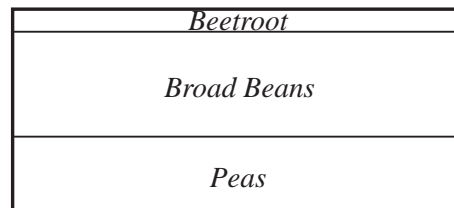
(b) What percentage of the pupils do *not* support Manchester City?

10. In a group of 40 pupils there are 7 who cannot swim.  
What percentage of the pupils *can* swim?
11. Simon is growing vegetables in three vegetable patches.
- (a) About 50% of this vegetable patch is for *carrots*.



Write down the missing *percentages*:

- (i) about . . . % of the patch is for *cabbages*,
- (ii) about . . . % of the patch is for *lettuces*.
- (b) About  $\frac{1}{8}$  of this vegetable patch is for *beetroot*.



Write down the missing *fractions*:

- (i) about . . . of the patch is for *broad beans*.
- (ii) about . . . of the patch is for *peas*.
- (c) About  $\frac{4}{5}$  of this vegetable patch is for *potatoes*.

Copy the diagram below and draw a straight line to show how much of the patch is for *potatoes*. Shade in the area for potatoes.

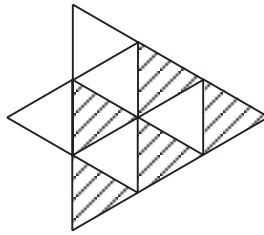


The rest of the patch is for *turnips*.

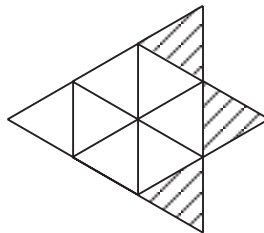
About what fraction of the patch is for *turnips*?

(KS3/96/Ma/Tier 4-6/P1)

12.  $\frac{1}{2}$  of the diagram below is shaded.



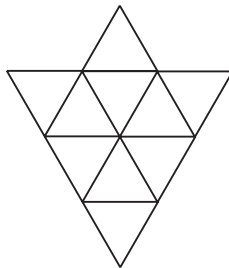
- (a) Look at this diagram:



What *fraction* is shaded?

What *percentage* is shaded?

- (b) Copy the diagram below and shade  $\frac{2}{5}$  of it.



What *percentage* of the diagram have you shaded?

(KS3/97/Ma/Tier 3-5/P1)

## 4.5 Percentage Increases and Decreases

Often prices are increased or decreased by a percentage. In this section we consider how to increase or decrease quantities by using percentages.



### Example 1

Katie earns £40 per week for her part-time job. She is to be given a 5% pay rise. How much will she earn per week after the pay rise?

**Solution**

$$\begin{aligned} 5\% \text{ of } \pounds 40 &= \frac{5}{100} \times \pounds 40 \\ &= \pounds 2 \end{aligned}$$

*OR*

$$100\% + 5\% = 105\%$$

which is 1.05 as a decimal

$$\begin{aligned} \text{New pay} &= \pounds 40 + \pounds 2 \\ &= \pounds 42 \end{aligned}$$

$$\begin{aligned} \text{New pay} &= \pounds 40 \times 1.05 \\ &= \pounds 42 \end{aligned}$$

**Example 2**

The prices of all the televisions in a shop are to be increased by 8%. Calculate the new price of a television that originally cost £150.

**Solution**

$$\begin{aligned} 8\% \text{ of } \pounds 150 &= \frac{8}{100} \times \pounds 150 \\ &= \pounds 12 \end{aligned}$$

*OR*

$$100\% + 8\% = 108\%$$

which is 1.08 as a decimal

$$\begin{aligned} \text{New price} &= \pounds 150 + \pounds 12 \\ &= \pounds 162 \end{aligned}$$

$$\begin{aligned} \text{New price} &= \pounds 150 \times 1.08 \\ &= \pounds 162 \end{aligned}$$

**Example 3**

In a sale the cost of a computer is reduced by 30%. The normal price of the computer was £900. Calculate the sale price of the computer.

**Solution**

$$\begin{aligned} 30\% \text{ of } \pounds 900 &= \frac{30}{100} \times \pounds 900 \\ &= \pounds 270 \end{aligned}$$

*OR*

$$100\% - 30\% = 70\%$$

which is 0.7 as a decimal

$$\begin{aligned} \text{Sale price} &= \pounds 900 - \pounds 270 \\ &= \pounds 630 \end{aligned}$$

$$\begin{aligned} \text{New price} &= \pounds 900 \times 0.7 \\ &= \pounds 630 \end{aligned}$$



## Exercises

1. (a) Increase £100 by 20%. (b) Increase £400 by 30%.  
 (c) Increase £80 by 25%. (d) Increase £50 by 6%.  
 (e) Increase 40 kg by 3%. (f) Increase 250 m by 7%.
2. (a) Decrease £60 by 30%. (b) Decrease 8 m by 5%.  
 (c) Decrease 80 kg by 10%. (d) Decrease £44 by 20%.  
 (e) Decrease 90 m by 2%. (f) Decrease 420 kg by 25%.
3. A company increases the cost of all its products by 5%. Calculate the new price of each of the items listed below:
  - (a) a tent that previously cost £60.
  - (b) a rucksack that previously cost £15,
  - (c) a sleeping bag that previously cost £24.
4. Joe was paid £30 per week for delivering papers. He was given a 3% pay rise. How much will he now earn each week?

5. A small firm employs 4 staff. They are all given a 4% pay rise. The original salaries are as follows:

John Smith	£24 000
Alice Holland	£22 500
Graham Hall	£14 000
Emma Graham	£8500

Calculate the new salary for each member of staff.

6. Rachel puts £50 into a bank account. After one year 5% interest is added to her money. How much does she have then?
7. Add  $17\frac{1}{2}\%$  VAT to each of the following prices:
  - (a) £200
  - (b) £70
  - (c) £42
8. A rope is 8 m long but it shrinks when it gets wet. What would be the new length of the rope if its length is reduced by:
  - (a) 2%
  - (b) 7%
  - (c) 12% ?

9. In a sale the prices of each of the items listed below is to be reduced by 35%.

<i>Coat</i>	£28	<i>Jeans</i>	£42
<i>Trainers</i>	£36	<i>Shirt</i>	£14

Calculate the sale price of each item.

10. A mountain bike was priced at £180. Its price was increased by 8%. Later, this increased price was reduced by 20% in a sale.

Calculate the sale price of the bike.



11. This is how Caryl works out 15% of 120 in her head.

10% of 120 is 12,

5% of 120 is 6,

so 15% of 120 is 18.

- (a) Copy and complete the following calculations to show how Caryl can work out  $17\frac{1}{2}\%$  of 240 in her head.

..... % of 240 is .....

..... % of 240 is .....

..... % of 240 is .....

so  $17\frac{1}{2}\%$  of 240 is .....

- (b) Work out 35% of 250. Show your working.

(KS3/98/Ma/Tier 3-5/P1)

12. Look at this table:

*Birth rate per 1000 population*

	1961	1994
<i>England</i>	17.6	
<i>Wales</i>	17.0	12.2

- (a) In England, from 1961 to 1994, the birth rate fell by 26.1%  
What was the birth rate in England in 1994? Show your working.
- (b) In Wales, the birth rate also fell.  
Calculate the percentage fall from 1961 to 1994. Show your working.

(KS3/98/Ma/Tier 5-7/P2)

13. The table shows the land area of each of the World's continents.

<i>Continent</i>	<i>Land Area (in 1000 km<sup>2</sup>)</i>
Africa	30 264
Antarctica	13 209
Asia	44 250
Europe	9 907
North America	24 398
Oceania	8 534
South America	17 793
<i>World</i>	148 355

- (a) Which continent is approximately 12% of the World's land area?
- (b) What percentage of the World's land area is Antarctica? Show your working.
- (c) About 30% of the World's area is land. The rest is water. The amount of land in the World is about 150 million km<sup>2</sup>.

Work out the approximate total area (land and water) of the World. Show your working.

(KS3/98/Ma/Tier 6-8/P2)



14. In 1995, the Alpha Company employed 4000 people. For each of the next 2 years, the number of people employed increased by 10%.

1995	employed 4000 people
1996	employed 10% more people
1997	employed 10% more people

- (a) Tony said:  
*"Each year, the Alpha Company employed another 400 people."*  
 Tony was wrong. Explain why.
- (b) Which of the calculations below shows how many people worked for the company in 1997:
- (i)  $4000 \times 0.1 \times 2$       (ii)  $4000 \times 0.1^2$       (iii)  $(4000 \times 0.1)^2$
- (iv)  $4000 \times 1.1 \times 2$       (v)  $4000 \times 1.1^2$       (vi)  $(4000 \times 1.1)^2$

- (c) Look at these figures for the Beta Company:

1995	employed $n$ people
1996	employed 20% fewer people
1997	employed 10% more people

Write an expression using  $n$  to show how many people the company employed in 1997. Show your working and write your expression as simply as possible.

(KS3/99/Ma/Tier 6-8/P1)

15. A clothes shop had a closing down sale. The sale started on Tuesday and finished on Saturday. For each day of the sale, prices were reduced by 15% of the prices on the day before.
- (a) A shirt had a price of £19.95 on Monday. Kevin bought it on Wednesday. How much did he pay? Show your working.
- (b) Ghita bought a dress on Tuesday for £41.48. What was its price on Monday? Show your working.
- (c) A jacket had a price of £49.95 on Monday. What was its price on Friday? Show your working.
- (d) Another shop is reducing its prices each day by 12% of the prices on the day before. How many days would it take for its original prices to be reduced by more than 50%? Show your working.

(KS3/96/Ma/Tier 6-8/P2)