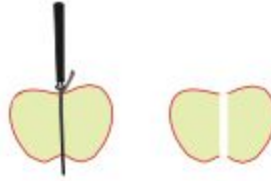


A **fraction** represents a part of any quantity.

For example:

- Half of an apple.

An apple was cut into two equal pieces and one piece was chosen.

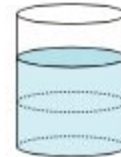


One half is written as  $\frac{1}{2}$  ↙ indicates the number of parts being considered.  
↘ indicates the number of equal parts in a whole.

There are two halves in a whole.

- The container is two thirds full.

Two thirds is written as  $\frac{2}{3}$  ↙ indicates the number of filled parts.  
↘ indicates the number of equal parts in a whole.



There are three thirds in a whole.

Notice that  $\frac{1}{3}$  of the container is empty.  $\frac{2}{3} + \frac{1}{3} = 1$



[filled part of container + empty part of container = whole container]

## EXERCISE 6A

- 1 Write a fraction to describe the number of coloured parts:

a



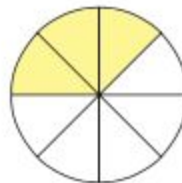
b



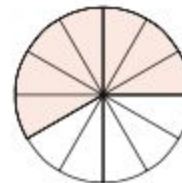
c



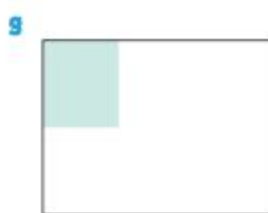
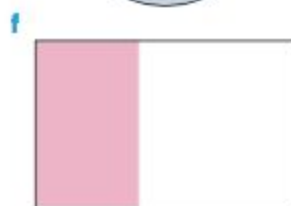
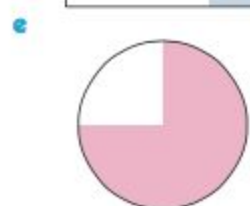
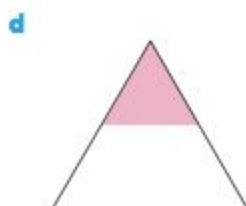
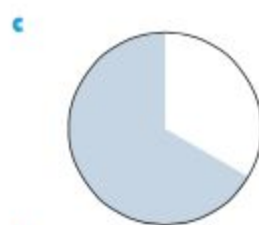
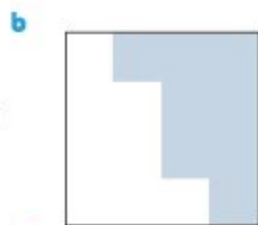
d



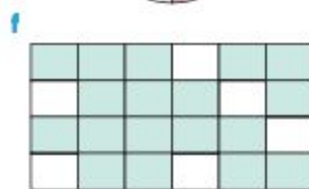
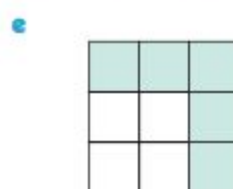
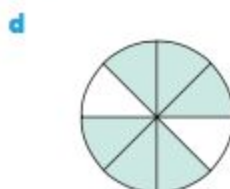
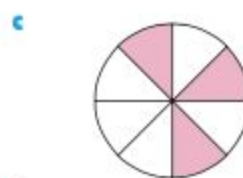
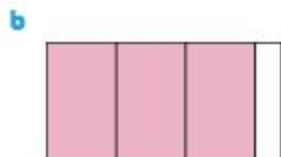
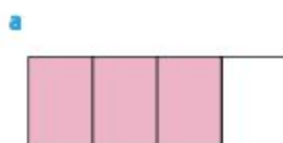
e



2 Estimate the fraction shaded:



1 Which of the following shaded shapes shows  $\frac{3}{4}$ ?



2 Make three copies of each of the following diagrams:



Use dotted lines to show how the figures could be folded to give

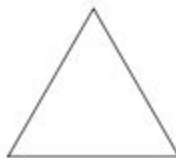
i 2 ii 4 iii 8 equal parts. (There may be more than one answer.)

3 Copy the following diagrams twice. Use dotted lines to show how the figures could be divided into i 6 ii 3 equal parts.

a



b

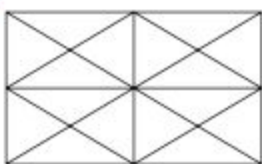


PRINTABLE  
TEMPLATE



4 Make three copies of each of the following diagrams:

a



b



c

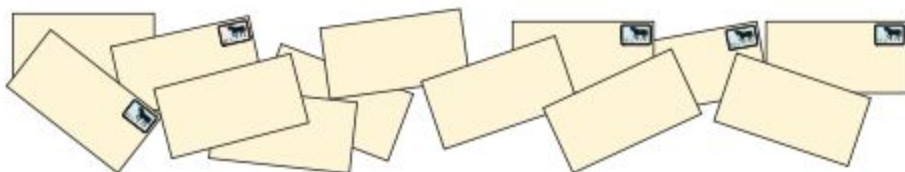


- i Shade one copy to show  $\frac{3}{4}$ .      ii Shade the second copy to show  $\frac{5}{8}$ .  
 iii Shade the third copy to show  $\frac{12}{16}$ .      iv Comment on your answers for i and iii.

1 a What fraction of this flock of sheep are white?



b What fraction of these letters have stamps?



c What fraction of the following group

i are wearing caps or hats

ii have hoops?



### Example 1

What fraction of 1 metre is 37 cm?

$$\begin{aligned} 37 \text{ cm as a fraction of 1 metre is } & \frac{37 \text{ cm}}{1 \text{ metre}} \\ & = \frac{37 \text{ cm}}{100 \text{ cm}} \quad \{\text{the same units}\} \\ & = \frac{37}{100} \end{aligned}$$

1 metre = 100 cm



2 What fraction of

- a 1 metre is 20 cm
- b 2 metres is 78 cm
- c 1 kg is 500 g
- d 3 kg is 750 g
- e 1 week is 1 day
- f 1 day is 5 hours
- g 1 hour is 23 minutes
- h November is two days
- i a decade is one year
- j 2 dollars is 27 cents?

A decade is 10 years.

1 kg = 1000 g



### Example 2

Eruera was given a basket of Easter eggs. 5 had red wrappers, 3 had blue, 3 had gold and 2 had green.

- a What fraction of the eggs had red wrappers?
- b What fraction of the eggs did not have gold wrappers?

a Fraction with red wrappers =  $\frac{\text{number with red wrappers}}{\text{total number of eggs}} = \frac{5}{13}$

- b 10 eggs did not have gold wrappers.

Fraction without gold wrappers =  $\frac{\text{number without gold wrappers}}{\text{total number of eggs}} = \frac{10}{13}$



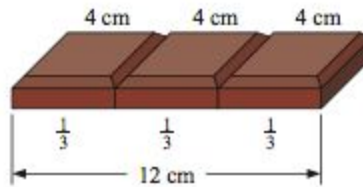
- 3 James scored 23 correct answers in his test of 36 questions. What fraction of his answers were incorrect?
- 4 Kiri lost 2 pens and broke 3 others. If she had 9 pens to start with, what fraction of her pens remain?
- 5 Mere was travelling a journey of 250 km. Her car broke down after 200 km. What fraction of her journey did she still have to travel?
- 6 Heremata started his homework at 8.05 pm and completed it at 8.53 pm. If he had allowed one hour to do his homework, what fraction of that time did he use?
- 7 Rachel spent \$1.65 on a drink and \$2.70 on chocolates. What fraction of \$10 did she spend?
- 8 Julie cut 3 pieces of ribbon each 25 cm long from 2 m of ribbon. What fraction of the ribbon remained?



## FINDING FRACTIONS OF A WHOLE

- Henri has \$10 and gives  $\frac{1}{2}$  of it to his friend Claire.  
To do this he divides \$10 into 2 equal amounts.  
Each gets \$5, as \$5 is exactly  $\frac{1}{2}$  of \$10.  
That is,  $\frac{1}{2}$  of \$10 =  $\$10 \div 2 = \$5$ .
- Sarah wants to give  $\frac{2}{3}$  of her 12 cm long chocolate bar to Sam.  
She starts by dividing it into 3 equal portions.  
She then gives Sam *two* of them.  
Sam's share is 8 cm long.

$$\begin{aligned} \text{So, } \frac{2}{3} \text{ of } 12 \text{ cm} &= 12 \text{ cm} \div 3 \times 2 \\ &= 4 \text{ cm} \times 2 \\ &= 8 \text{ cm} \end{aligned}$$



We can see from these examples that:

To find a fraction of an amount we *divide the amount by the denominator* and then *multiply the answer by the numerator*.

- For example,
- $\frac{1}{4}$  of 12 kg  
=  $12 \text{ kg} \div 4$   
= 3 kg
  - $\frac{2}{5}$  of \$10  
=  $\$10 \div 5 \times 2$   
=  $\$2 \times 2$   
= \$4

### Example 3

On the first day of school this year,  $\frac{1}{3}$  of the Year 7 class were aged 11 years or older. If there were 27 students in the class, how many were 11 years or older?

$$\begin{aligned}\frac{1}{3} \text{ of } 27 \text{ students} &= 27 \text{ students} \div 3 \\ &= 9 \text{ students}\end{aligned}$$

There were 9 students aged 11 years or older.

To find  $\frac{1}{3}$  of 27 we need to divide 27 into 3 equal parts.



9 Find

- a  $\frac{1}{3}$  of 12
- b  $\frac{1}{4}$  of 20
- c  $\frac{1}{5}$  of 35
- d  $\frac{1}{10}$  of 650 g
- e  $\frac{1}{2}$  of \$1.20
- f  $\frac{1}{4}$  of 1 hour (in minutes)

10 Richard only won one quarter of the games of chess that he played for his school team. If he played 16 games, how many did he win?



11 One eighth of the apples in a bag were bad. If there were 128 apples in the bag, how many were bad?

12 One sixth of the cars from an assembly line were painted red. If 78 cars came from the assembly line, how many were painted red?

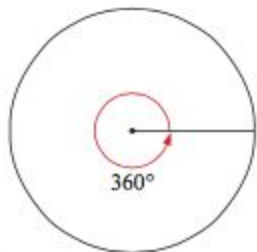
13 Jessica spent one third of her money on a new dress. If she had \$120 before she bought the dress, how much did the dress cost?



14 While Bill was on holidays one fifth of the plants in his shadehouse died. If he had 25 plants alive when he went away, how many were still alive when he came home?

15 There are  $360^\circ$  in 1 revolution (one full turn).

- a Find the number of degrees in  
 i one quarter turn    ii a half turn  
 iii three quarters of a turn.
- b What fraction of a revolution is  
 i  $30^\circ$     ii  $60^\circ$     iii  $240^\circ$ ?



**Example 4**

Only two thirds of the children at a country school could swim. If there were 84 children at the school, how many could swim?

$$\begin{aligned} \frac{2}{3} \text{ of } 84 \text{ children} &= 84 \text{ children} \div 3 \times 2 \\ &= 28 \text{ children} \times 2 \\ &= 56 \text{ children} \end{aligned}$$

So, 56 children could swim.

To find  $\frac{2}{3}$  of 84 we need to divide 84 into 3 equal parts and use 2 of them.



16 Find

- a i  $\frac{1}{5}$  of 55    ii  $\frac{3}{5}$  of 55    b i  $\frac{1}{4}$  of 76    ii  $\frac{3}{4}$  of 76
- c i  $\frac{1}{10}$  of 610 g    ii  $\frac{3}{10}$  of 610 g    d i  $\frac{1}{8}$  of \$48    ii  $\frac{3}{8}$  of \$48
- e  $\frac{5}{8}$  of 640 m    f  $\frac{2}{3}$  of 33 days

17 One morning three fifths of the passengers on my bus were school children. If there were 45 passengers, how many were school children?



18 Daniel spent three quarters of his working day installing computers, and the remainder of the time travelling between jobs. If his working day was 10 hours, how much time did he spend travelling?

19 When Emily played netball, she scored a goal with five sixths of her shots for goal. If she shot for goal 18 times in a match, how many goals did she score?

20 A business hired a truck to transport boxes of equipment. The total weight of the equipment was 2 tonnes, but the truck could only carry  $\frac{5}{8}$  of the boxes in one load.

- a What weight did the truck carry in the first load?  
Remember 1 tonne = 1000 kg.
- b If there were 72 boxes, how many did the truck carry in the first load?



1 Find the whole amount if

a  $\frac{1}{5}$  is \$9

b  $\frac{1}{7}$  is 110 g

c  $\frac{1}{10}$  is 30 bags

d  $\frac{1}{6}$  is 6 m

e  $\frac{1}{4}$  is 3 weeks

f  $\frac{1}{2}$  is 2 hours 5 minutes

2 Helena spent half her holidays in America. She was in America for 17 days. How long were her holidays?



3 Gavin said that one fifth of his supermarket bill was the cost of a leg of lamb at \$10.20. What was his supermarket bill?

4 Katy put 16 jars of jam in her pantry. These were  $\frac{1}{4}$  of the jars of jam that she had made. How many jars of jam had she made?



5 The deposit on a refrigerator was one eighth of its value. If the deposit was \$125, how much did the refrigerator cost?

**Example 6**

Two thirds of my barley crop was 176 bags.  
How many bags was the whole crop?

2 thirds was 176 bags. So, 1 third was 88 bags.

The whole crop was 3 thirds =  $3 \times 88$  bags  
= 264 bags.

$\frac{2}{3}$  means that we have divided the whole into 3 equal parts and we are considering two of them.



6 Find the whole amount if

a  $\frac{2}{3}$  is 8 apples

b  $\frac{3}{10}$  is \$171

c  $\frac{5}{8}$  is 10 days

d  $\frac{2}{5}$  is 160 g

e  $\frac{3}{4}$  is 1200 m

f  $\frac{9}{10}$  is 81 marks

7 Three quarters of my dairy herd are grazing in my largest paddock. If this is 90 cows, how many are in my herd?

8 If  $\frac{2}{5}$  of a bag of flour weighs 800 g, how much does a bag of flour weigh?

9 Rangı won  $\frac{2}{3}$  of the tennis matches that he played this summer. If he won 64 matches, how many matches did he play?



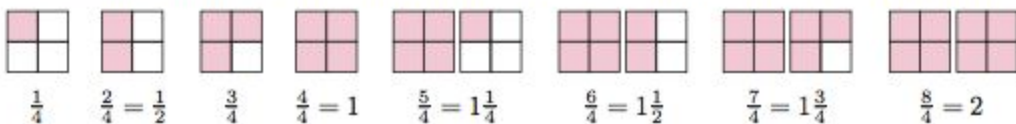
10 Briony saved  $\frac{1}{10}$  of the money that she earned working at a restaurant. If she spent \$927, how much did she earn?



# F

# ORDERING OF FRACTIONS

Consider the following diagrams which have been shaded to represent the given fractions:



Notice that when two quarters ( $\frac{2}{4}$ ) are shaded, the result is the same as shading  $\frac{1}{2}$  the square, and when four quarters ( $\frac{4}{4}$ ) are shaded, the result is the same as shading the whole square.

Similarly when six quarters ( $\frac{6}{4}$ ) are shaded, the result is the same as shading  $1\frac{1}{2}$  squares and when eight quarters ( $\frac{8}{4}$ ) are shaded the result is the same as shading two squares.



$1\frac{3}{4}$  means  $1 + \frac{3}{4}$ .

Counting in quarters we have  $\frac{1}{4}$   $\frac{2}{4}$   $\frac{3}{4}$   $\frac{4}{4}$   $\frac{5}{4}$   $\frac{6}{4}$   $\frac{7}{4}$   $\frac{8}{4}$   
 or it could be written as  $\frac{1}{4}$   $\frac{1}{2}$   $\frac{3}{4}$   $1$   $1\frac{1}{4}$   $1\frac{1}{2}$   $1\frac{3}{4}$   $2$ .

## EXERCISE 6F

- a Count in halves to four, i.e.,  $\frac{1}{2}$ ,  $1$ ,  $1\frac{1}{2}$ , .... up to 4.
  - b Count in thirds to three.
  - c Count in fifths to two.
- a Use the circle diagrams given to count in sixths to 2.



- b Can you find another way of writing some of these fractions?

There are 5 fifths in a whole and 10 fifths in 2 wholes.



## FRACTIONS GREATER THAN ONE

Oranges are cut into quarters for your netball match on Saturday.

If Kelly eats 5 of these quarters, how much has she eaten?

She has eaten a full orange (4 quarters) and another quarter.



Fractions where the numerator is larger than the denominator (such as  $\frac{5}{4}$ ) are called **improper fractions**.

Numbers like  $1\frac{1}{4}$  which are made up of a whole number and a fraction are called **mixed numbers**.

**Example 7**

Write  $\frac{8}{3}$  as a mixed number.

$$\begin{aligned}\frac{8}{3} &= \underbrace{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}}_1 + \underbrace{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}}_1 + \underbrace{\frac{1}{3} + \frac{1}{3}}_{\frac{2}{3}} \\ &= 2\frac{2}{3}\end{aligned}$$

4 Write as mixed numbers:

a  $\frac{4}{3}$     b  $\frac{6}{5}$     c  $\frac{9}{7}$     d  $\frac{7}{3}$     e  $\frac{9}{4}$     f  $\frac{16}{11}$     g  $\frac{17}{8}$

**Example 8**

Place on a number line:

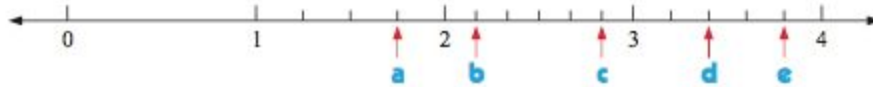
a  $1\frac{2}{3}$     b  $3\frac{1}{4}$     c  $\frac{12}{5}$



5 On separate number lines, place these numbers:

a  $1\frac{1}{2}$     b  $1\frac{1}{5}$     c  $2\frac{2}{3}$     d  $2\frac{3}{5}$     e  $\frac{6}{5}$     f  $\frac{17}{4}$

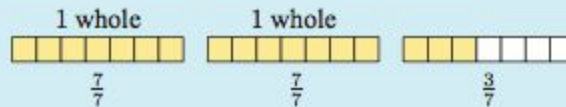
6 What is the fraction value (both improper *and* mixed) for a to e on this number line?

**Example 9**

a Write  $\frac{5}{3}$  as a mixed number.    b Write  $2\frac{3}{7}$  as an improper fraction.

a  $\frac{5}{3} = \frac{3}{3} + \frac{2}{3}$     or     $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$   
 $= 1 + \frac{2}{3}$   
 $= 1\frac{2}{3}$

b  $2\frac{3}{7} = 1 + 1 + \frac{3}{7}$   
 $= \frac{7}{7} + \frac{7}{7} + \frac{3}{7}$   
 $= \frac{17}{7}$



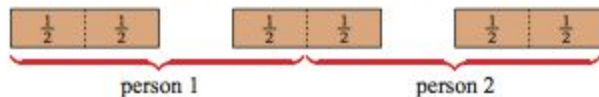
7 Write as mixed numbers:

a  $\frac{6}{5}$     b  $\frac{7}{4}$     c  $\frac{5}{2}$     d  $\frac{6}{3}$     e  $\frac{9}{2}$     f  $\frac{6}{4}$     g  $\frac{10}{4}$

8 Write as improper fractions:

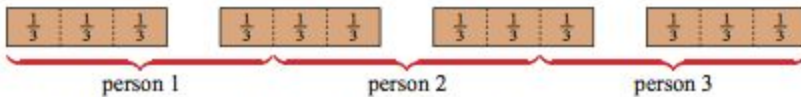
a  $1\frac{3}{4}$     b  $2\frac{2}{5}$     c  $4\frac{1}{2}$     d  $1\frac{4}{5}$     e  $3\frac{5}{8}$     f  $7\frac{1}{2}$     g  $8\frac{3}{4}$

- If 3 chocolate bars are shared equally between 2 people, what fraction does each person get?



Each person would get 3 halves, which is  $\frac{3}{2}$  of a chocolate bar.

- If 4 chocolate bars are shared equally between 3 people, what fraction does each person get?



Each person would get 4 thirds, which is  $\frac{4}{3}$  of a chocolate bar.

Notice that, if 7 is divided equally between 5, each gets  $\frac{7}{5}$ .

### EXERCISE 6G

- How many chocolate bars will each person get if:
  - 5 bars are shared equally between 4 people
  - 5 bars are shared equally between 3 people
  - 6 bars are shared equally between 2 people
  - 7 bars are shared equally between 4 people
  - 3 bars are shared equally between 4 people
  - 10 bars are shared equally between 3 people
  - 9 bars are shared equally between 10 people?

