

# 5

## A picture of health



My name is Tom. Twice a week I go to my local fitness centre.

I exercise for about an hour and a half each time I go.

I do aerobic exercises on the rowing machine, cycle and treadmill. I also do some strength exercises by lifting and pulling weights.

On the walls of the fitness centre there are tables and charts giving information about the exercises we do. Many of the machines have displays showing information in numbers.

I wonder how much maths is involved in being healthy and fit?

### Talk about it

Does anyone in the group belong to a fitness centre?

What kinds of exercise do you do in a fitness centre?

Which kinds of food are healthy or unhealthy?

Where are numbers involved? Do you need number skills to measure heart rate, speed, weight, etc?

### These are the skills you will practise in this unit.

Which are the most useful for you? Tick the boxes.

- ☐ Obtaining information from tables, diagrams, charts and line graphs
- ☐ Collecting, organising and presenting information in tables, charts, diagrams and line graphs
- ☐ Finding and using different averages known as the mean, median and mode and using them appropriately to compare two sets of information
- ☐ Finding the range and using it to describe the spread in groups of information
- ☐ Expressing one number as a percentage of another number
- ☐ Estimating, measuring and comparing temperatures.
- ☐ Reading scales and conversion tables

#### Skill code

HD1/L2.1

HD1/L2.2

HD1/L2.3

HD1/L2.4

N2/L2.9

MSS1/L2.4

# Preparing to exercise 1

*Before I joined the fitness centre I went to my doctor to check my general state of health. The first thing my doctor did was to measure my height and weight.*



## Activity 1

- 1 Tom's height was 175 **centimetres** and his weight was 75 **kilograms**. The doctor said that he had a **medium** size frame. She checked his height and weight by looking at a **table**.

This is a table of heights and weights for adult men.

When she looked at the **table** she went down the 'Height in cm' column to 175 and across to the 'Medium frame' column. This told her that Tom should weigh between 67 kg and 73 kg.

Discuss the table with your teacher if you do not understand how to use it.

Tom weighed 75 kg, which meant he was a little overweight.

Use the table to answer these questions.

Draw a ring around **underweight**, **correct weight** or **overweight** for each of these men.

- a height 162 cm weight 58 kg small frame  
**underweight correct weight overweight**
- b height 183 cm weight 85 kg medium frame  
**underweight correct weight overweight**
- Check your answers before going any further.
- c height 190 cm weight 90 kg large frame  
**underweight correct weight overweight**
- d height 157 cm weight 65 kg small frame  
**underweight correct weight overweight**
- e height 180 cm weight 68 kg large frame  
**underweight correct weight overweight**

	Weight in kg		
Height in cm	Small frame	Medium frame	Large frame
157	58–61	59–64	63–68
160	59–62	60–65	64–70
162	60–63	61–66	65–71
165	61–64	62–67	65–73
167	62–65	63–69	66–75
170	63–66	65–70	68–76
173	64–67	66–71	69–78
<b>175</b>	65–69	<b>67–73</b>	70–80
178	66–70	69–74	72–82
180	67–71	70–75	73–84
183	68–73	71–77	75–85
185	69–75	73–79	76–87
188	70–76	75–81	78–89
190	72–78	76–83	80–92
193	74–80	78–85	82–94

- 2 Use the table on page 2 to answer these questions.
- a A man of medium frame and 180 cm in height should weigh between 70 kg and ..... kg.
  - b A man of small frame and 157 cm in height should weigh between ..... kg and ..... kg.

Check your answers before you go any further.

- c A man of small frame and 185 cm in height should weigh between ..... kg and ..... kg.
  - d A man of large frame and 173 cm in height should weigh between ..... kg and ..... kg.
  - e A man of medium frame and 190 cm in height should weigh between ..... kg and ..... kg.
  - f A man of small frame and 165 cm in height should weigh between ..... kg and ..... kg.
- 3 This is some information about sensible weights for women.  
Put the weights into the correct places in the table below.
- a A woman who is 157 cm tall and of medium frame should weigh 54 kg to 60 kg.
- Look at the table. This answer has been done for you. Discuss the table with your teacher if you do not understand it.
- b A woman who is 165 cm tall and of small frame should weigh 53 kg to 59 kg.
  - c A woman who is 152 cm tall and of large frame should weigh 55 kg to 62 kg.
  - d A woman who is 152 cm tall and of small frame should weigh 47 kg to 52 kg.
  - e A woman who is 163 cm tall and of medium frame should weigh 56 kg to 63 kg.
  - f A woman who is 155 cm tall and of large frame should weigh 57 kg to 64 kg.
  - g A woman who is 160 cm tall and of small frame should weigh 50 kg to 56 kg.
  - h A woman who is 157 cm tall and of small frame should weigh 49 kg to 55 kg.

Heights and weights for adult women

	Weight in kg		
Height in cm	Small frame	Medium frame	Large frame
152			
155			
157		54–60	
160			
163			
165			

#### Remember

The **information** used in tables, diagrams, charts and graphs is known as **data**.

My doctor asked me about the sorts of foods that I usually eat. She thinks that I eat too much fat and salt and suggested that I should reduce them. I decided to check the amount of fat and salt in the foods I eat.

When I go shopping I look on the back of the tins and packets to see how much fat and salt is in each product.

## Activity 2

- 1 These are three examples of labels. They show the amounts of fat, etc. in every 100 g of the product.

Tomato soup		Baked beans		Cream crackers	
Protein	0.9 g	Protein	4.9 g	Protein	10.2 g
Carbohydrate	7.1 g	Carbohydrate	13.0 g	Carbohydrate	66.9 g
Fat	3.6 g	Fat	0.4 g	Fat	14.4 g
(of which saturates)	0.3 g	(of which saturates)	0.1 g	(of which saturates)	6.2 g
Fibre	0.4 g	Fibre	5.2 g	Fibre	2.9 g
Sodium	0.4 g	Sodium	0.3 g	Sodium	0.5 g

Salt is called **sodium** on the labels and the most unhealthy type of fat is **saturated** fat.

100 grams of the tomato soup in the example above contains

0.3 g of saturated fat and 0.4 g of salt

- a 100 grams of the baked beans contains 0.1 g of saturated fat and ..... g of salt
- b 100 grams of the cream crackers contains ..... g of saturated fat and ..... g of salt

Check your answers before going any further.

- c How much fibre is contained in 100 grams of tomato soup? ..... g
- d How much protein is contained in 100 grams of cream crackers? ..... g
- e How much carbohydrate is contained in 100 grams of baked beans? ..... g
- f How much protein is contained in 100 grams of tomato soup? ..... g

In the tomato soup there is a total of 3.6 g of fat

- g How much total fat is contained in 100 g of baked beans? ..... g
- h How much total fat is contained in 100 g of cream crackers? ..... g
- i Which of the three foods contains the most fat? Draw a ring around the correct answer:      **tomato soup**      **baked beans**      **cream crackers**

2 This is some of the nutrition information from four more products.

	Protein	carbohydrate	Total fat	Saturated fat	Sodium
Porridge	11.0 g	62.0 g	8.0 g	1.5 g	0.005 g
Drinking chocolate	6.4 g	72.4 g	5.8 g	3.1 g	0.001 g
Cereal bars	4 g	71 g	8.4 g	1.7 g	0.3 g
Crisps	3.7 g	54.2 g	31.6 g	14.2 g	1.5 g

- a Write the names of the four products in the boxes below in order of the amount of saturated fat that each of them contains. One has been done for you.

Most saturated fat

←
→

Least saturated fat

Cereal bars

Check your answers before going any further.

- b Write the names of the four products in the boxes below in order of the amount of sodium that each of them contains.

Most sodium

←
→

Least sodium

- c Foods that contain a lot of saturated fat and sodium are bad for your heart. Which of the four foods shown above is most unhealthy for your heart? Ring your answer.

porridge      drinking chocolate      cereal bars      crisps



## Review

Do you need more practice in

– obtaining information from tables and diagrams?

Yes ☐ No ☐

– putting information into tables and diagrams?

Yes ☐ No ☐

For more work on this, go to H1 (page 20) or E1 (page 22).

This work links to mini-project M1 (page 23).

## Preparing to exercise 2

On a packet of self-raising flour, you can read this information.

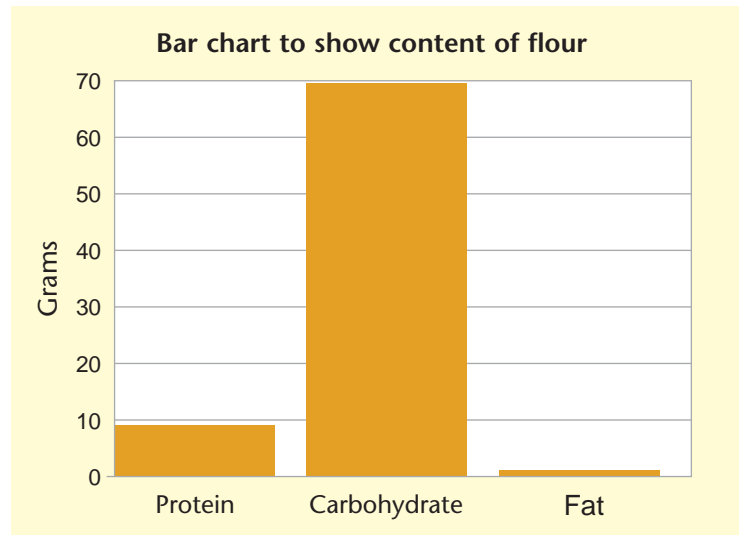
Protein	Carbohydrate	Fat
9.8 g	68.8 g	1.2 g

This information can be shown in a **chart**. This one is called a **bar chart**.

The height of each **column** shows how much of that item is contained in this food product.

The tallest column is almost up to 70 g and shows that in self-raising flour there is a lot more carbohydrate than protein or fat.

The next tallest column is almost up to 10 g and represents the amount of protein in self-raising flour.



### Activity 3

1 Another food has this nutrition information.

**Protein 10 g      Saturated fat 3 g      Sodium 2 g**

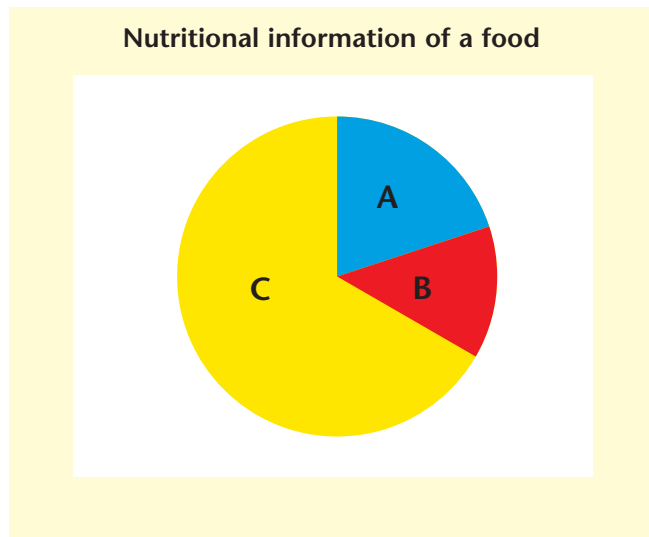
Draw a bar chart to show the data.



Check your answers before you go any further.

2 The same data can be shown in this circular chart.

This type of chart is called a **pie chart**.



a Which section in the pie chart shows the amount of protein? Ring your answer.

A      B      C

b Which section shows the amount of saturated fat? Ring your answer.

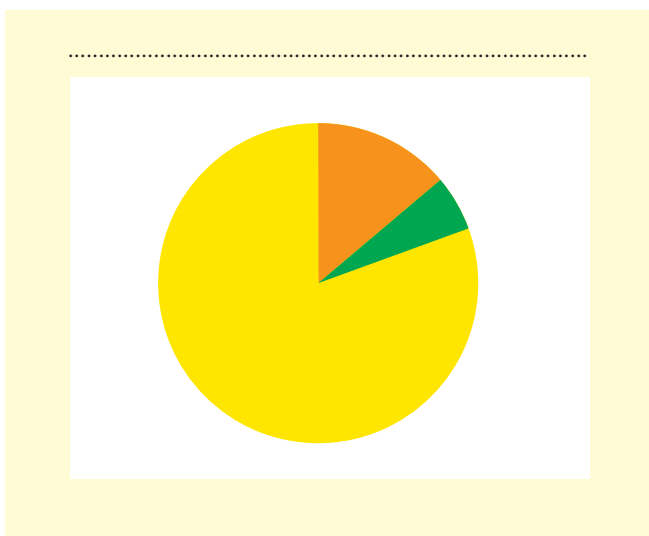
A      B      C

c Which section shows the amount of sodium? Ring your answer.

A      B      C

3 The pie chart below shows this nutrition information.

Protein	Carbohydrate	Fat
12 g	72.8 g	5.3 g



Write the words:

**Protein      Carbohydrate      Fat**

in the correct sections on the pie chart. Give your pie chart a suitable title.

Check your answers before you go any further.

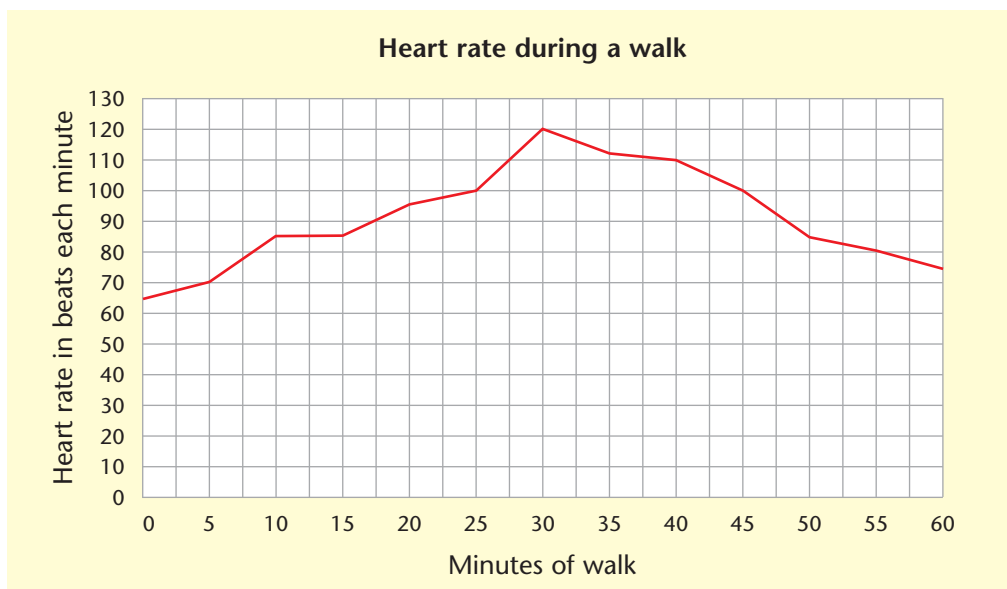


## Activity 4

My doctor thinks it would be a good idea for me to do some cycling before I join the fitness centre.

Normally, my heart beats between about 60 and 80 times each minute. This is called my **heart rate**. When I exercise or work hard my heart rate gets faster.

- 1 Tom went for a one-hour walk. He checked his heart rate every 5 minutes. This **line graph** shows his heart rate while he was walking.



When he started walking, Tom's heart rate was 65 beats each minute. When he had been walking for 10 minutes, his heart rate was 85 beats each minute.

If you do not understand the graph discuss it with your teacher.

Use the graph to get some more data on Tom's heart rate.

- a When Tom had been walking for 30 minutes, his heart rate was ..... beats each minute.  
If you did not get the answer 120 beats each minute, discuss this with your teacher.
- b When he had been walking for 45 minutes, his heart rate was ..... beats each minute.
- c When he had been walking for 50 minutes, his heart rate was ..... beats each minute.
- d When he finished his walk, his heart rate was ..... beats each minute.
- e When Tom finished his walk was his heart rate was faster or slower than when he started the walk? Ring the correct answer.

**faster**      **slower**

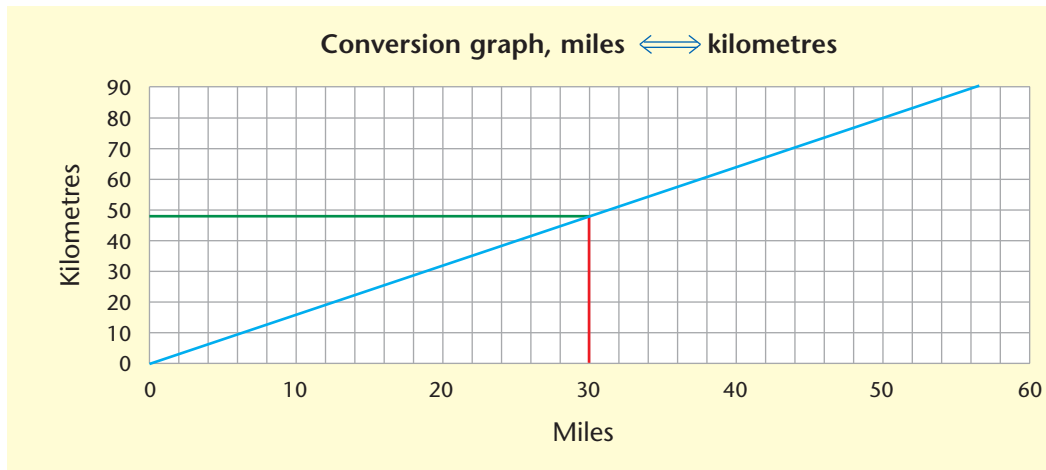
- f After he had been walking for ..... minutes his heart rate was 110 beats each minute.

Check your answers before you go any further.



- 2 The graph below is called a conversion graph because it converts **miles** into **kilometres** and **kilometres** into **miles**.

When I go walking or cycling I still think of distances in **miles**. I should really start to think of them in **kilometres**.



The lower end of the line starts at the point where both the miles and kilometres are zero.

The top end of the line stops where 50 miles is the same as 80 kilometres.

If you do not understand, ask your teacher.

If you want to work out how many kilometres there are in 30 miles, follow these steps.

- A Go to 30 on the horizontal axis.
- B Go straight up from the 30 to the blue graph line (follow the red line).
- C Go straight left to the kilometres scale from the blue line (follow the green line).
- D Read the number on the kilometres scale. It is 48. This shows that 30 miles is approximately 48 kilometres.

Use the steps above to answer these questions. Be as accurate as you can.

- a How many kilometres equal 10 miles? .....

Check your answer before going any further. Ask your teacher if you need help.

- b How many kilometres equal 20 miles? .....
- c How many kilometres equal 25 miles? .....
- d How many kilometres equal 40 miles? .....

## Review

- Do you need more practice in
- obtaining information from charts and line graphs?
  - putting information into charts?

Yes ☐ No ☐

Yes ☐ No ☐

For more work on this, go to H2 (page 21) or E2 (page 22).

This work links to mini-project M2 (page 23).

## Activity 5

	Monthly	Annual
Single adult	£20	£220
Two adults joint membership	£35	£400
Family membership Two adults and two children under 18 years of age	£65	£650
People over 60 years of age	£15	£150
People between 15 and 18 years of age	£15	£150

<b>b</b>	Number of children in a school	<b>discrete</b>	<b>continuous</b>
<b>c</b>	The length of someone's arm	<b>discrete</b>	<b>continuous</b>
<b>d</b>	Number of tracks on a CD	<b>discrete</b>	<b>continuous</b>
<b>e</b>	Time at which a light bulb fails	<b>discrete</b>	<b>continuous</b>

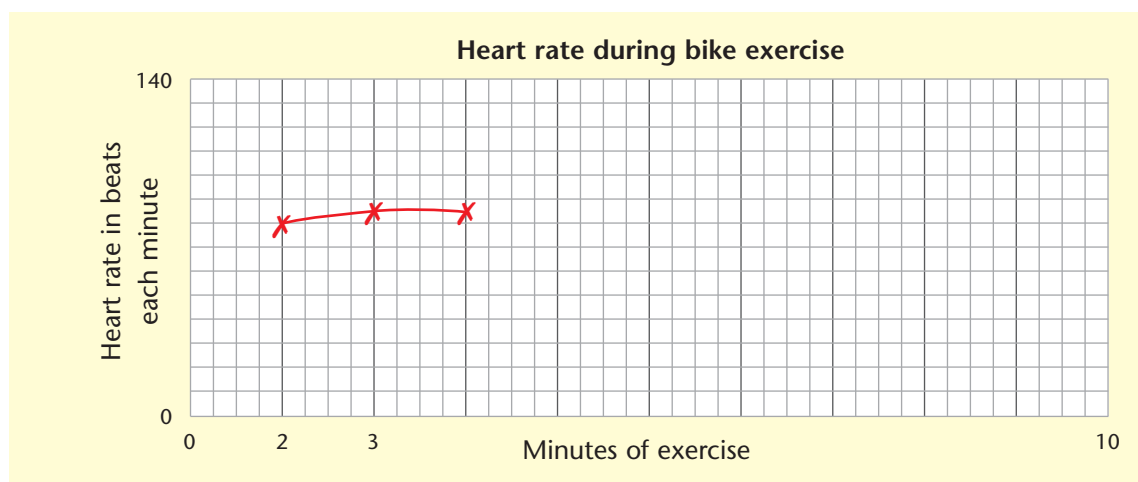
## Activity 6

Tom's heart rate was recorded every minute during the exercise. This was the data that was recorded.

As part of my membership fee I was given a fitness check by one of the instructors. This included a ten-minute session on one of the exercise bikes. After five minutes I was told to pedal faster.

Minutes	1	2	3	4	5	6	7	8	9	10
Heart rate in beats each minute	80✓	85✓	85✓	95	100	120	125	125	130	135

This data can be shown in a line graph.



- 1 Complete the line graph, which has been started for you.

Label the scales on both axes.

Start at 4 minutes and a heart rate of 95 beats each minute, as shown in red in the table above, and follow these steps.

- a Go to 4 minutes on the horizontal axis.
- b Go straight up until you are **level** with the 95 on the heart rate scale (on the vertical axis).
- c Draw a small cross at this point. Join this cross with a straight line to the cross on its left so that you continue the line of the graph.
- d Repeat these steps for the next values in the table until you have **plotted** all of them.

## Review

Do you need more practice in  
– creating line graphs?

Yes ☐ No ☐

– understanding discrete and continuous data?

Yes ☐ No ☐

For more work on this, go to H3 (page 21) or E3 (page 22).

This work links to mini-project M3 (page 23).

# Exercising 1

*On my first visit to the fitness centre I was interested to see how popular it was, despite the fact that the fitness centre is quite small.*



## Activity 7

In the reception area there is a table showing how many members visited the centre on each day last week.

- 1 How many members visited the centre on:
  - a Monday? .....
  - b Saturday? .....
  - c Wednesday? .....
- 2 How many members in total visited the centre last week? .....

Tom wanted to know the **average** attendance for last week.

There are different types of average. The sort of average that Tom wanted is called the **mean**. If you work out the mean for last week's attendance, this will share out the total of **301** evenly between each day. To work out the mean, follow these steps.

**A Add up all the numbers.** This has already been done in the table and is **301**.

**B Divide the total by how many numbers we added up.** In this case there were 7 numbers to add.

Therefore, the **mean** attendance last week is  $301 \div 7 = 43$ .

Here is another example.

What is the **mean** of this list of numbers: 6, 8, 4, 2, 3, 4?

**Add up the numbers:**  $6 + 8 + 4 + 2 + 3 + 4 = 27$

**Divide this total by 6** because there are 6 numbers in the list:  $27 \div 6 = 4.5$ .

Therefore, the **mean** of 6, 8, 4, 2, 3, 4 is **4.5**.

Day	Number of members
Sunday	49
Monday	38
Tuesday	42
Wednesday	29
Thursday	36
Friday	45
Saturday	62
<b>TOTAL</b>	<b>301</b>

### Remember

When you work out the **mean** of a list of numbers, your answer **might not** be a whole number **or** any of the numbers in the list.

3 Follow steps A and B on page 12 to work out the mean of each of these lists of numbers. The first one has been started for you.

a 5, 7, 3                                      Add the numbers  $5 + 7 + 3 = 15$

Divide the total by ..... Therefore the **mean** is  $15 \div \dots = \dots$

Check your answer before you go any further.

b 10, 12, 8, 4, 8                              Add the numbers ..... = .....

Divide the total by ..... Therefore the **mean** is .....  $\div$  ..... = .....

c 7, 8, 1, 0, 4, 4                              Add the numbers ..... = .....

Divide the total by ..... Therefore the **mean** is .....  $\div$  ..... = .....

Another type of average is called the **median**. The median is the **middle** number in a list of numbers.

If I want to find the median of this list of numbers, 3, 7, 2, 1, 7, 8, 4, 2, 5

I follow these steps.

C First, put the numbers in order: 1, 2, 2, 3, 4, 5, 7, 7, 8

D Find the middle number: ~~1~~, ~~2~~, ~~2~~, ~~3~~, 4, ~~5~~, ~~7~~, ~~7~~, ~~8~~

Therefore, 4 is the median of 3, 7, 2, 1, 7, 8, 4, 2, 5.

4 Follow steps C and D to work out the **median** of each of these lists of numbers. The first one has been started for you:

a 3, 7, 5, 3, 9, 1, 5

Put the numbers in order: 1, 3, 3, 5, 5, 7, 9

Find the middle number: It is ..... Therefore the **median** is .....

Check your answer before you go any further.

b 19, 12, 13, 20, 14

Put the numbers in order .....

Find the middle number: ..... Therefore, the **median** is .....

c 5, 8, 9, 1, 4, 2, 7, 4, 7

Put the numbers in order .....

Find the middle number: ..... Therefore, the **median** is .....

Sometimes there is no middle number in a list. In this list the 3 and 5 share the middle position: 1, 2, 3, 3, 5, 6, 7, 8.

When this happens, we **add** the two middle numbers and then **halve** the answer.

$3 + 5 = 8$     **Half** of 8 = 4

Therefore, the median of 1, 2, 3, 3, 5, 6, 7, 8 is 4.

5 Find the median of this list of numbers: 3, 6, 4, 2 .....

The third type of average is called the **mode**. The **mode** is the number which appears *most often*, or most *frequently*, in a list of numbers.

Example: Find the **mode** of this list of numbers: 3, 6, 1, 6, 7, 2, 5.

The **mode** of this list of numbers is 6 because there are two sixes in the list and only one of each of the other numbers.

If you do not understand this, discuss it with your teacher.

6 Find the **mode** of each of these lists of numbers.

a 12, 13, 12, 14, 15, 11 .....

Check your answer before you go any further.

b 1, 6, 1, 3, 3, 1, 5, 2 .....

c 5, 5, 12, 11, 4, 5 .....

Sometimes there is more than one **mode** in a list of numbers.

For example, in this list: 1, 5, 6, 2, 3, 1, 2, 1, 6, 4, 6

there are two **modes** because the numbers 1 and 6 both appear three times, which is more than any other number.

## Why three averages?

There are three types of average because sometimes one type is more representative of the **data** than the other types.

The **median** is often better than the **mean** because in some lists there might be a much bigger or much smaller number than the others in the list. This would make the **mean** less representative than the **median**. Look at the example below.

**Example:** Joseph is one of the members of the fitness centre. He plays cricket each week and his batting scores for the last seven games are:

15, 18, 17, 12, 82, 15, 16

The **mean** of these numbers is 25 and the **median** is 16.

Looking at the list, you can see that Joseph usually scored less than 20 but had one very large score of 82. In this case the median is a better average than the mean because it is nearer to Joseph's usual scores.

7 Which of Joseph's scores is the mode? .....



## Activity 8

1 Sometimes it is useful to know how far a list of numbers stretches from its lowest number to its highest.

The spread of the numbers 5, 2, 4, 6, 3, 2, 3, 7, 4, 8, 3, 5 is from 2 to 8.

Put the numbers in order to check that this is correct.

.....

To find the **range** of a list of numbers we take the smallest number away from the biggest number. In the list above we have to take 2 away from 8.

$8 - 2 = 6$  therefore, the range for this list is 6.

The word range is used quite frequently in phrases like 'age range' and 'price range'

### Remember

The **difference** between the highest number and the lowest number is called the **range**.

In the fitness centre, the youngest member is 15 years old and the oldest member is 71 years old. This is a **range** of 56 years.

If you do not understand this, discuss it with your teacher.

2 Find the **range** for these lists of numbers.

a 5, 3, 6, 7, 1, 2 .....

b 10, 17, 23, 18, 31, 21 .....

c 3, 9, 16, 11, 12 .....

Check your answers before you go any further.

3 This table shows the different attendances for the first three days in two different weeks at the fitness centre.

WEEK 1	No. of members	WEEK 2	No. of members
Monday	25	Monday	18
Tuesday	16	Tuesday	33
Wednesday	26	Wednesday	51
<b>TOTAL</b>		<b>TOTAL</b>	

a Work out the totals for each week and put them in the table.

.....

b What is the range for Week 1? .....

Check your answer before you go any further

c What is the range for Week 2? .....

d Which week has the bigger range? .....

e What is the mean for Week 1? .....

f What is the median for Week 2? .....

g Do either of the weeks have a mode? YES NO



## Review

Do you need more practice in

– calculating and using the **mean**, **median** and **mode**?

Yes ☐ No ☐

– finding the **range** in a list of data?

Yes ☐ No ☐

For more work on this, go to H4 (page 21) or E4 (page 22).

This work links to mini-project M4 (page 23).

## Exercising 2

*When I went to the fitness centre last night a total of 25 people were exercising. 15 of them were women.*

Tom wondered what **percentage** of the people exercising at the centre were women.

The fraction  $\frac{15}{25}$  is one way of showing how many of the members were women. If Tom could make this a fraction 'out of' 100 instead of 'out of' 25 then he would have changed the fraction into a percentage.

Tom can easily change the bottom number into 100 by multiplying it by 4 but he must also multiply the top number by 4 so that he does not change the real value of the fraction.

$$\frac{15}{25} = \frac{60}{100}$$

$\frac{15}{25}$  is the same as 60 'out of' 100 which means it is the same as **60%**.

If you do not understand this, ask your teacher to explain.

### Remember

A **percentage** is a **fraction** but it is always '**out of**' 100. The sign for **percentage** is %.

### Remember

To keep the real value of a fraction from changing, multiply the top and bottom numbers by the same number.

### Tip

If you can easily change the bottom number in a **fraction** to 100, do the same to the top number. The top number is the **percentage**.

This is another example.

To change  $\frac{11}{20}$  into a percentage, multiply both the top and bottom numbers by 5 because this changes the bottom number into 100.

$$\frac{11}{20} = \frac{55}{100}$$

The number in the fraction on top of the 100 becomes the percentage. Therefore,

$$\frac{55}{100} = 55\%$$



### Activity 9

1 Change these fractions into percentages by making the bottom number into 100.

a  $\frac{12}{50} = \frac{\quad}{100}$  which equals ..... %

Check this answer before going further

b  $\frac{8}{25} = \frac{\quad}{100}$  which equals ..... %

c  $\frac{18}{20} = \frac{\quad}{100}$  which equals ..... %

d  $\frac{7}{10} = \frac{\quad}{100}$  which equals ..... %

e  $\frac{9}{10} = \frac{\quad}{100}$  which equals ..... %

f  $\frac{7}{20} = \frac{\quad}{100}$  which equals ..... %

g  $\frac{13}{25} = \frac{\quad}{100}$  which equals ..... %

Check your answers before going any further.



Changing the bottom number of a fraction into 100 is not always easy.

Another way of changing a fraction into a percentage which works every time is to multiply the fraction by 100. It is best to use a calculator to do this.

If we want to know what **percentage** 5 is of 14 we make a fraction and multiply it by 100.



$\frac{5}{14}$  means **5 out of 14** or **5 divided by 14**. To work this out as a percentage press these buttons on your calculator.

5 ÷ 14 × 100 =

this gives the answer 35.71428571.

Give this to 2 decimal places, so  $\frac{5}{14}$  equals **35.71%**.



2 Use a calculator to change these fractions into percentages.

a  $\frac{11}{16} = \dots\dots\dots\%$  Check this answer before you go any further.

b  $\frac{11}{50} = \dots\dots\dots\%$  c  $\frac{18}{25} = \dots\dots\dots\%$

d  $\frac{18}{50} = \dots\dots\dots\%$  e  $\frac{17}{19} = \dots\dots\dots\%$

3 What **percentage** is 12 of 60?

A Make a **fraction** of the two numbers  $\frac{12}{60}$  then

B **multiply** it by 100 using a calculator  $\frac{12}{60} \times 100$

This gives the answer **20**, therefore 12 is **20%** of 60.

If you do not understand this, discuss it with your teacher.

Use steps A and B to answer these questions.

a What percentage is 5 of 10?  $\dots\dots\dots$

Check your answer before you go any further.

b What percentage is 7 of 700?  $\dots\dots\dots$

c What percentage is 12 of 48?  $\dots\dots\dots$

d What percentage is 11 of 55?  $\dots\dots\dots$

### Remember

If you want to know what **percentage** one number is of another number, make a **fraction** of the two numbers and multiply it by 100.



### Review

Do you need more practice in writing one number as a percentage of another?

Yes ☐ No ☐

For more work on this, go to H5 (page 21) or E5 (page 22).

This work links to mini-project M5 (page 23).

## Exercising 3

Anyone who exercises or works hard knows that the more you do the hotter you feel.

The **temperature** in a gym rises when everyone is working hard.

**Temperature** is usually measured in degrees **Celsius** or degrees **Fahrenheit**.

In the **Celsius** scale, water boils at 100 degrees and freezes at 0 degrees.

In the **Fahrenheit** scale, water boils at 212 degrees and freezes at 32 degrees.

The **Celsius** scale seems to be the more sensible scale, which is why most people now use it.

If you do not understand this, discuss it with your teacher.

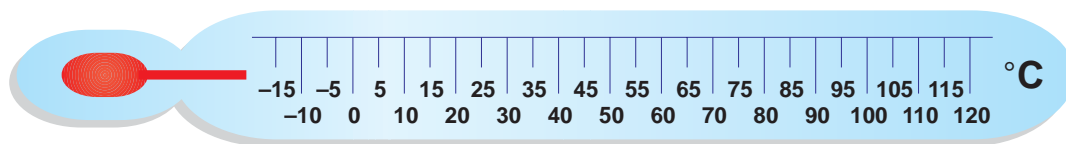


### Activity 10

This is a picture of a **Celsius thermometer**.

- 1 Draw crosses on the picture at these temperatures.

15      40      25      70      90      55



- 2 Working with a partner, use a Celsius thermometer to find

a the **temperature** in the room .....

b the **temperature** in your hand .....

- 3 Which is the higher temperature?

**room**      **hand**      (ring your answer)

- 4 What is the range of these two temperatures? .....

Check your answers before going any further.

- 5 Is the temperature in your hand the same as the temperature in the hand of the person you are working with?

**yes**      **no**      (ring your answer)

Humans are said to be 'warm blooded' animals. This means our temperature does not change very much. If our temperature rises or falls we can become ill.

The normal **temperature** for humans is 37 degrees Celsius ( $^{\circ}\text{C}$ ) or 98.4 degrees Fahrenheit ( $^{\circ}\text{F}$ ).

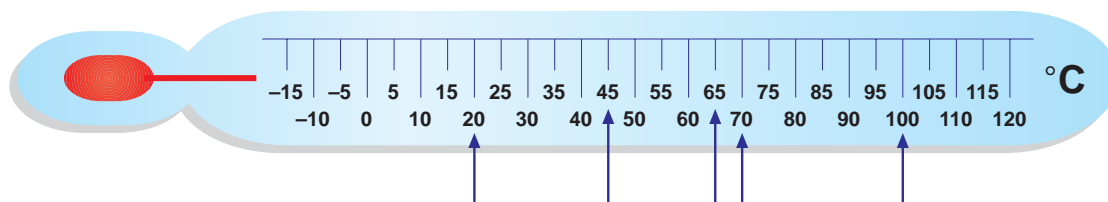
- 6 You have measured the temperature inside the room. Now guess what the temperature is outside. Write your guess here: .....

- 7 Use the thermometer to measure the outside temperature if possible.

Write it here: .....

- 8 Was your guess close to the real temperature outside?      **yes**      **no**

9 What temperatures are shown by the arrows on this Celsius thermometer?



.....

## Activity 11

This is a conversion table. It changes Fahrenheit temperatures into Celsius temperatures.

1 Use the table to change these Fahrenheit temperatures into Celsius temperatures.

a 60 °F is ..... b 90 °F is .....

Check your answers before going further.

c 55 °F is ..... d 100 °F is .....

e 85 °F is ..... f 75 °F is .....

2 Use the table to change these Celsius temperatures into Fahrenheit temperatures.

a 13 °C is ..... b 27 °C is .....

Check your answers before going further.

c 21 °C is ..... d 35 °C is .....

e 29 °C is ..... f 38 °C is .....

3 The temperatures below are Fahrenheit temperatures. Use the table to help you to **estimate** what these temperatures would be in Celsius.

a 93 °F is about ..... b 78 °F is about ..... c 63 °F is about .....

Check your answers before going any further.

d 53 °F is about ..... e 98 °F is about ..... f 73 °F is about .....

Fahrenheit	Celsius
50	10
55	13
60	16
65	18
70	21
75	24
80	27
85	29
90	32
95	35
100	38

## Review

- Do you need more practice in
- estimating, measuring and comparing temperatures?
  - reading scales and conversion tables?

Yes ☐ No ☐

Yes ☐ No ☐

This work links to mini-project M6 (page 23).

## Activity H1

- 1 Victor uses the rowing machine at the fitness centre. This is the display.

Time	Distance	Time	Distance
5:29 minutes	1102 metres	How long he has been rowing	How far he has rowed
Calories	Speed	Calories	Speed
80	87 metres per minute	How much energy he has used	Average speed

The display above shows examples of this **data**. Use the display to answer these questions.

- How far has he rowed? .....
  - How many calories has he used? .....
  - How long has he been rowing? .....
  - What is his average speed? .....
- 2 Put these pieces of information about Sam's session on the rowing machine into their correct places in the display below.

Time	Distance	
		66 metres per minute
		1245 metres
Calories	Speed	
		46
		18:40 minutes

- How much energy has Sam used? .....
- What is the range of Victor and Sam's speed? .....
- What is the mean of the distances rowed? .....
- What is the difference in time spent on the rowing machine?  
.....

Does this information tell you anything about the relative fitness of Victor and Sam?

Explain, and be prepared to discuss, your ideas.

.....  
.....



### Activity H2

1 Use this bar chart to answer these questions

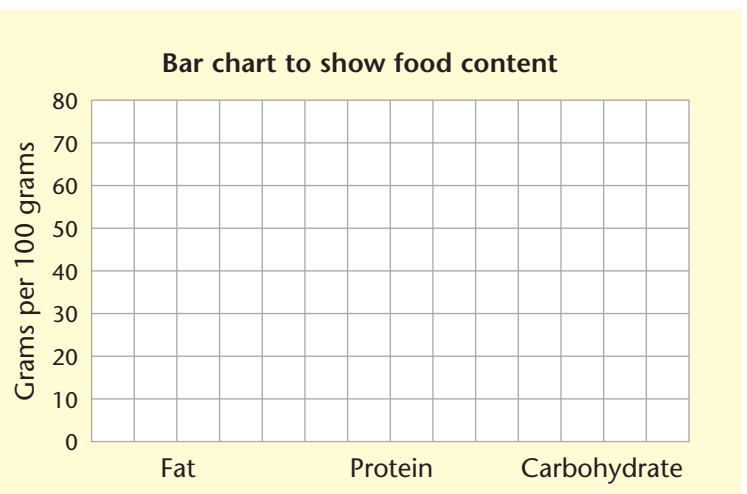
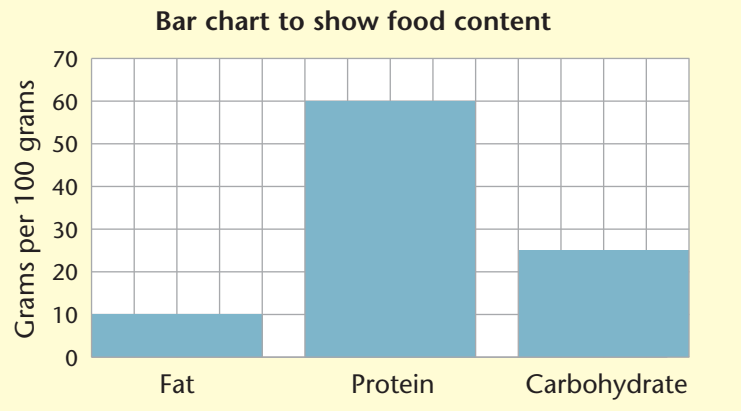
- a How many grams of fat are contained in 100 grams of this product?  
.....
- b How many grams of protein are contained in 100 grams of this product?  
.....
- c How many grams of carbohydrate are contained in 100 grams of this product?  
.....

2 Draw bars on the chart to show this information.

Fat 10 grams

Protein 50 grams

Carbohydrate 30 grams



### Activity H3

Are these examples discrete data or continuous data? Ring your answer.

- |                                     |          |            |
|-------------------------------------|----------|------------|
| 1 The temperature today             | discrete | continuous |
| 2 The depth of snow in the Alps     | discrete | continuous |
| 3 The number of teeth in your mouth | discrete | continuous |



### Activity H4

Find the **mean**, **median** and **mode** for the following sets of numbers.

- 1 5, 6, 2, 6, 8      mean = .....      median = .....      mode = .....
- 2 1, 7, 8, 1, 3, 5      mean = .....      median = .....      mode = .....
- 3 What is the **range** of this list of numbers? 2, 7, 1, 6, 6, 9, 2, 5, 10, 3, 3 .....



### Activity H5

What percentage is 1 12 of 25 ..... 2 10 of 50 ..... 3 3 of 4 .....



## Extension



### Activity E1

Middleton	Southam	Gurton	Leigh	Wilton	Rossbridge	Merton	Tyebridge
10:30	10:42	11:00	11:15	11:32	11:39	11:55	12:09

This is part of a bus timetable. The bus travels from Middleton to Tyebridge, passing through six other villages.

- 1 When does the bus reach Gurton? .....
- 2 When does the bus reach Merton? .....
- 3 Where is the bus at 11:35? .....



### Activity E2

This **pie chart** shows how 100 children travel to their local school.

48 travel by car

25 by bus

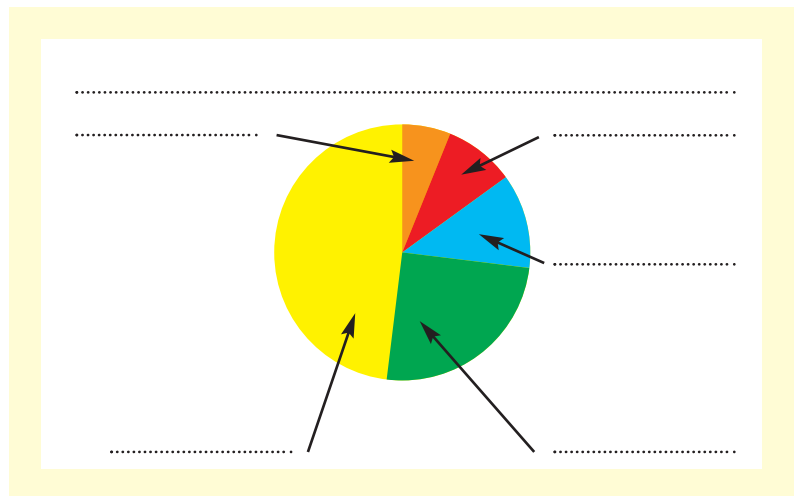
12 by bike

9 by taxi

6 walk to school

Write car, bus, bike, taxi and walk by the correct arrow on the pie chart.

Add a title.



### Activity E3

Would the number of people who could travel on a bus be called discrete data or continuous data?

**discrete**      **continuous**      (ring your answer)



### Activity E4

Calculate the **range** of these two lists of numbers and say which list has the larger spread.

**List 1:** 2, 5, 7, 3, 4, 6, 7, 12, 6

**List 2:** 12, 14, 18, 16, 13, 19

**Range** = .....      **Range** = .....

**List** ..... has the larger **spread**.



### Activity E5

What percentage is    **1** 9 of 12? .....    **2** 6 of 7? .....    **3** 5 of 8? .....



# Mini-projects



## Activity M1

Use the Internet to log on to a home catalogue site and find data about clothes to fit yourself.

Use telephone directories, libraries, etc. to find information about fitness centres in your area. Ask the centres for any leaflets they have about the services they offer. Which offer the best deals?



## Activity M2

Collect pie charts, bar charts, line graphs, etc. from a daily newspaper, for one week. (Look in the weather and business sections.) Write about the information shown in the charts and graphs you found.



## Activity M3

Keep a record of how far you walk each day and draw a line graph to illustrate the data.

Keep a record of how many hours you watch television each day and illustrate this in a line graph and a bar chart.



## Activity M4

Make a list of five different foods that you usually buy. Visit your local supermarkets and grocery stores and make a list of the prices of these items.

What is the range of prices for each item?

What is the median and mean price of each item?



## Activity M5

Find out how many people in your class or where you work are female and how many are male. Calculate what percentage are female and what percentage are male.



## Activity M6

Use a thermometer to measure the outside temperature at the same time each day for one week. Draw a line graph to illustrate the data.

Find a formula for changing the temperature in Fahrenheit into the temperature in Celsius. You could visit your local library or adult education centre, or use the Internet.



## Check it



### Activity C1

1 This is part of a table showing the ideal weight in kilograms for men of different heights.

a What range of weights is ideal for a man of small frame and 162 cm in height?

.....

b What range of weights is ideal for a man of large frame and 157 cm in height?

.....

	Weight in kg		
Height in cm	Small frame	Medium frame	Large frame
157	58–61	59–64	63–68
160	59–62	60–65	64–70
162	60–63	61–66	65–71
165	61–64	62–67	65–73
167	62–65	63–69	66–75

2 This bar chart shows how some children travel to school each day.

Add a title to the bar chart.

a How many children walk to school?

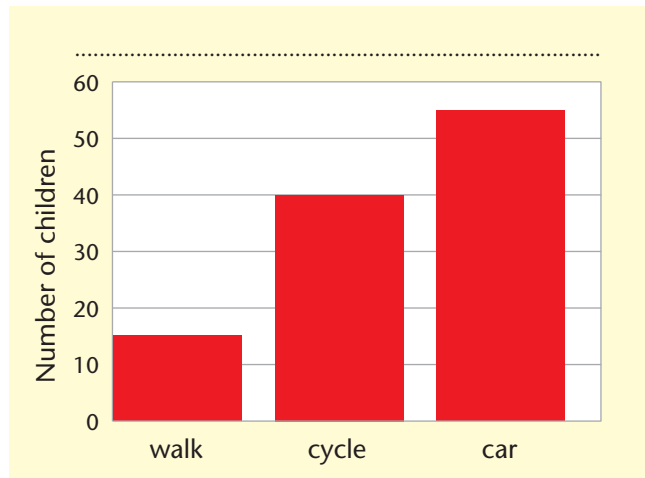
.....

b How many children cycle to school?

.....

c How many children are driven to school?

.....



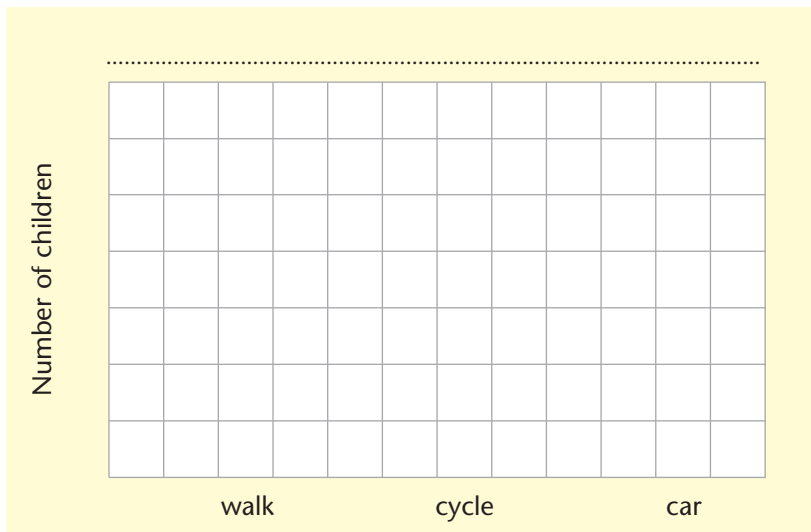
3 Choose a scale and draw bars on the chart below to illustrate the data.

a 20 children walk to school

b 35 children cycle to school

c 50 children are driven to school

Add a title.







### Activity C2

1 Calculate the mean, median and mode of these lists of numbers.

a 3, 5, 2, 6, 7, 7, 1

b 12, 14, 12, 16, 20

c 50, 35, 16, 52

Mean = .....

Mean = .....

Mean = .....

Median = .....

Median = .....

Median = .....

Mode = .....

Mode = .....

Mode = .....

2 What is the range of each of these lists of numbers?

a 3, 8, 1, 9, 2, 2, 6, 7    Range = .....    b 16, 11, 18, 14, 23    Range = .....

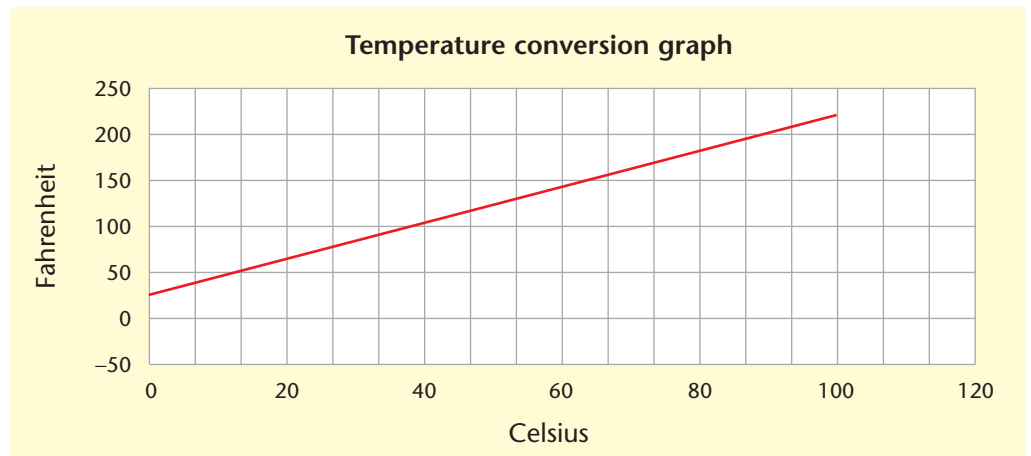
### Activity C3

This graph will help you to convert the temperature from Fahrenheit to Celsius.

1 What Fahrenheit temperature is approximately the same as 60 degrees Celsius?

.....

2 What Fahrenheit temperature is approximately the same as 40 degrees Celsius? .....



### How am I doing?

Now look back at the skills listed on page 1.  
Then complete the sentences below.

I am confident with

.....  
.....

I need more practice with

.....

Date .....



# Answers

## Activity 1

- 1 a underweight  
b overweight  
c correct weight  
d overweight  
e underweight
- 2 a between 70 kg and 75 kg  
b between 58 kg and 61 kg  
c between 69 kg and 75 kg  
d between 69 kg and 78 kg  
e between 76 kg and 83 kg  
f between 61 kg and 64 kg

3

	Weight in kg		
Height in cm	Small frame	Medium frame	Large frame
152	47–52		55–62
155			57–64
157	49–55	54–60	
160	50–56		
163		56–63	
165	53–59		

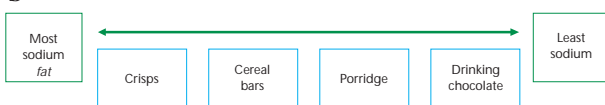
## Activity 2

- 1 a 0.1 g of saturated fat and 0.3 g of salt  
b 6.2 g of saturated fat and 0.5 g of salt  
c 0.4 g of fibre  
d 10.2 g of protein  
e 13.0 g of carbohydrate  
f 0.9 g of protein  
g 0.4 g  
h 14.4 g  
i cream crackers

2 a



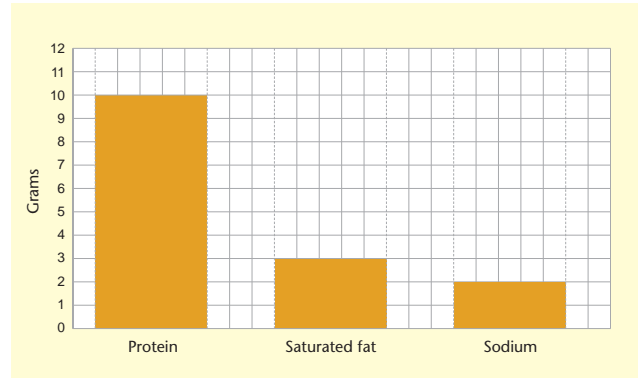
b



c Crisps

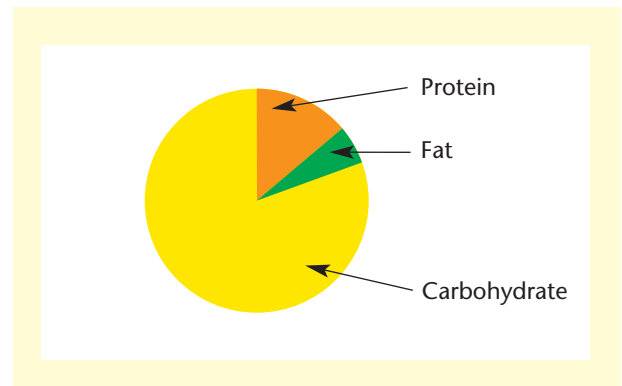
## Activity 3

1 A chart similar to this.



2 a C b A c B

3



## Activity 4

- 1 a 120 b 100 c 85 d 75 e faster  
f  $27\frac{1}{2}$  and again at 40
- 2 Your answers should be close to  
a 16 km b 32 km c 40 km d 64 km

## Activity 5

- 1 £20
- 2 a discrete b discrete c continuous  
d discrete e continuous

## Activity 6

1 Check your answer with your teacher.

## Activity 7

- 1 a 38 b 62 c 29
- 2 301



- 3 a Divide the total by 3.  
Therefore the **mean** is  $15 \div 3 = 5$
- b Divide the total by 5.  
Therefore the **mean** is  $42 \div 5 = 8.4$
- c Divide the total by 6.  
Therefore the **mean** is  $24 \div 6 = 4$
- 4 a 5 b 14 c 5
- 5 3.5
- 6 a 12 b 1 c 5
- 7 15

### Activity 8

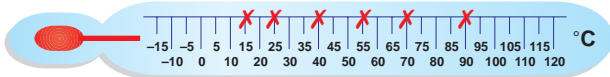
- 1 2, 2, 3, 3, 3, 4, 4, 5, 5, 6, 7, 8
- 2 a 6 b 21 c 13
- 3 a Total for Week 1 = 67 Total for Week 2 = 102  
b 10 c 33 d Week 2 e 22.3 f 33 g No

### Activity 9

- 1 a  $\frac{12}{50} = \frac{24}{100}$  which equals 24%
- b  $\frac{8}{25} = \frac{32}{100}$  which equals 32%
- c  $\frac{18}{20} = \frac{90}{100}$  which equals 90%
- d  $\frac{7}{10} = \frac{70}{100}$  which equals 70%
- e  $\frac{9}{10} = \frac{90}{100}$  which equals 90%
- f  $\frac{7}{20} = \frac{35}{100}$  which equals 35%
- g  $\frac{13}{25} = \frac{52}{100}$  which equals 52%
- 2 a 68.75% b 22% c 72% d 36% e 89.47%
- 3 a 50% b 1% c 25% d 20%

### Activity 10

1



Check your answers to questions 2 to 8 with your teacher.

- 9 The arrows are pointing at these temperatures:  
20, 45, 65, 70, 100 °C.

### Activity 11

- 1 a 16 °C b 32 °C c 13 °C d 38 °C e 29 °C  
f 24 °C
- 2 a 55 °F b 80 °F c 70 °F d 95 °F e 85 °F  
f 100 °F
- 3 a 33 or 34 °C b 26 °C c 17 °C  
d 11 or 12 °C e 36 or 37 °C f 22 or 23 °C

### Help

#### H1

- 1 a 1102 m b 80 c 5:29 minutes  
d 87 metre per minute (m/min)

2

Time	Distance
18:40	1245 metres
Calories	Speed
46	66 metres per minute

- a 46 calories b  $87 - 66 = 21$  m/min  
c 1173.5 m d 13:11 min  
Discuss your ideas with your teacher.

#### H2

- 1 a 10 g b 60 g c 25 g
- 2 Check your answer with your teacher.

#### H3

- 1 continuous 2 continuous 3 discrete

#### H4

- 1 a mean = 5.4 median = 6 mode = 6  
b mean = 4.17 median = 4 mode = 1
- 2 Range = 9

#### H5

- 1 48% 2 20% 3 75%



## Extension

### E1

- 1 11:00
- 2 11:55
- 3 Between Wilton and Rossbridge

### E2

Check your pie chart answers with your teacher.

### E3

- 1 discrete

### E4

Range of List 1 = 10    Range of List 2 = 7  
List 1 has the larger spread.

### E5

- 1 75%    2 85.7%    3 62.5%

## Mini-projects

*Activities M1, M2, M3, M4, M5, M6*

Answers will vary. Check your answers with your teacher.

## Check it

### C1

- 1 a 60 to 63 kg  
b 63 to 68 kg
- 2 a 15    b 40    c 55

- 3 Check your answers with your teacher.

### C2

- 1 a Mean = 4.4    Median = 5    Mode = 7  
b Mean = 14.8    Median = 14    Mode = 12  
c Mean = 38.25    Median = 42.5    Mode = no mode
- 2 a Range =  $9 - 1 = 8$     b Range =  $23 - 11 = 12$

### C3

- 1 Approximately 140 °F
- 2 Approximately 104 °F