

KNOWLEDGE CHECK

32

KNOWLEDGE OF METRIC UNITS OF LENGTH AND DISTANCE

- a) The length of a sheet of A4 paper is 297 mm. What is this in centimetres? What is it in metres?
- b) The length of the school running track is 400 m. What is this in kilometres?
- c) The speed limit on a German autobahn is 130 km/hour. What is this in miles per hour?
- d) Which is longer, a 200-mm ruler or a 12-inch (foot) ruler?

ANSWERS TO KNOWLEDGE CHECK 32

- a) $297 \text{ mm} = 29.7 \text{ cm} = 0.297 \text{ m}$. b) $400 \text{ m} = 0.4 \text{ km}$.
c) about 80 mph. d) 12-inch.

DISCUSSION AND EXPLANATION OF KNOWLEDGE CHECK 32

This knowledge check is an opportunity for you to make sure you have a basic knowledge of metric units of length and the relationships between them. The basic metric unit of length is the metre, which is about the distance from my nose to my outstretched finger-tip. Other units of length are then obtained by adding prefixes to this: such as, *kilo(k)* for a thousand, *centi(c)* for a hundredth and *milli(m)* for a thousandth. So, $1 \text{ km} = 1000 \text{ m}$, $1 \text{ m} = 100 \text{ cm}$, $1 \text{ m} = 1000 \text{ mm}$, and $1 \text{ cm} = 10 \text{ mm}$. Putting these another way: $1 \text{ m} = 0.001 \text{ km}$, $1 \text{ cm} = 0.01 \text{ m}$, $1 \text{ mm} = 0.001 \text{ m} = 0.1 \text{ cm}$.

So $297 \text{ mm} = 29.7 \text{ cm}$ (dividing by 10) and $297 \text{ mm} = 0.297 \text{ m}$ (dividing by 1000). Similarly, $400 \text{ m} = 0.400 \text{ km}$ (dividing by 1000).

Did you know that the distance from the North Pole to the equator is about 10 million metres? That's 10 000 km. Knowing this helps you to have some idea of distances on the Earth's surface. For example, the distance right round the equator would be about 40 000 km. It's always useful to learn by heart the lengths of a few items that you can use for reference like this. Start with your own height. I am 183 cm, for example – is that tall for a man, or average, or short? I always relate smaller lengths to the dimensions of A4 paper (297 mm by 210 mm, or about 30 cm by 21 cm). Most rulers used in school are 30 cm (300 mm) in length.

You should have some idea of how metric units relate to imperial units still in everyday use, like the mile. Most people use an approximation such as 5 miles = 8 kilometres or 3 miles = 5 kilometres. If you combine these you can get the following simple sequence of approximate conversions: 3 miles = 5 km, 5 miles = 8 km, 8 miles = 13 km, 13 miles = 21 km, 21 miles = 34 km, 34 miles = 55 km, 55 miles = 89 km and so on. These are pretty good approximations and they can be used to work out other approximate conversions very easily. For example, knowing that $13 \text{ km} = 8 \text{ miles}$ (approximately) gives me $130 \text{ km} = 80 \text{ miles}$, which is a reasonably accurate result.

You will find that inches are still widely used for many informal communications of lengths, even though officially nothing should now be sold in these imperial units. If you remember that a 12-inch ruler has been replaced by a 30-cm (300 mm) ruler, you should be able to convert between inches and centimetres fairly easily. The following are fairly good approximations which can be deduced from this starting-point: $15 \text{ cm} = 6 \text{ inches}$, $10 \text{ cm} = 4 \text{ inches}$, $5 \text{ cm} = 2 \text{ inches}$, $2.5 \text{ cm} = 1 \text{ inch}$.

SUMMARY OF KEY IDEAS

- Metric units of length include the metre (m), kilometre (1 km = 1000 m), the centimetre (1 cm = 0.01 m), and the millimetre (1 mm = 0.001 m).
- 1 m = 1000 mm, 1 m = 100 cm, 1 cm = 10 mm, 1 m = 0.001 km.
- Memorise the lengths of some reference items, such as the dimensions of A4 paper (about 30 cm by 21 cm), your height in centimetres, the distance from the North Pole to the equator (about 10 000 km).
- To convert between metric and imperial, remember: 3 miles is about 5 km, 5 miles is about 8 km; 30 centimetres is about 12 inches (one foot).



FURTHER PRACTICE

- 32.1 The length of a sheet of A0 paper is about 1189 millimetres. Write this length in centimetres. Then write it in metres.
- 32.2 Estimate the following lengths:
- a) the height of a standard litre-carton of milk, in cm
 - b) the length of a cricket pitch, in m
 - c) the diameter of the hole in the neck of a wine bottle, in mm.
- 32.3 If there was a motorway straight from the North Pole to the equator and you drove down it non-stop at 70 mph, about how long would the complete journey take? About how many degrees of latitude would you pass through per hour? (The whole journey is 90° .)