EDEXCEL FUNCTIONAL SKILLS PILOT

Maths Level 2

Chapter 4

Working with measures

EDEXCEL FUNCTIONAL SKILLS: INTERIM SUPPORT MATERIAL

Maths Level 2

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Chapter 4: Working with measures

Use these free pilot resources to help build your learners' skill base
We are delighted to continue to make available our free pilot learner resources and teacher notes, to help teach the skills learners need to pass Edexcel FS Mathematics, Level 2.

But use the accredited exam material and other resources to prepare them for the real assessment
We developed these materials for the pilot assessment and standards and have now matched them to the final specification in the table below. They'll be a useful interim measure to get you started but the assessment guidance should no longer be used and you should make sure you use the accredited assessments to prepare your learners for the actual assessment.

New resources available for further support
We're also making available new learner and teacher resources that are completely matched to the final specification and assessment – and also providing access to banks of the actual live papers as these become available. We recommend that you switch to using these as they become available.

Coverage of accredited specification and standards
The table below shows the match of the accredited specification to the unit of pilot resources. This table supersedes the pilot table within the teacher notes.

Coverage and Range	Exemplification	Learner Unit
Use, convert and calculate using metric and, where appropriate, imperial measures	• Including time, length, weight, capacity and temperature • Conversion graphs • Speed • Convert between metric units • Convert between imperial units • Convert between metric and imperial units	**G1** Time **G2** Temperature **G3** Length **G4** Weight **G5** Capacity **G6** Conversion between metric units **G7** Conversion between metric and imperial units **G8** Conversion factors Conversion graphs are covered in our new publishing (see below)
		G9 Remember what you have learned

Where to find the final specification, assessment and resource material
Visit our website **www.edexcel.com/fs** then:
- **for the specification and assessments:** under **Subjects**, click on **Mathematics (Levels 1–2)**
- **for information about resources:** under **Support**, click on **Published resources**.

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G Working with units and scales

You should already know how to:

- ✓ read, measure and record time in common date formats and in the 12-hour and 24-hour clock
- ✓ choose and use appropriate units and instruments to measure length, weight, capacity, time and temperature
- ✓ add, subtract and convert common units of measure.

By the end of this section you will know how to:

- calculate, measure and record time in different formats
- estimate, measure and compare length, weight, capacity and temperature, using metric and imperial units
- read and use scales
- use conversion factors and conversion tables

1 Time

Learn the skill

You need to know the units for time and the connections between them.

- 60 seconds = 1 minute
- 60 minutes = 1 hour
- 24 hours = 1 day
- 1 month has between 28 and 31 days
- 7 days = 1 week
- 52 weeks = 1 year
- 12 months = 1 year
- 365 days = 1 year (366 in a leap year)

Example 1: A train leaves Manchester at 09:45 and arrives in London at 12:06. How long does the train take to get from Manchester to London?

09:45 to 11:45 is 2 hours.

11:45 to 12:00 is 15 minutes.

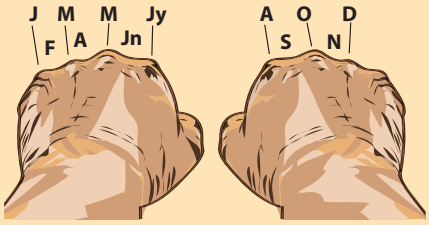
12:00 to 12:06 is 6 minutes.

Total time = 2 hours + 15 minutes + 6 minutes
= 2 hours 21 minutes

Answer: 2 hours 21 minutes

Tip

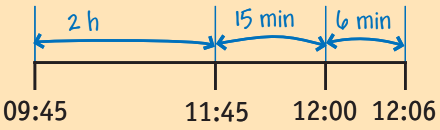
Use your knuckles to remember how many days in each month. Start with the knuckle on the smallest finger of your left hand, move from left to right ignoring the thumb knuckles.



Months on the knuckles have 31 days, months in the valleys have 30 days. Apart from February which has 28 days and 29 in a leap year, which is every 4 years.

Tip

A timeline can help:



Example 2: A boy is 9 years 2 months old. His sister is 2 years 5 months younger. How old is his sister?

You need to subtract 2 years 5 months from 9 years 2 months.

First subtract 2 years to give 7 years 2 months.

Then subtract 2 months to give 7 years. (5 = 2 + 3)

Finally, subtract the remaining 3 months to give 6 years 9 months.

Answer: 6 years 9 months

Try the skill

1. A family plan to take a train which leaves at 07:27. They need to allow 40 minutes to get from home to the station. What time should they leave home?

2. A telephone bill shows the longest telephone call was 33 minutes 7 seconds and the shortest was 6 minutes 50 seconds. What is the difference between the two times?

3. A builder drives for 20 minutes to the local DIY store. He is in the DIY store for $1\frac{3}{4}$ hours and then drives to work, which takes $1\frac{1}{2}$ hours. How long does his journey take, in total?

4. The youngest child in a nursery is 1 year 9 months old. The oldest child is 4 years 5 months old. What is the difference between these two ages?

5. The timetable shows the times of coaches from Manchester Piccadilly to Liverpool John Lennon Airport in the afternoon.

Manchester Piccadilly Rail Station	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
Manchester Sackville Street	1410	1510	1610	1710	1810	1910	2010	2110	2210	2310
Salford Regent Road Sainsbury's	1418	1518	1618	1718	1818	1918	2018	2118	2218	2318
Eccles Interchange	1428	1528	1628	1728	1828	1928	2028	2128	2228	2328
Burtonwood Services	1453	1553	1653	1753	1853	1953	2053	2153	2253	2353
Liverpool John Lennon Airport	1515	1615	1715	1815	1915	2015	2115	2215	2315	0015

A family living in Manchester have booked a flight from Liverpool John Lennon Airport. The flight leaves at 7pm and they need to be at the airport at least two hours before the flight departure. What is the time of the latest coach the family can take to get to the airport on time?

Tip

Test questions involving time may include looking at bus and train timetables as well as working out the time taken to complete activities.

Tip

In the 24-hour clock the day runs from midnight to midnight and is divided into 24 hours, numbered from 0 to 23.
17.25 = 5.25pm (17 – 12 = 5)

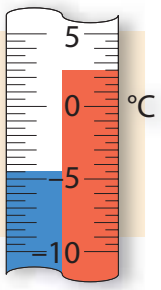
2 Temperature

First read this ...

Temperature is usually recorded in **degrees Celsius**, although **degrees Fahrenheit** are still sometimes used.

To read a temperature scale, first work out what the individual marks on the scale represent.

Example 1: The thermometer shows the maximum and minimum temperatures recorded in Moscow on a particular day.
What is the difference between the maximum and minimum temperatures?



10 marks represent 5 degrees

so 1 mark represents $\frac{5}{10}$ = 0.5 degrees

Reading from the scale, the maximum temperature is 2.5 °C and the minimum temperature is –4.5 °C.

The signs are different so you *add* the two numbers together to find the difference in temperature.

2.5 + 4.5 = 7

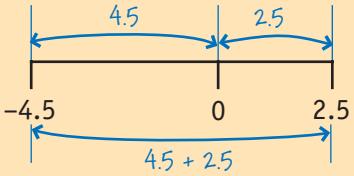
Answer: 7 °C

Test tip

Test questions about temperature may also involve **reading scales**.

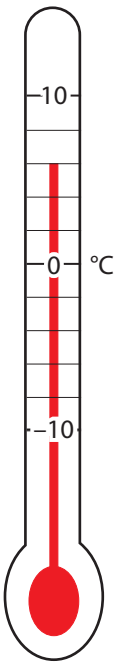
Tip

Sketch a temperature line:

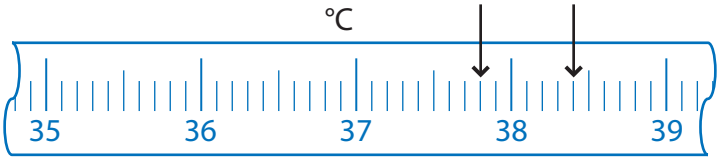


Try the skill

1. What is the temperature marked on this thermometer?



2. What is the difference between the two temperatures marked on this thermometer?



3 Length

Learn the skill

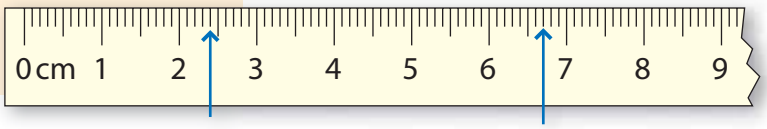
Length is a measure of distance.

You need to know the metric units for length and the connections between them.

- 10 mm = 1 cm
- 100 cm = 1 m
- 1000 m = 1 km

Questions can involve reading scales

Example 1: Work out the distance between the two markers shown on the ruler.



10 marks represent 1 centimetre.

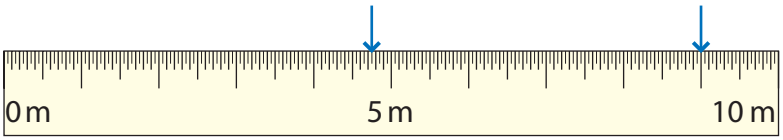
1 mark represents $\frac{1}{10}$ = 0.1 cm.

The first mark is at 2.4 cm, the second is at 6.7 cm, so the distance between them is 6.7 – 2.4 = 4.3 cm.

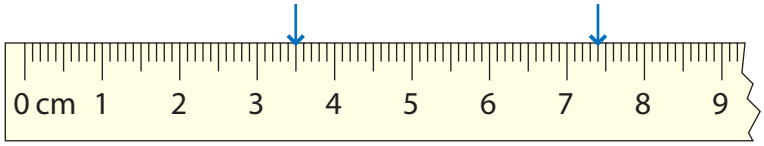
Answer: 4.3 cm

Try the skill

1. Work out the distance between the markings on this metre scale.



2. What is the distance between the two points marked on this scale?



4 Weight

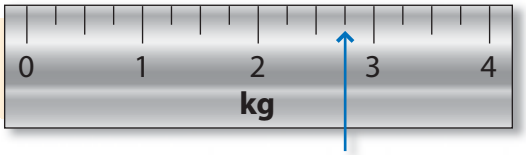
Learn the skill

Weight is a measure of the **mass** of an object.

You need to know the metric units for weight and the connections between them.

- 1000 mg = 1 g
- 1000 g = 1 kg
- 1000 kg = 1 tonne

Example 1: What is the weight, in kilograms, marked on this scale?



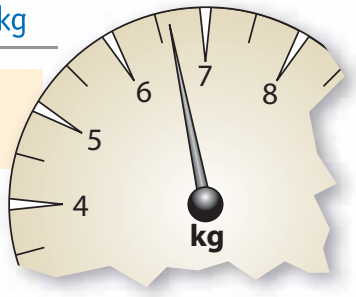
4 marks represent 1 kilogram.

1 mark represents $\frac{1}{4}$ = 0.25 kg.

So the mark on the scale is at 2 + (3 × 0.25) = 2.75 kg.

Answer: 2.75 kg

Example 2: What is the reading on this scale, to the nearest $\frac{1}{2}$ kilogram?



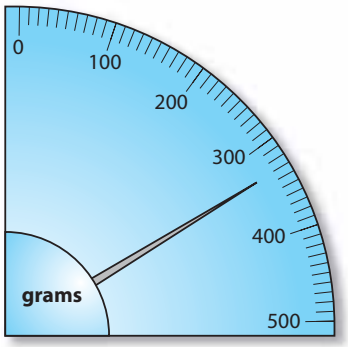
Each mark represents $\frac{1}{2}$ kg.

The pointer is nearer to the $6\frac{1}{2}$ kg mark than the 7 kg mark.

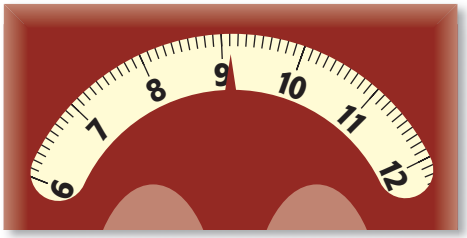
Answer: $6\frac{1}{2}$ kg

Try the skill

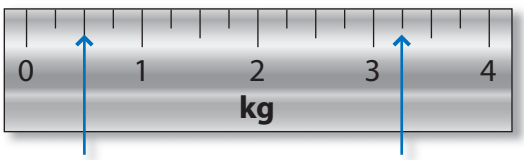
1. What is the reading on this scale, in grams?



2. What is the reading on this scale, which is marked in kilograms?



3. What is the difference between the two readings on this scale?



5 Capacity

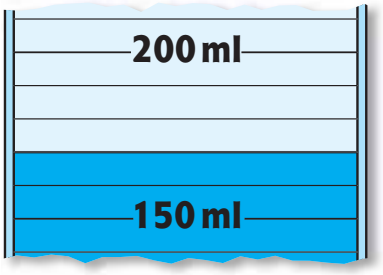
Learn the skill

The capacity of a container is the amount of fluid it can hold.

You need to know the metric units for capacity and the connections between them.

- 1000 ml = 1 litre
- 1000 cm^3 = 1 litre

Example 1: What is the reading on this scale, in millilitres?



5 marks represent 50 millilitres.

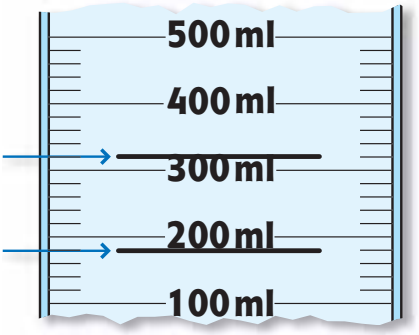
1 mark represents $\frac{50}{5}$ = 10 ml.

The reading is 170 ml.

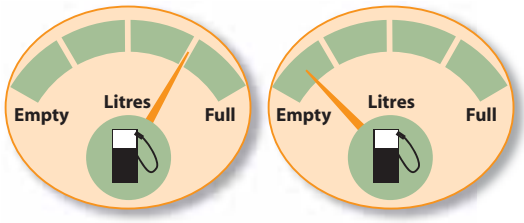
Answer: 170 ml

Try the skill

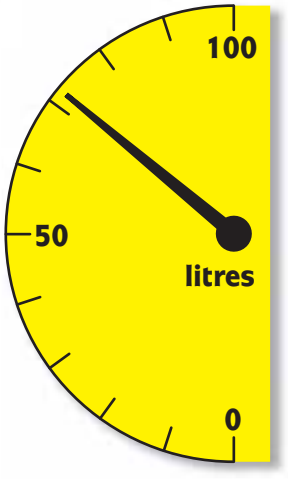
1. What is the difference between the two marks on the scale, in millilitres?



2. A car's fuel tank holds 40 litres. The fuel gauges show the petrol in the tank at the start and the end of a journey. How much petrol did the car use during the journey?



3. A lorry's fuel tank holds 100 litres of diesel. The diagram shows the amount of fuel in the tank at the start of a journey. Approximately how much diesel is in the tank?



6 Conversion between metric units

Learn the skill

The metric system is based on tens, hundreds and thousands. To convert from one unit to another you need to multiply or divide by 10, 100 or 1000. You should know the following conversions to change from one metric unit to another:

Length	Weight	Capacity/Volume
10 mm = 1 cm	1000 mg = 1 g	100 cl = 1 litre
100 cm = 1 m	1000 g = 1 kg	1000 ml = 1 litre
1000 mm = 1 m	1000 kg = 1 tonne	1000 cm^3 = 1 litre
1000 m = 1 km		1000 l = 1 m^3

Tip

To convert **from large** units **to small** units **multiply**.
To convert **from small** units **to large** units **divide**.

Example 1: 1 litre of water weighs 1 kilogram. What does 100 millilitres of water weigh?

If 1 litre of water weighs 1 kg, then 1000 ml weighs 1000 g, so that 100 ml weighs 100 g.

Answer: 100 g

Example 2: The length of a standard safety barrier on UK motorways is 30 metres. How many standard safety barriers are needed on a 10 kilometre stretch of motorway?

10 km = 10 × 1000 m = 10 000 m. The number of barriers needed is $\frac{10\,000}{30}$ = 333.3, 333 barriers is not enough.

Answer: 334 barriers

Example 3: A measuring jug contains 500 milllitres of water. Stones for a fish tank are added and the measuring jug then reads 875 millilitres. What is the volume of stones for the fish tank?

875 – 500 = 375 ml. 1000 cm^3 = 1 litre = 1000 ml so 375 ml = 375 cm^3

Answer: 375 cm^3

Try the skill

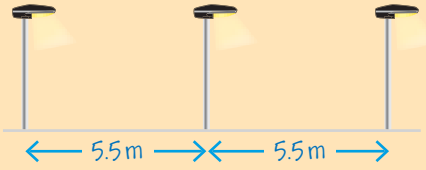
1. What is the largest number of 200 millilitre glasses that can be filled from a 1.5 litre carton of fruit juice?

2. The weight of a case of 24 cans of cola is 7.92 kilograms. A lorry has a maximum load capacity of 60 tonnes. What is the largest number of cans of cola the lorry can carry at one time?

3. A local council instals solar lights along the centre of its roads. The distance between each of the solar lights is 5.5 metres. How many solar lights are fitted on an 11 kilometre stretch of road?

Tip

In an 11 metre stretch of road 3 solar lights will be fitted:



There are 3 lights but 2 gaps.

7 Conversion between metric and imperial units

Learn the skill

Some imperial units are still used in the UK. For example, distances on road signs are given in miles and drinks can be measured in pints. You should be familiar with some of the more common imperial units and the connection between them.

Length	Weight	Capacity
12 inches = 1 foot	16 ounces = 1 pound	1 pint = 20 fluid ounces
3 feet = 1 yard	14 pounds = 1 stone	8 pints = 1 gallon.
1760 yards = 1 mile	160 stone = 1 ton	

It is useful to remember some of the approximate connections between metric and imperial units to give you an idea of the relative size. For example:

- One yard is a little less than one metre
- Two pounds is a little less than one kilogram
- Two pints is a little more than one litre

The table shows some conversions between metric and imperial units which are usually used in assessment questions.

Length		Weight		Capacity	
1 inch	2.5 cm	1 ounce	25 g	1 l	$1\frac{3}{4}$ pints
1 foot	30 cm	1 kg	2.2 pounds	1 gallon	4.5 l
1 m	39 inches				
8 km	5 miles				

Example 1: Jessica is 5 feet 4 inches tall. What is her height in metres?

Using the table:

1 foot = 30 cm so 5 feet = 5 × 30 = 150 cm

1 inch is 2.5 cm so 4 inches = 4 × 2.5 = 10 cm

Total height = 150 + 10 = 160 cm = 1.6 metres.

Answer: 1.6 metres

Example 2: A supermarket sells milk in 6 pint containers. What is 6 pints in litres?

Remember

Decide which of fraction, decimal or percentage form is most suitable to use in calculations.

Using the table:

1 litre = $1\frac{3}{4}$ pints = 1.75 pints

As every 1.75 pints is 1 litre, the calculation is 6 ÷ 1.75 = 3.428571429 litres.

The answer should be given to an appropriate degree of accuracy.

As 1 litre = 1000 millilitres, to write to the nearest millilitre you need 3 places of decimals, which is 3.429 litres, or 3 litres 429 millitres.

Answer: 3.429 litres

Try the skill

Use the conversion table to answer the following questions

1. A recipe for 60 cupcakes uses 32 ounces of flour. What is 32 ounces in grams?

2. A large turkey weighs 25 pounds. What is 25 pounds in kilograms?

3. Matthew is 1.75 metres tall. What is 1.75 metres in feet and inches to the nearest inch?

4. In the USA, gallons are still used to measure units of 'gas' or petrol in their 'gas' stations. A customer fills up his car with 10.5 gallons of petrol. What is 10.5 gallons in litres?

5. A marathon is 42.195 kilometres. How far is this in miles?

6. A car's petrol tank holds 42 litres of petrol. The manufacturer advertises that the car can travel 430 miles on a full tank of petrol. How many miles per gallon can the car travel?

7. The distance between Manchester and London is 163.87 miles. How far is this in kilometres?

8. A Good Health magazine recommends that you should drink 8 pints of water a day. What is 8 pints in litres?

9. The weight of one of the engines in the QE2 is 120 tons. What is 120 tons in tonnes?

Remember

12 inches = 1 foot

8 Conversion factors

Learn the skill

You can convert between units by using a conversion factor.

A conversion factor is a number by which you multiply or divide measures to change them to another unit.

Example 1: Convert 2.55 hours to hours and minutes.

2.55 hours = 2 hours + 0.55 hours

The conversion factor to change a fraction or decimal fraction of an hour to minutes is 60.

0.55 × 60 = (0.5 × 60) + (0.05 × 60) = 30 + 3 = 33 minutes

Answer: 2 hours 33 minutes

Example 2: A car travels at a speed of 60 mph. Approximately what is 60 mph in km per hour?

From table 2, 5 miles = 8 kilometres so

1 mile = $\frac{8}{5}$ kilometres = 1.6 kilometres

The conversion factor from miles to kilometres is 1.6

60 mph = 60 × 1.6 = 96 km per hour

Example 3: A tennis player weighs 60 kg. What is her weight, in stones and pounds? 1 kilogram is approximately 2.2 pounds and 14 pounds = 1 stone.

First, change kilograms to pounds by multiplying by 2.2.

60 × 2.2 = (60 × 2) + (60 × 0.2) = 120 + 12 = 132 pounds

14 pounds = 1 stone so 140 pounds = 10 stones

132 pounds = 10 stones – 8 pounds = 9 stones 6 pounds

Answer: 9 stones 6 pounds

Example 4: A car uses an average of 47 miles per gallon. How much is this in kilometres per litre?

Use the conversion factors 1 gallon = 4.5 litres and 1 mile = 1.6 kilometres

47 miles per gallon = 47 miles per 4.5 litres = $\frac{47}{4.5}$ miles per litre

This is 10.444 … miles per litre

As 1 mile = 1.6 km the calculation is $10.\dot{4} \times 1.6$ = 16.711111111

Answer: 16.7 km per litre (to 1 d.p.)

Tip

The conversion factor can be worked out from table 2. For example, the conversion factor to convert from inches to centimetres is 2.5.

Tip

2.55 hours is not the same as 2 hours 55 minutes as there are 60 minutes in an hour.

Tip

Check your answer makes sense. 1 mile is longer than 1 kilometre so the answer must be more than 60 km per hour.

Tip

Be careful not to round too soon.

Try the skill

1. A car travels at an average speed of 50 mph. Approximately how long, in hours and minutes, does it take to travel a distance of 115 miles?

Remember

Time = $\frac{\text{distance}}{\text{speed}}$

2. A television is described as having a 22-inch screen. What is 22 inches in centimetres? Use 1 inch = 2.5 cm.

3. A football pitch has a length of 22 yards. What is the length of the football pitch in metres? Use 1 yard = 3 feet, 1 foot = 12 inches and 1 inch = 2.5 cm.

4. An electrician needs 90 feet of cable. Approximately how many metres of cable does he need? Use 1 metre = 40 inches.

5. Tomatoes are priced at £1.43 per kilogram. What is the price of the tomatoes per pound weight? Use 1 kg = 2.2 pounds.

Tip

Remember to check that your answer makes sense. For example a pound is less than a kilogram so the answer must be less than £1.43 a pound.

6. A recipe for chocolate cake needs 8 ounces of self-raising flour. How many grams of flour are needed for the chocolate cake? Use 1 ounce = 25 g.

7. A ballerina weighs 7 stone 1 pound. What does she weigh in kilograms? Use 1 kg = 2.2 pounds, 14 pounds = 1 stone.

Tip

Fluid ounces are an imperial measure of capacity. There are 20 fluid ounces in 1 pint.

8. An old recipe for chocolate mousse needs $7\frac{1}{2}$ fluid ounces of double cream. Approximately what is $7\frac{1}{2}$ fluid ounces in millilitres? Use 1 fluid ounce = 28 millilitres.

9. The instructions for mixing baby milk formula say that 5 scoops of powdered milk should be mixed with half a pint of water. How many millilitres are needed for each scoop of powdered milk? Use 1 pint = 570 millilitres.

9 Remember what you have learned

Learn the skill

- You need to know these units:
  - 60 seconds = 1 _____
  - 60 _____ = 1 hour
  - 7 _____ = 1 week
  - 52 weeks = 1 _____
  - 365 days = 1 _____ (366 in a _____ year)
  - 12 _____ = 1 year
  - _____ mm = 1 cm
  - _____ cm = 1 m
  - _____ m = 1 km
  - _____ g = 1 kg
  - _____ kg = 1 tonne
  - _____ cl = 1 litre
  - _____ ml = 1 litre
  - _____ cm^3 = 1 litre
- To read a temperature _____, first work out what the individual marks on the _____ represent.
- Length is a measure of _____.
- Weight is a measure of the _____ of an object.
- The _____ of a container is the amount of fluid it can hold.
- A _____ factor is a number by which you multiply or divide to change between units.

Use the skill

1. The preparation time for French roast lamb is $\frac{3}{4}$ hour and the cooking time is 3 hours 25 minutes.

What is the latest time a chef could begin to prepare French roast lamb, if it needs to be ready for customers at 8.30 pm?

A ☐ 4.10 pm
B ☐ 4.20 pm
C ☐ 4.40 pm
D ☐ 4.50 pm

2. A truck driver is driving a British vehicle in France. His fuel tank holds 18 gallons and is $\frac{1}{4}$ full.

Which calculation should he do to work out how many litres he needs to buy to fill up with fuel?

A ☐ $(\frac{1}{4} \times 18) \div 4.5$
B ☐ $(\frac{1}{4} \times 18) \times 4.5$
C ☐ $(\frac{3}{4} \times 18) \div 4.5$
D ☐ $(\frac{3}{4} \times 18) \times 4.5$

3. The Health Service needs to collect 10 000 units of blood per day to meet demand. 1 unit of blood is 450 ml.

How many litres of blood does the Health Service need per week? 1 litre = 1 000 ml

- A ☐ 3150
- B ☐ 31 500
- C ☐ 3 150 000
- D ☐ 315 000

4. The tallest player in the England football team in 2006 was 6 feet 7 inches.

What is 6 feet 7 inches in metres to the nearest centimetre?

Remember

1 inch = 2.5 cm
1 foot = 30 cm

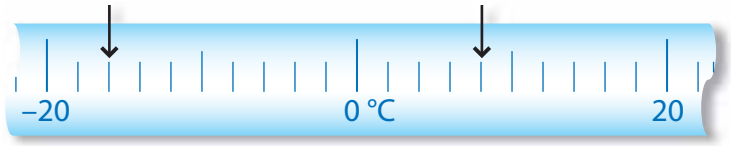
- A ☐ 1.68 metres
- B ☐ 1.70 metres
- C ☐ 1.98 metres
- D ☐ 2.25 metres

5. The average flying height of a plane is 39 000 feet.

What is the average flying height of the plane, in metres? 13 feet is approximately 4 metres.

- A ☐ 3000 m
- B ☐ 12 000 m
- C ☐ 39 000 m
- D ☐ 126 750 m

6. This thermometer shows the temperature inside a deep freeze before and after it has been defrosted.

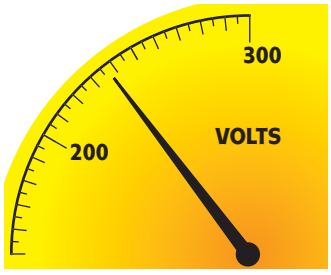


What is the difference between the temperatures?

- A ☐ 8 °C
- B ☐ 11 °C
- C ☐ 20 °C
- D ☐ 24 °C

7. The diagram shows the voltage across a circuit on a voltmeter.

What is the voltage, to the nearest 10 volts?



- A ☐ 230 volts
- B ☐ 235 volts
- C ☐ 240 volts
- D ☐ 245 volts

8. A recipe for one omelette needs 5 fluid ounces of milk.

Approximately how many omelettes can you make from 1 litre of milk?

Use the conversion 1 fluid ounce is approximately 28 millilitres.

Remember

1 litre = 1000 ml

- A ☐ 7
- B ☐ 8
- C ☐ 30
- D ☐ 35

