GCSE
Maths

R1 SI Units

Ratio
Proportion and Rates of Change

Contents

Information

International System of Measure (SI units)

Historically, there have been many different units used to measure quantities. Many are still in common usage today such as the British Imperial Measures. However, in an attempt to standardise measures throughout the world, the International System of Units (SI) was introduced in the 1960s and is widely accepted as the system of measure today.

Quantity Name	SI Unit Name	British Imperial Measures
length	metre	inches, feet, yards, miles
mass	kilogram	ounces, pounds, stones, hundredweights, tons
time	second	second

Compound Measures

Other units of measures can be derived from the above 3 SI units:

Quantity Name	Units
speed	metres per second (m/s)
acceleration	metres per second squared (m/s^2)
area	metres squared (m^2)
volume	metres cubed (m^3)
density	kilograms per cubic metre (kg/m^3)

Information

Length

The metre is the basic SI unit of length. For convenience, we can use smaller or larger units which are based on the metre:

mm = millimetres   10 mm = 1 cm

cm = centimetres   100 cm = 1 m

m = metres   1000 m = 1 km

1 **milli**metre (1 mm)   = 0.001 m   (or **1000** mm = 1 m)

1 **cen**timetre (1 cm)   = 0.01 m   (or **100** cm = 1 m)

1 **kilo**metre (1 km)   = **1000** m   (or 1 m = 0.001 km)

To convert centimetres to millimetres, multiply by 10
To convert meters to centimetres, multiply by 100

Exercise 1

1.   How many **milli**metres are there in 1 metre?   _____

2.   How many square **cent**imetres are there in 1 square metre?   _____

3.   How many cubic **centimetres** are there in 1 cubic metre?   _____

Information

Imperial Measure

Imperial metric conversion factors will be given to you in an exam if required. However, you should become familiar with the following British Imperial conversion factors for length.

 ins = inches

ft = feet

yds = yards

To convert feet to inches, multiply by 12

To convert yards to feet, multiply by 3

Exercise 2

1.   How many inches are there in a yard?   _____

2.   How many feet are there in 1 mile?   _____

Information

Mass

The kilogram is the basic SI unit of mass but we also use smaller or larger units which are based on the kilogram.

1 **milli**gram (1 mg)   = 0.001 g   (or 1,000,000 mg = 1 kg)

1 gram (1 g)   = 0.001 kg   (or 1000 g = 1 kg)

1 kilogram (1 kg)   = 0.001 t   (or 1000 kg = 1 t)

t = metric tonne = 1000 kg

1000 g = 1 **k**g

Example

To convert 1.5 **kilo**grams to grams

1.5 kg = 1.5 x **1000** = 1500 g

Information

Weight

Imperial to metric conversion factors will be given to you in an exam if required. However, you should become familiar with the following British Imperial conversion factors for mass.

oz = ounce

lb = pound (weight)

st = stone

cwt = hundredweight

Useful information when making estimations about weight:

1 kilogram = approximately 2.2 pounds.

½ kg is just a little more than 1 lb.

Examples

To convert 1.5 **kilo**grams to grams

1.5 kg = 1.5 x **1000** = 1500 g

To convert 3 *pounds* to *ounces*

3 lb = 3 x 16 = 48 oz

To convert 12 *pounds* to *kilograms.*

12 lb = 12 ÷ 2.2 = 5.45 kg

Exercise 3

1.   Convert the following quantities in pounds to kilograms.

   13 lb [   ] kg

   22 lb [   ] kg

   35 lb [   ] kg

2.   Convert the following quantities in pounds to grams.

   56 lb [   ] g

   78 lb [   ] g

   97 lb [   ] g

3. Put these parcels in order of size.

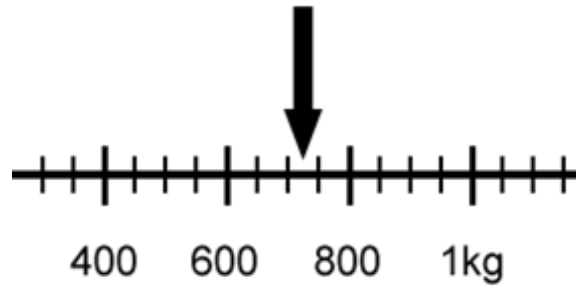|	
	6kg 350g
	6.02kg
	6.6kg
	6400g
	$6\frac{1}{2}$ kg

4. What is the weight shown on the scales below?

5. What is the weight shown on the scales below?
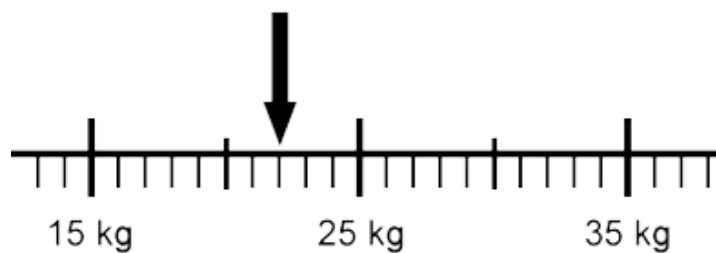
6.   What is the weight shown on the scales below?

400   600   800   1kg

7.   What is the weight shown on the scales below?

0
4kg 500g   500g
4kg   1kg
3kg 500g   1kg 500g
3kg   2kg
2kg 500g

8.   Convert the following from g/kg to pounds.

a.   500g [   ] lb

b.   1.75 kg [   ] lb

c.   45 g [   ] lb

d.   6.8 kg [   ] lb

Information

Capacity

The derived SI unit of volume is the **m³.** When dealing with liquids, it is more common to use a litre as the basic unit of capacity (the amount of liquid something can hold).

The litre is a non-SI unit of volume.

1 litre = 1000 cm^2 or 0.001 m^3

For convenience we can use smaller units or larger which are based on the litre.

ml = **milli**litre
cl = **cent**ilitre
l = litre

10 ml = 1 cl
100 cl = 1 l

Imperial/metric conversion factors will be given to you in an exam if required. However, you should be familiar with the following British Imperial conversion factors for capacity.

pt = pint
gal = gallon
8 pt = 1 gal

Useful information when making estimations about capacity.

A useful saying to convert between pints and litres is:

A litre of water is a pint and three quarters.

1 gallon approximately = $4 \frac{1}{2}$ litres

Examples

To convert 5 *litres* to *centilitres*

5 *l* = 5 x 100 = 500 *cl*

To convert 3 *litres* to *millilitres*

3 *l* = 3 x 1000 = 3000 *ml*

To convert 4 gallons to *pints*

4 *gal* = 4 x 8 =   32 *pt*

Exercise

1.   Order these liquid units.

	1022ml
	1.2litres
	1002ml
	122cl
	102cl

2.   A recipe says you will need $\dfrac{3}{4}$ of a pint of milk.

Round your answer to the nearest whole number.

Approximately how many centilitres this will this be?

	cl

3.   Five containers hold the following amounts of liquid:

$3\frac{1}{4}$ litres   190 cl $2\frac{3}{4}$ litres   1800 ml   3.3 litres

a)   What is the total capacity of the liquid in the 5 containers?

[   ] l

b)   What is the difference in capacity between the least full and most full container?

[   ] l

c)   Which 2 containers have a total capacity of liquid of 4.65 litres?

$3\frac{1}{4}$ *litres*   190 *cl* $2\frac{3}{4}$ *litres*   1800 *ml*   3.3 *litres*

4.   Complete the table using the conversion below. Give your answer to 1 decimal point.

1 *gallon* approximately = $4\frac{1}{2}$ litres,

Average Water Usage	Gallons	Litres
Toilet: per flush	1.6	
1 minute shower		15
3 minute shower	10	
Bath	22	