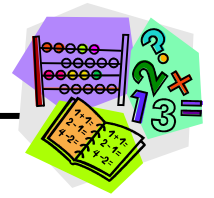


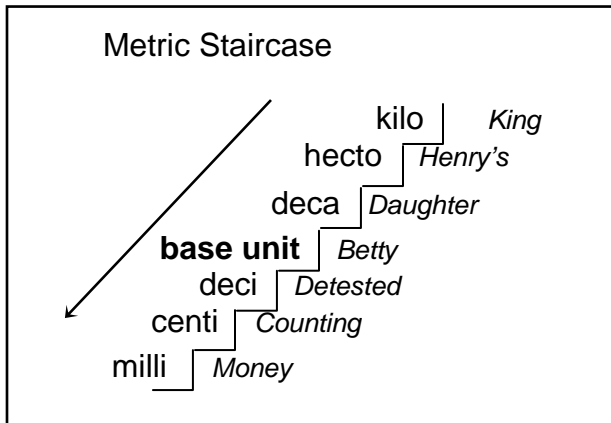
Converting Metric Linear Units



Using Mathematical Operations to Convert Metric Linear Units

Converting Larger to Smaller Units

To convert from larger to smaller metric linear units, multiply by 10 for each step downward on the metric staircase.



Use this ACRONYM to help you remember the order of the units:

King
Henry's
Daughter
Betty
Detested
Counting
Money

Examples

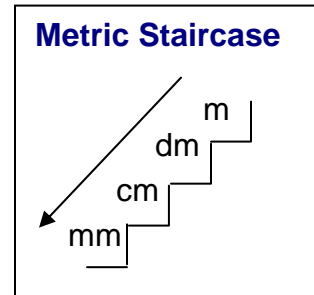
A) How many **cm** in 1 **m**?
m to **cm** is 2 steps
 $1 \text{ m} = 10 \times 10 = 100 \text{ cm}$
There are 100 cm in 1 m.

B) How many **mm** in 1 **m**?
m to **mm** is 3 steps
 $1 \text{ m} = 10 \times 10 \times 10 = 1000 \text{ mm}$
There are 1000 mm in 1 m.

Remember that $10 \times 10 \times 10 = 1000$
 $10 \times 10 = 100$

C) How many **mm** in 4.2 **m**?
 $4.2 \times 10 \times 10 \times 10 = 4200 \text{ mm}$
There are 4200 mm in 4.2 m.

OR $4.2 \times 1000 = 4200 \text{ mm}$



- D) For every kilometre you travel in a car or school bus, you are travelling 1000 metres. How many **metres** in 69.7 **kilometres**?



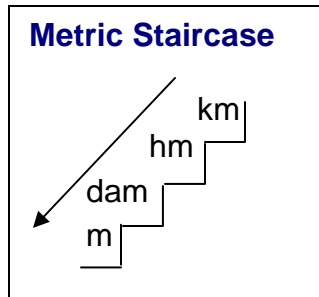
km to m is 3 steps
 $10 \times 10 \times 10 = 1000$ m There are 1000 m in 1 km.

$$69.7 \times 10 \times 10 \times 10 = 69\,700 \text{ m}$$

OR

$$69.7 \times 1000 = 69\,700 \text{ m}$$

There are 69 700 m in 69.7 km.



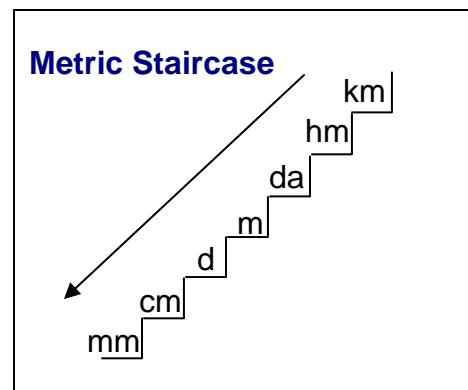
- E) How many **mm** in 1 **km**?

km to mm is 6 steps

$$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\,000\,000 \text{ mm}$$

$$1 \text{ km} = 1\,000\,000 \text{ mm.}$$

One kilometre equals one million millimetres.



- F) **1 km = ? cm**

km to cm is 5 steps.

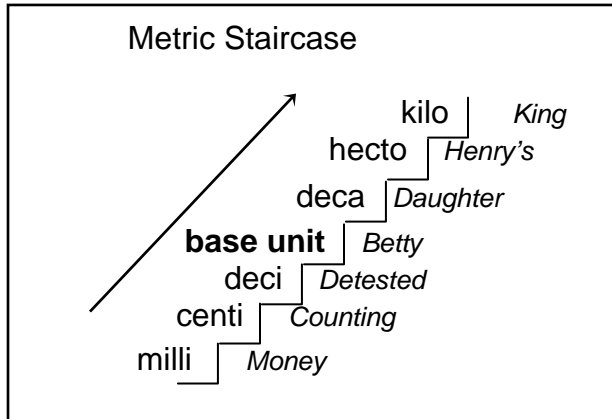
$$10 \times 10 \times 10 \times 10 \times 10 = 100\,000$$

$$1 \text{ km} = 100\,000 \text{ cm.}$$

One kilometre equals one hundred thousand centimetres.

Converting Smaller to Larger Units

To convert from smaller to larger metric units, divide by 10 for each step upward on the metric staircase.



Use this ACRONYM to help you remember the order of the units:

King
Henry's
Daughter
Betty
Detested
Counting
Money

Examples

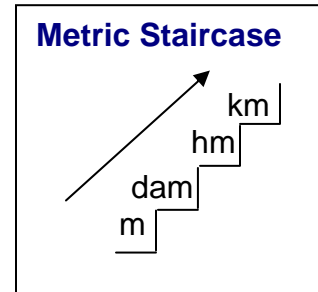
- A)** $4000 \text{ mm} = ? \text{ m}$
mm to m is 3 steps upward
3 steps are $10 \times 10 \times 10 = 1000$
 $4000 \text{ mm} \div 1000 \text{ (3 steps)} = 4 \text{ m} \rightarrow 4000 \text{ mm are equivalent to } 4 \text{ m.}$
- B)** $3000 \text{ cm} = ? \text{ m}$
cm to m is 2 steps upward
2 steps are $10 \times 10 = 100$
 $3000 \div 100 = 30 \rightarrow 3000 \text{ cm are equivalent to } 30 \text{ m.}$
- C)** $79.6 \text{ mm} = ? \text{ m}$
mm to m is 3 steps upward
3 steps are $10 \times 10 \times 10 = 1000$
 $79.6 \div 1000 = 0.0796 \rightarrow 79.6 \text{ mm are equivalent to } 0.0796 \text{ m.}$

D) $8000 \text{ m} = \underline{\quad} \text{ km}$

m to km is 3 steps upward $\rightarrow 10 \times 10 \times 10 = 1000$

$8000 \text{ m} \div 1000$ (3 steps) $= 8 \text{ km} \rightarrow 8000 \text{ m} = 8 \text{ km}$

8000 m are equivalent to 8 km.



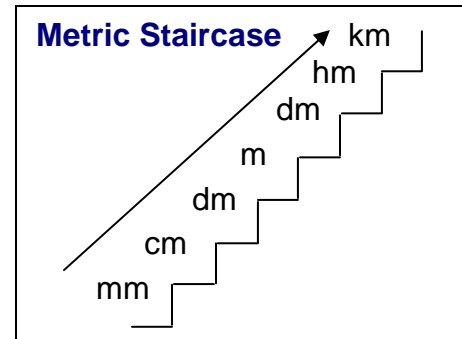
E) Convert 22 000 000 mm to km.

There are 6 steps upward from **mm** to **km**.

$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\,000\,000$

$22\,000\,000 \div 1\,000\,000 = 22 \text{ km}$

22 km are equivalent to 22 000 000 mm.





Practice: Converting Metric Linear Units Using Mathematical Operations

1.
 - a) How many millimetres in 7 cm?
 - b) How many millimetres in 15 cm?
 - c) How many centimetres in 5 m?
 - d) How many centimetres in 24 m?
 - e) How many centimetres in 87 m?

2.
 - a) How many millimetres in 6 m?
 - b) How many millimetres in 12 m?
 - c) How many centimetres in 102 m?
 - d) How many centimetres in 456 m?

3.
 - a) How many millimetres in 3.5 cm?
 - b) How many millimetres in 12.8 cm?
 - c) How many centimetres in 2.3 m?
 - d) How many centimetres in 35.6 m?
 - e) How many millimetres in 2.3 m?
 - f) How many millimetres in 34.5 m?

- 4.
- a) How many metres in 6 km?
 - b) How many metres in 22 km?
 - c) How many metres in 124 km?
 - d) How many metres in 345 km?

- 5.
- a) How many metres in 5.6 km?
 - b) How many metres in 7.3 km?
 - c) How many metres in 13.5 km?
 - d) How many metres in 48.5 km?
 - e) How many metres in 138.4 km?

6. The sign displays a speed limit of 100 km/h. If a vehicle travels at the speed limit:
- a) How many km will the vehicle travel in one hour?
 - b) How many km will the vehicle travel in three hours?
 - c) How many metres will the vehicle travel in one hour?



Use the **metric staircase** or another strategy to convert the following measurements.

7.

- a) 80 cm = _____ mm
- b) 72 m = _____ cm
- c) 126 cm = _____ mm
- d) 93 m = _____ cm
- e) 13 km = _____ m
- f) 64 km = _____ m

8.

- a) 7 km = _____ cm
- b) 56 km = _____ cm
- c) 12 m = _____ mm
- d) 61 m = _____ mm
- e) 2 km = _____ mm
- f) 4 km = _____ mm

9.

- a) 3900 cm = _____ m
- b) 4600 cm = _____ m
- c) 17800 cm = _____ m
- d) 2000 mm = _____ m
- e) 1400 mm = _____ m

10.

- a) 400 cm = _____ m
- b) 157 cm = _____ m
- c) 70 cm = _____ m
- d) 800 mm = _____ m
- e) 166 mm = _____ m

11.

- a) 90 cm = _____ dm
- b) 563 cm = _____ dm
- c) 867 m = _____ hm
- d) 457 m = _____ km
- e) 899 dm = _____ km

12.

- a) 7 000 000 cm = _____ km
- b) 320 000 000 mm = _____ km
- c) 59.2 cm = _____ m
- d) 563.4 cm = _____ m
- e) 123.7 dm = _____ km

Moving the Decimal to Convert Metric Linear Units

Converting Larger to Smaller Units

When **multiplying by multiples of 10 (whole numbers that end in zero)**, move the decimal to the right with each step downward (add a zero) or write each multiplication by 10.

$$4 \times 10 = 40$$

$$4\underline{0} = 40$$

The decimal to the right of the number 4 is moved one place to the right. A zero is inserted as a placeholder.

$$4 \times 10 \times 10$$

$$4 \times 100 = 400$$

The decimal is moved two places and two zeros are used as placeholders.

$$4\underline{00} = 400$$

$$4 \times 10 \times 10 \times 10$$

$$4 \times 1000 = 4000$$

The decimal is moved three places and three zeros are used as placeholders.

$$4\underline{000} = 4000$$

Examples

A) $7 \text{ km} = \underline{\quad ? \quad} \text{ m}$
 $7 \times 10 \times 10 \times 10 = 7000$
or $7\underline{000} = 7000$
 $7 \text{ km} = 7000 \text{ m}$

B) $3.6 \text{ km} = \underline{\quad ? \quad} \text{ m}$
 $3.6 \times 10 \times 10 \times 10 = 3600$
or $3\underline{600} = 3600$
 $3.6 \text{ km} = 3600 \text{ m}$

C) $1.02 \text{ m} = \underline{\quad ? \quad} \text{ cm}$
 $1.02 \times 10 \times 10 = 102$
or $1\underline{02} = 102$
 $1.02 \text{ m} = 102 \text{ cm}$

D) $0.59 \text{ km} = \underline{\quad ? \quad} \text{ mm}$
 $0.59 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 590\,000$
or $0\underline{590000} = 590\,000$
 $0.59 \text{ km} = 590\,000 \text{ mm}$

Converting Smaller to Larger Units

When dividing by multiples of 10, move the decimal to the left with each step upward.

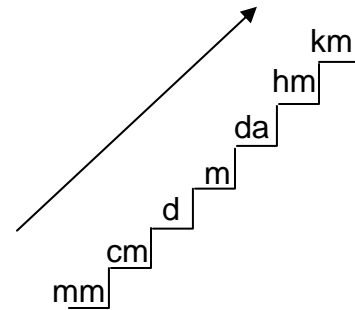
millimetres

1 mm = 0.1 cm
1 mm = 0.01 dm
1 mm = 0.001 m

metres

1 m = 0.1 dam
1 m = 0.01 hm
1 m = 0.001 km

Metric Staircase



Examples

A) $7 \text{ cm} = 0.07 \text{ m}$

2 steps upward, from cm to m move the decimal 2 spaces to the left.

B) $6.3 \text{ mm} = 0.0063 \text{ m}$

3 steps upward, from mm to m move the decimal 3 spaces to the left.

C) $23.4 \text{ m} = 0.0234 \text{ km}$

3 steps upward, from m to km move the decimal 3 spaces to the left.

D) $301276.4 \text{ mm} = 0.3012764 \text{ km}$

6 steps upward, from mm to km move the decimal 6 spaces to the left.



Practice: Converting Metric Linear Units

Convert the following measurements by moving the decimal.

1.

- a) 8 km = _____ m
- b) 62 m = _____ cm
- c) 37 m = _____ mm
- d) 22 km = _____ m
- e) 197 km = _____ m
- f) 27 km = _____ cm

2.

- a) 2.3 km = _____ cm
- b) 42.7 km = _____ cm
- c) 1.3 m = _____ cm
- d) 0.03 m = _____ mm
- e) 0.12 km = _____ mm
- f) 0.407 km = _____ mm

3. Convert the measurements by using the metric staircase, moving the decimal or using another strategy

Converting larger to smaller metric units	Converting smaller to larger metric units
a) 76 m = _____ cm	e) 214 000 cm = _____ km
b) 2 km = _____ m	f) 760 mm = _____ m
c) 71 cm = _____ mm	g) 36 cm = _____ m
d) 4 km = _____ cm	h) 800 000 mm = _____ km

4. Convert the measurements by using the metric staircase, moving the decimal or using another strategy.

Converting larger to smaller metric units	Converting smaller to larger metric units
a) 2.3 m = _____ cm	e) 45 000 cm = _____ km
b) 2.98 km = _____ m	f) 23 mm = _____ m
c) 31.46 cm = _____ mm	g) 96.7 cm = _____ m
d) 3.7 km = _____ cm	h) 547 630 mm = _____ km

5. Marshall is 1.67 m tall. How tall is Marshall in cm? In mm?
6. Shannon runs 2.5 km every two days. How many metres does she run every two days?
7. Chen's hand is 14 cm long. How many millimetres long is it? How many decametres long is it?
8. Use the metric staircase, move the decimal or use another strategy to convert the following.

35 km = _____ m	3 km = _____ mm
6 m = _____ mm	4.5 m = _____ dm
345 mm = _____ m	1.5 hm = _____ m
72 cm = _____ mm	2470 m = _____ km

9. Marie measured the height of her two horses. The first was 147 cm tall and the second was 205 cm tall. What are the heights of each of Marie's horses in metres?

10. With a partner, create a word problem that includes a metric conversion. Trade your problems with another group and solve them.

Think About ...

When might people have to convert from one unit to another in the workplace?

What if a customer asks for an amount in centimetres, but the item is packaged by the metre?

What if a blueprint shows the measurements of the building in metres, but the land is measured in kilometres?