

Converting Units of Area and Volume

Starter

1. **(Review of last lesson)** A cone has a surface area of 250 m^2 and its height is 10 m . If the height of a similar cone is 16 m , calculate its surface area.
2. **(Review of last lesson)** Two spheres are such that their radii (plural of radius) are 7 cm and 12 cm . The larger sphere has a volume of 3600 cm^3 . Calculate the volume of the smaller sphere. Give your answer to 1 d.p..
3. Convert 6 m^2 to cm^2 .

Notes

Converting metric units of area

Let us explain why $6 \text{ m}^2 \equiv 60000 \text{ cm}^2$.

Consider a rectangle whose area is 6 m^2 .

Its dimensions could be 3 m by 2 m (see [diagram on the left](#)).

By converting the dimensions of the rectangle to cm , the rectangle stays the same size. Its dimensions would be 300 cm by 200 cm (see [diagram on the right](#)).



N.B. I chose dimensions of 3 m by 2 m but I could also have chosen 6 m by 1 m or any other numbers that multiply together to get 6

E.g 1 By using a similar method to above, convert

- (a) 12 m^2 to cm^2 (b) 8 cm^2 to mm^2 (c) 4500 cm^2 to m^2

Working: (a) Let the dimensions of the rectangle be 4 m by 3 m .

Convert to cm: 400 cm by 300 m

Multiply: 120000 cm^2

So $12 \text{ cm}^2 \equiv 120000 \text{ m}^2$

Alternatively, your working could look like this:

$$\begin{aligned} 12 \text{ m}^2 &= 4 \text{ m} \times 3 \text{ m} && \text{two numbers multiply to get 12} \\ &= 400 \text{ cm} \times 300 \text{ cm} && \text{convert the units} \\ &= 120000 \text{ cm}^2 \end{aligned}$$

N.B. I could also have chosen 6 m by 2 m or 12 m by 1 m for the dimensions of the rectangle.

Quick converting

Let's find a quicker method to convert units by considering the working of converting 14 m^2 to cm^2 .

$$\begin{aligned} 14 \text{ m}^2 &= 7 \text{ m} \times 2 \text{ m} && \text{two numbers multiply to get 14} \\ &= (7 \times 100) \text{ cm} \times (2 \times 100) \text{ cm} && \text{convert the units} \\ &= (7 \times 2) \times (100 \times 100) \text{ cm}^2 \\ &= 14 \times 100^2 \text{ cm}^2 \end{aligned}$$

So to convert from m^2 to cm^2 we **multiply by 100^2** .

To convert from **m** to **cm** we **multiply** by 100.

So to convert from m^2 to cm^2 we **multiply** by 100^2 .

Converting from cm^2 to m^2 , we would have to **divide by 100^2** .

E.g. 2 State what you need to **multiply** or **divide** by to convert from:

- (a) cm^2 to m^2 (b) cm^2 to mm^2 (c) m^2 to km^2

Working: (a) To convert from **cm** to **m** we **divide** by 100.
To convert from cm^2 to m^2 we **divide** by 100^2 .

Converting metric units of volume

E.g. 3 To convert from m^2 to cm^2 we **multiply** by 100^2 — this is for areas.

What could we need to multiply by to convert from m^3 to cm^3 (units of volume).

Working: We would multiply by 100^3 — **cubed** because it is a **volume**.

E.g. 4 State what you need to **multiply** or **divide** by to convert from:

- (a) km^3 to m^3 (b) mm^3 to cm^3 (c) m^3 to mm^3

Working: (a) To convert from **km** to **m** we **multiply** by 1000.
So to convert from km^3 to m^3 we **multiply** by 1000^3 .

Success criteria — converting units of area or volume

- Ignore the ² or the ³ on the units. Write down how to convert the length units
E.g. Multiply by 10 if cm to mm or Divide by 100 if cm to m
- Now look at the ² or the ³ on the units. Square the number from step 1 if it is an area conversion or cube the number if it involves volumes.
E.g. Multiply by 10^2 if cm^2 to mm^2 or Divide by 100^3 if cm^3 to m^3
- Multiply or divide the given units by the number found in step 2.

E.g. 5 Convert these areas or volumes to the units given:

- (a) 9 m^3 to cm^3 (b) 72000 mm^2 to cm^2
(c) 4.3 cm^3 to mm^3 (d) 3000000 cm^2 to km^2

Working: (a) To convert from **m** to **cm** we **multiply** by 100.
So to convert from m^3 to cm^3 we **multiply** by 100^3 .
 $\therefore 9 \text{ m}^3 \equiv 9 \times 100^3 \text{ cm}^3$
 $= 9 \times 1000000 \text{ cm}^3$
 $= 9000000 \text{ cm}^3$

Video: [Converting between metric units of area](#)
Video: [Converting between metric units of volume](#)

[Solutions to Starter and E.g.s and Exercise](#)

Exercise

1. Convert these units to the ones stated:

- | | |
|--|--|
| (a) 9 m^2 to cm^2 | (b) 850 mm^2 to cm^2 |
| (c) 2000000 m^3 to km^3 | (d) 3.65 cm^3 to mm^3 |
| (e) 690 cm^3 to m^3 | (f) 5300 km^2 to m^2 |
| (g) 9100 cm^2 to m^2 | (h) 793 km^3 to m^3 |
| (i) 4200 mm^3 to cm^3 | (j) 5800 m^2 to km^2 |
| (k) 6.1 m^3 to cm^3 | (l) 1.8 cm^2 to mm^2 |

2. Convert these units to the ones stated:

- | | |
|--|--|
| (a) 54 km^3 to cm^3 | (b) 850 mm^2 to m^2 |
|--|--|

For the answers to the exercise, click on the [blue link](#) above.