Converting Square and Cubic Units

Grade 8 – 10 math · area and volume

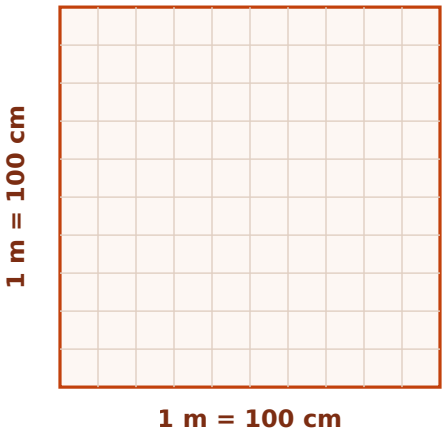
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Where the factor comes from

Converting 1 m to 100 cm is straightforward. Converting 1 m² to cm² catches almost everyone, because the instinct is to divide or multiply by 100 again — and the right factor is **10 000**.

The reason is visible as soon as you draw it. A square metre is a square a hundred centimetres on each side, so it holds a hundred rows of a hundred centimetre squares. The factor gets squared because the unit is squared, and cubed for a volume: 1 m³ is 1 000 000 cm³.

The rule is short enough to state once: **the exponent on the unit is the exponent on the factor**. If you convert area with the same number you would use for length, the answer is wrong by a factor of a hundred, and in a volume by ten thousand.



One square metre, drawn. The grid is 10 by 10 squares of 10 cm, which is 100 squares of 100 cm² each.

The rules

- A **squared** unit needs the conversion factor squared: 1 m² = 100² cm² = 10 000 cm².
- A **cubed** unit needs it cubed: 1 m³ = 100³ cm³ = 1 000 000 cm³.
- The exponent on the **unit** is the exponent on the **factor**. They always match.
- Picture it: a square metre holds a hundred rows of a hundred centimetre squares.
- With the **factor-label** method it happens automatically — write the factor twice for an area, three times for a volume.
- **1 mL = 1 cm³** and **1 L = 1000 cm³**, which links volume to capacity.

Part A — What is the factor? (6 marks)

Converting	Multiply or divide by
cm to m	

cm^2 to m^2	
cm^3 to m^3	
m to km	
m^2 to km^2	
mm^2 to cm^2	

Part B — Convert (8 marks)

3 m^2 → _____ cm^2	**50 000 cm^2 → _____ m^2**
2 m^3 → _____ cm^3	**4.5 cm^3 → _____ mm^3**
0.5 km^2 → _____ m^2	**250 cm^3 → _____ mL**
2 L → _____ cm^3	**800 mm^2 → _____ cm^2**

Part C — Find the error give the correct answer and a way to check it (8 marks)

1. A room is 600 cm by 400 cm. A student finds the area as 240 000 cm^2 and converts it to 2400 m^2.

2. A tank holds 1.5 m^3. A student says that is 1500 cm^3.

Part D — Explain (4 marks)

1. Explain, using a drawing if it helps, why 1 m^2 is 10 000 cm^2 and not 100 cm^2.

Converting Square and Cubic Units — Answer Key

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Part A — What is the factor?

1. cm to m → **÷ 100**
2. cm² to m² → **÷ 10 000**
3. cm³ to m³ → **÷ 1 000 000**
4. m to km → **÷ 1000**
5. m² to km² → **÷ 1 000 000**
6. mm² to cm² → **÷ 100**

Part B — Convert

1. 3 m² → **30 000 cm²**
2. 50 000 cm² → **5 m²**
3. 2 m³ → **2 000 000 cm³**
4. 4.5 cm³ → **4500 mm³**
5. 0.5 km² → **500 000 m²**
6. 250 cm³ → **250 mL**
7. 2 L → **2000 cm³**
8. 800 mm² → **8 cm²**

Part C — Find the error

1. **24 m²**
   They divided by 100 instead of 10 000. Checking the other way round catches it: 6 m × 4 m = 24 m², and no room is 2400 square metres.
2. **1 500 000 cm³**
   The factor has to be cubed: 100³ = 1 000 000, not 1000. As a check, 1.5 m³ is 1500 litres, and a litre is 1000 cm³.

Part D — Explain

1. **A square metre is 100 cm by 100 cm, so it contains 100 × 100 = 10 000 square centimetres.**
   The factor is squared because the unit is. Accept any answer that gets to 100 × 100, with or without a drawing. A student who writes 100 cm² has converted one side and forgotten the other.