**VOLUME**

Volume measures how much space an object occupies. Sometimes you might hear questions like "what is the capacity of a box?" or "how much can the box hold?" You can assume that these questions will need a volume to be calculated.

**Calculating Volume**

Volume is measured in cubes (or cubic units).

How many cubes are in this rectangular prism (cuboid)?

We can count the cubes although it is quicker to take the length, width, and height and use multiplication. The rectangular prism above has an volume of 48 cubic units.

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| **The volume of a rectangular prism is = length x width x height**  |

**Examples of calculating the area of a rectangle**

We need to do two multiplications to work out the volume. We calculate the area of one face (or side) and multiply that by its height. The examples below show how there are three ways of doing this.

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| **example showing how to work out volume** | **Area = 6 x 4 = 24** **Volume = Area x 2****Volume = 24 x 2 = 48 cubic units**  |
| **example showing how to work out volume** | **Area = 6 x 2 = 12** **Volume = Area x 4** **Volume = 12 x 4 = 48 cubic units**  |
| **http://www.helpingwithmath.com/images/geometry/volume04.gif** | **Area = 4 x 2 = 8** **Volume = Area x 6** **Volume = 8 x 6 = 48 cubic units**  |

Notice how we get the same answer no matter what side we use to find an area.

**Units for measuring volume**

There are very big differences between units of measure for volume. For example, there are 100 centimeters in 1 meter but there are 1,000,000 (yes, 1 million) cubic centimeters in a cubic meter.

Why the big difference? Because in volume we have not just length; we have length, width, and height. The sugar cube example below shows this.

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| **How much sugar? 1 m3 or 1,000,000 cm3**  |
| **Think of filling a very big box (it would be 1 meter wide, 1 meter, long, and one meter high) with sugar cubes (with each side 1 centimeter).** |
| 1 cubic meter box and 1 cubic centimeter sugar cube | **Step 1: one row along the bottom of the box - that would be 100 sugar cubes**  |
| **Step 2: cover the rest of the base of the box - that would give a total of 100 rows each with 100 sugar cubes. 100 x 100 = 10,000 sugar cubes at the bottom of the big box.** |
| **Step 3: Repeat this 99 times until there are layers of 10,000 cubes stacked 100 deep. 10,000 x 100 = 1,000,000 sugar cubes** |
| **There are 1,000,000 cm3 in 1 m3 - be careful not to have too much sugar!**  |

There are other units for measuring volume; cubic inches, cubic feet, cubic yards are all units used for measuring volume. Milliliters, liters, gallons are also used especially when measuring liquids.

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| **Don't forget the wee 3**  |
| **We write cubic sizes using a small 3 next to the unit.** **We write mm3, cm3, m3 , km3, cm3** **We can say "85 centimeters cubed" or "85 cubic centimeters"** |

**Examples of Calculating Volume of Rectangular Prisms**

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| **12 x 8 x 6 cuboid** | **Volume = Length x Width x Height** **Volume = 12 cm x 8 cm x 6 cm= 576 cm3**  |
| **20 x 2 x 2 cuboid** | **Volume = Length x Width x Height** **Volume = 20 m x 2 m x 2 m= 80 m3**  |
| **10 x 4 x 5 cuboid** | **Volume = Length x Width x Height** **Volume = 10 m x 4 m x 5 m= 200 m3**  |