**Skill Sheet: Volumes**

***What You Need to Know:***

The volume of a component may be needed to calculate, for example:

***Examiners***

***Top Tip***

*The volume of a complicated shape can be calculated by breaking it down into a number of simple shapes*

* the amount of material required to make a number of parts
* how much material is held in a container
* the mass of material needed to make a product.

The formulae for the volumes of simple shapes are:

Volume of a cuboid, V = length x width x height = L x W x H

Volume of a cylinder, V = area of circle x length = A x L = π r2 x L

***Example:***

A container of lubricant is cuboid in shape, with internal dimensions 150 mm x 250 mm x 500 mm.

Calculate how many litres of lubricant can be held in the container.

***Answer:***

Volume V = length x width x height = L x W x H = 150 x 250 x 500 = 18750000 mm3 = 1.875 x 107 mm3

Volume in litres = 1.875 x 107 / 1 x 106 = 18.75 litres

***Now Try These:***

1. Plastic granules are being stored in a vertical cylinder with the following internal dimensions:
* diameter 500 mm
* height 900 mm.

a) Calculate the volume of material held in the cylinder, to 3 significant figures.

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b) The plastic granules are being used to make cubes where each side is 12 mm in length.

Determine how many cubes can be made from one full cylinder of the plastic granules.

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**Practice Sheet: Volumes**

***Now Try These:***

1. A manufacturer is making a toy hammer from solid plastic, figure 1.

The hammer comprises a cuboid head and a cylindrical handle. The head is 60 mm by 80 mm by 40 mm.

The handle has a radius of 10 mm and is 160 mm long.

Calculate the volume of material needed to make 1 hammer.

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**Figure 1**

1. A manufacturer has 200 litres of plastic resin. This will be used to make products that each require 26 cm3 of the resin. Calculate the number of products that can be made.

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1. A company is melting a solid metal cylinder to make products by the casting process. The cylinder is 1 m in length, with a radius of 20 cm.
2. Determine the volume of one cylinder.

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1. A total of 90 products were made using the metal from the cylinder.

Each product contained 1.2 litres of the metal, but also created some waste metal.

Calculate the percentage of waste metal created during the process.

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**Answers:**

**Skill Sheet: Volumes**

1. a) radius = diameter / 2 = 600 / 2 = 300 mm

Volume of the cylinder = π r2 x L = 3.14 x 2502 x 900 = 176625000 mm3 = 1.77 x 108 mm3

b) Volume of one cube = L x W x H = 12 x 12 x 12 = 1728 mm3

Number of cubes that can be made = 1.77 x 108 / 1728 = 102430

**Practice Sheet: Volumes**

1. Volume of the head = L x W x H = 60 x 80 x 40 = 192000 mm3 = 1.92 x 105 mm3

Volume of the handle = π r2 x L = 3.14 x 102 x 160 = 50240 mm3 = 5.024 x 104 mm3

Total volume = 1.92 x 105 + 5.024 x 104 = 2.42 x 105 mm3 (to 3 significant figures)

1. 200 litres = 200000 cm3

200000/26 = 7692 products

1. a) Volume of the cylinder = π r2 x L = 3.14 x 202 x 100 = 125600 cm3 = 125.6 litres

b) Volume of metal used in products = 90 x 1.2 = 108 litres

Volume of waste = 125.6 – 108 = 17.6 litres

% of waste = 17.6 / 125.6 x 100 / 1 = 14 %