MATHEMATICAL SKILLS

VOLUME OF A CYLINDER

AND

ASSOCIATED GEOMETRICAL SHAPES

DESIGN AND TECHNOLOGY

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**How to calculate the volume of a cylinder**

**Definition:** A three-dimensional geometrical shape, that has a circle at each end of a single curved surface.

In order to calculate the volume of a cylinder, the height and radius of the circular top/bottom must be known. The following formula is used to calculate the volume.

\[ V = \pi r^2 h \]

where \( \pi (\text{pi}) = 3.14 \)

**Example:**

- Height \( H = 100\text{mm} \)
- Radius \( R = 50\text{mm} \)

\[ V = \pi r^2 h \]

\[ V = 3.14 \times 50\text{mm} \times 50\text{mm} \times 100\text{mm} \]

\[ V = 785000\text{mm}^3 \]

or

\[ V = 785\text{cm}^3 \]
Calculate the volume of the cylinders seen below.

For the purpose of these calculations

\[ \pi \ (\text{pi}) = 3.14 \]

**FORMULA**

\[ v = \pi r^2 h \]

volume = \pi \times \text{radius}^2 \times \text{height}

\[ \pi \ (\text{pi}) = 3.14 \]

### Cylinder 1

- **R** = 60mm
- **H** = 120mm

\[ v = 3.14 \times 60\text{mm} \times 60\text{mm} \times 120\text{mm} \]

volume = 1356480mm³

or

volume = 1356.480cm³

### Cylinder 2

- **R** = 80mm
- **H** = 140mm

\[ v = 3.14 \times 80\text{mm} \times 80\text{mm} \times 140\text{mm} \]

volume = 2813440mm³

or

volume = 2813.440cm³

### Cylinder 3

- **R** = 75mm
- **H** = 135mm

\[ v = 3.14 \times 75\text{mm} \times 75\text{mm} \times 135\text{mm} \]

volume = 2384437.5mm³

or

volume = 2384.437cm³
Calculate the volume of the cylinders seen below.

For the purpose of these calculations \( \pi (\text{pi}) = 3.14 \)

\[
\text{FORMULA} \\

v = \pi r^2 h \\
\text{volume} = \pi \times \text{radius}^2 \times \text{height} \\
\pi (\text{pi}) = 3.14
\]
The solid steel object seen below, has been manufactured on an engineering centre lathe. It is one solid piece. Calculate the total volume.

In order to calculate the entire volume of the engineered solid, it is treated as two separate parts. Part A is the smaller cylinder and part B is the larger cylinder.

**PART A**

\[ v = \pi r^2 h \]

volume = 3.14 x 20mm x 20mm x 30mm

volume = 37680mm³

or

volume = 37.680cm³

**PART B**

\[ v = \pi r^2 h \]

volume = 3.14 x 40mm x 40mm x 90mm

volume = 452160mm³

or

volume = 452.160cm³

Then add both volumes together, to find the overall volume of the engineered object.

**FINAL VOLUME** = A + B

**FINAL VOLUME** = 37680mm³ + 452160mm³

**FINAL VOLUME** = 489840mm³ or 489.84cm³
The solid steel object seen below, has been manufactured on an engineering centre lathe. It is one solid piece. Calculate the total volume.

In order to calculate the entire volume of the engineered solid, it is treated as two separate parts. Part A is the smaller cylinder and part B is the larger cylinder.
The solid cylindrical object seen below, is engineered from mild steel, with a large machined ‘blind’ hole, in the top surface.

Calculate the volume of the engineered object.

The cylindrical object is treated as two separate cylinders.

Part A is the ‘blind’ hole. Part B is the cylinder.

**PART A**

\[ v = \pi r^2 h \]

volume = 3.14 x 30mm x 30mm x 40mm

volume = \(113040\)mm\(^3\)

or

volume = 113.040cm\(^3\)

**PART B**

\[ v = \pi r^2 h \]

volume = 3.14 x 60mm x 60mm x 130mm

volume = \(1469520\)mm\(^3\)

or

volume = 1469.520cm\(^3\)

Then subtract the volume of part A from the volume of part B, to find the overall volume of the engineered object.

**FINAL VOLUME = B - A**

FINAL VOLUME = 1469520mm\(^3\) - 113040mm\(^3\)

FINAL VOLUME = 1356480mm\(^3\) or 1356.48cm\(^3\)
The solid cylindrical object seen below, is engineered from mild steel, with a large machined ‘blind’ hole, in the top surface.

Calculate the volume of the engineered object.

The cylindrical object is treated as two separate cylinders.

Part A is the ‘Blind’ hole.
Part B is the cylinder.