

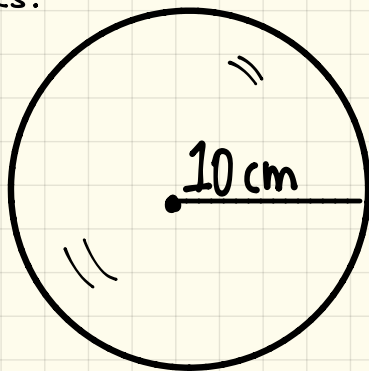
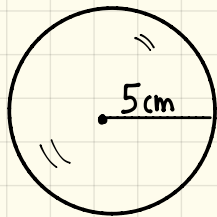
3.7 Finding Volumes of 3-Dimensional Shapes

Part 2

Prisms & Cylinders

Q1d] Volume of Sphere

- ① A spherical balloon has an initial radius of 5 in. When more air is added, the radius becomes 10 in. Explain how the volume changes as the radius changes.



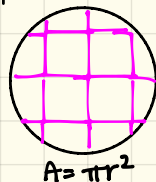
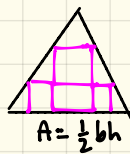
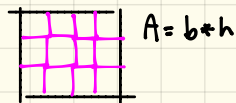
$$\begin{aligned}\text{Volume}_{\text{Sphere}} &= \frac{4}{3} \pi r^3 \\ V &= \frac{4}{3} \pi (5\text{cm})^3 \\ &= \frac{500\pi \text{cm}^3}{3} \\ &\approx 523.60 \text{cm}^3\end{aligned}$$

$$\begin{aligned}\text{Volume}_{\text{Sphere}} &= \frac{4}{3} \pi r^3 \\ V &= \frac{4}{3} \pi (10\text{cm})^3 \\ &\approx 4188.0 \text{cm}^3\end{aligned}$$

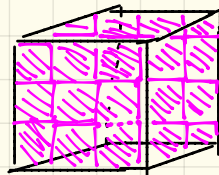
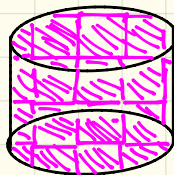
Sphere with radius of 5cm is 523.60 cm³. Sphere with radius of 10cm is 4188.0 cm³.

New Volume of Prisms & Cylinders

Let's recall: Area is the amount of square units of space a figure occupies

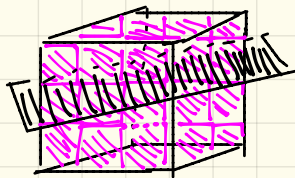


Also, let's recall: Volume is the amount of cubic units of space a solid occupies



How do we find the volume of these figures?

CAVALIERI PRINCIPLE — If the cross-sectional area of 2 prisms is the same for every height above the base, then the volumes will be the same.



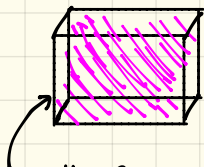
Why does this matter?

Let's consider a rectangle & find the space filled in the region. (Find area.)

$$\begin{aligned} \text{Area} &= b * h \\ &= 3 * 2 \\ &= 6 \end{aligned}$$



Let's consider the same rectangle & stack a duplicate of the rectangle on top. Find the space filled in object. (Find volume.)

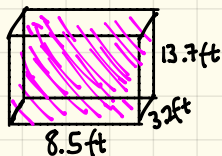


$$\begin{aligned} \text{Volume} &= \text{Area of Rectangle} * \text{depth} \\ \text{Volume} &= \text{Base} * \text{height} \end{aligned}$$

now there is "depth" or "deepness" o o o o think about: a pool of water

[Example 1] Find the Volume of the Prism.

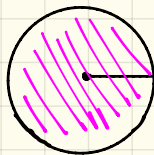
①



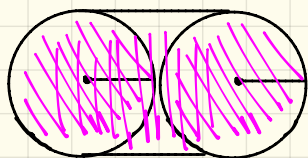
$$\begin{aligned} \text{Volume} &= \text{Base} * \text{height} \\ &= (8.5\text{ft})(3.2\text{ft}) * (13.7\text{ft}) \\ &\approx 372.64 \text{ ft}^3 \end{aligned}$$

Now, let's consider a circle & find the space filled in the region. (Find area.)

$$\begin{aligned} \text{Area} &= \pi r^2 \\ &= \pi (5)^2 \\ &= 25\pi \end{aligned}$$



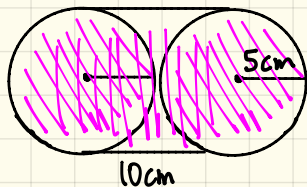
Let's consider the same rectangle & stack a duplicate of the circle beside it. Find the space filled in object. (Find volume.)



$$\begin{aligned} \text{Volume} &= \text{Area of Circle} * \text{depth} \\ \text{Volume} &= \text{Base} * \text{height} \end{aligned}$$

now there
is "depth"
or "deepness"

[Example 2] Find the volume of the Cylinder.



$$\begin{aligned} \text{Volume} &= \text{Base} * \text{height} \\ &= \pi r^2 * h \\ &= \pi (5\text{cm})^2 * (10\text{cm}) \\ &\approx 785.4 \text{ cm}^3 \end{aligned}$$

Prism

$$\begin{aligned} \text{Volume} &= \text{Base} * \text{height} \\ &= (\text{length})(\text{width}) * (\text{height}) \end{aligned}$$

Cylinder

$$\begin{aligned} \text{Volume} &= \text{Base} * \text{height} \\ &= (\pi (\text{radius})^2) * \text{height} \end{aligned}$$