

Working with Composite 3D Objects

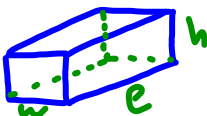
Composite Object - a structure or object made up from several simple objects.

To determine the volume of a composite object:

- Calculate the volume of each part of the object.
- Add the volumes.
- Subtract the volume of any part that were removed.

Example 1: Suppose the shed in the picture has the measurements indicated. Find the Volume of the shed.


Method 1: Add the volumes of a rectangular prism and triangular prism.



$$V_{\text{shed}} = V_{\text{rectangular-prism}} + V_{\text{triangular-prism}}$$

$$V_{\text{rectangular-prism}} = l \times w \times h$$

$$= 20 \times 5 \times 10$$

$$= 1000 \text{ ft}^3$$


$$V_{\text{triangular-prism}} = A_{\text{base}} \times \text{height}$$

$$= \left(\frac{5 \times 2}{2} \right) \times 20$$

$$= 5 \times 20$$

$$= 100 \text{ ft}^3$$

\therefore The volume of the shed is $1000 + 100 = 1100 \text{ ft}^3$.

Method 2 - Find the area of the front of the shed then find the volume using this as the base area

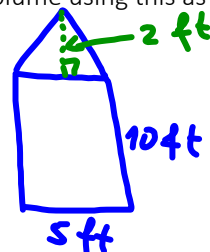
$$V_{\text{shed}} = (\text{Area}_{\text{base}}) \times \text{height}$$

$$\text{Area}_{\text{base}} = A_{\text{rectangle}} + A_{\text{triangle}}$$

$$= (5 \times 10) + \left(\frac{5 \times 2}{2} \right)$$

$$= 50 + 5$$

$$= 55 \text{ ft}^2$$



height = 20 ft

$$V_{\text{shed}} = 55 \times 20$$

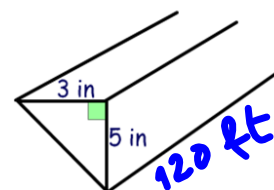
$$= 1100 \text{ ft}^3$$

\therefore The volume of the shed is 1100 ft^3 .

Example 2: A section of a water trough for a poultry farm is shown. The triangular face is a right triangle with a base of 3 inches and a height of 5 inches. The trough runs the length of the barn which is 120 feet long.

a) Determine the volume of the trough in cubic inches.

$$\begin{aligned} 1 \text{ ft} &= 12 \text{ in} \\ 120 \text{ ft} &= 120 \times 12 \text{ in} \\ &= 1440 \text{ in} \end{aligned}$$



$$\begin{aligned} V_{\text{trough}} &= A_{\text{base}} \times \text{height} \\ &= \left(\frac{3 \times 5}{2} \right) \times \cancel{1440}^{720} \\ &= 3 \times 5 \times 720 \\ &= 10800 \text{ in}^3 \end{aligned}$$

\therefore The volume of the trough is 10800 in^3

b) A cubic inch is about 0.00433 gallons. About how many litres of water can the trough hold?

$$\begin{aligned} 10800 \text{ in}^3 &= 10800 \times 0.00433 \text{ gallons} \\ &\doteq 46.764 \text{ gallons} \end{aligned}$$

$$1 \text{ gallon} \doteq 4.546 \text{ L}$$

$$\begin{aligned} 46.764 \text{ gallons} &\doteq 46.764 \times 4.546 \text{ L} \\ &\doteq 212.6 \text{ L} \end{aligned}$$

\therefore The trough can hold approximately 212.6 L of water.

Hwk: Pg. 83: #11, 14, 17