

Show your work in all problems.

1. A water container has 350ml of water initially. In the following two cases, tell how much the water amount will increase. (1 liter water weighs 1 kilograms)

1 ml weighs 1 gram

(a) A toy of volume 200ml and weight 100grams is dropped into the water.

Archimedes's principle: if an object floats, it displaces an amount of water of equal weight as the weight of the object.

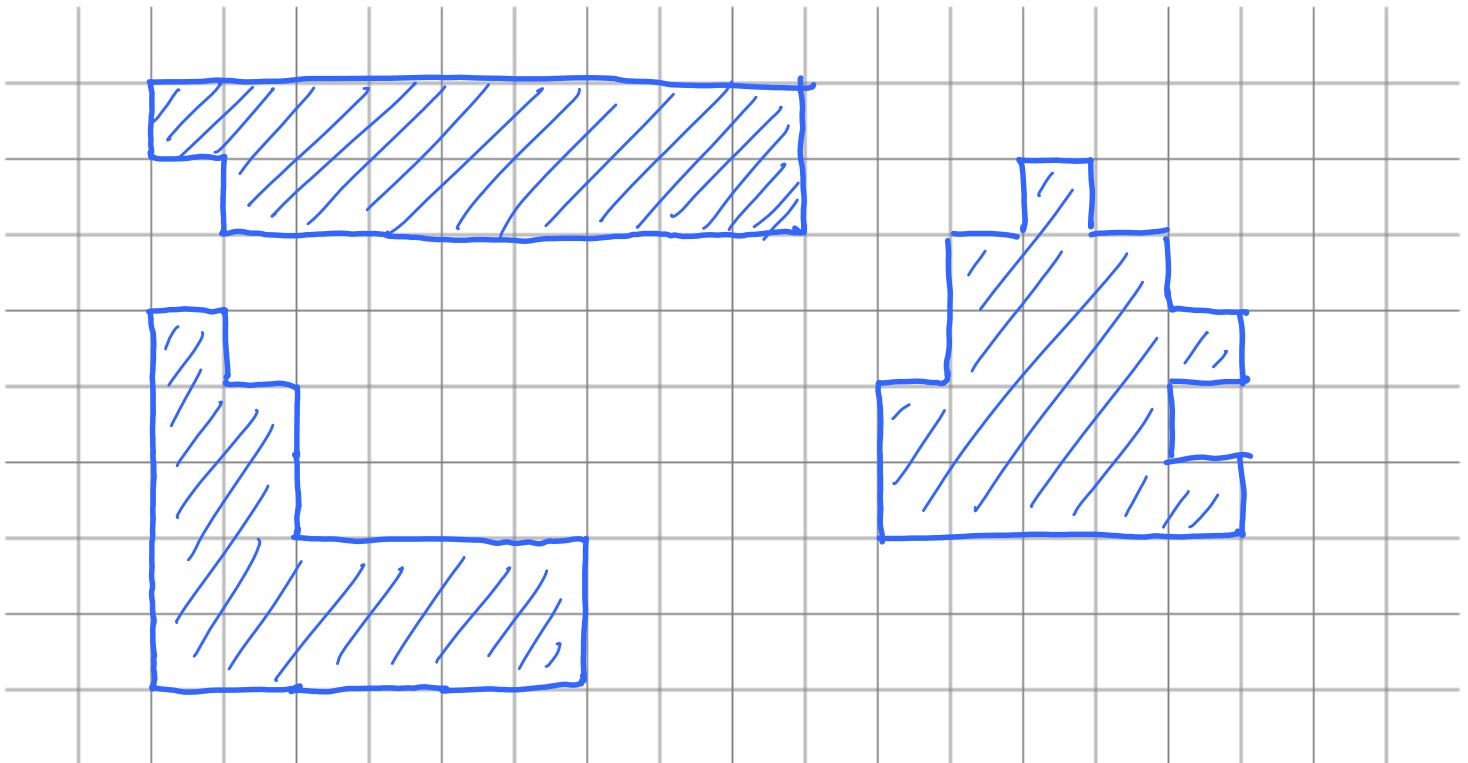
Since this toy is lighter than same volume of water that would occupy its place, it will float, hence the water level increases by 100grams  $\xrightarrow{\text{convert}}$  100ml

(b) A toy of volume 100ml and weight 200grams is dropped into the water.

This toy would sink, so it will be totally submerged, hence water level increases by the volume of the object: 100ml

2. Draw a shape of area 17 and perimeter 22.

3 examples:

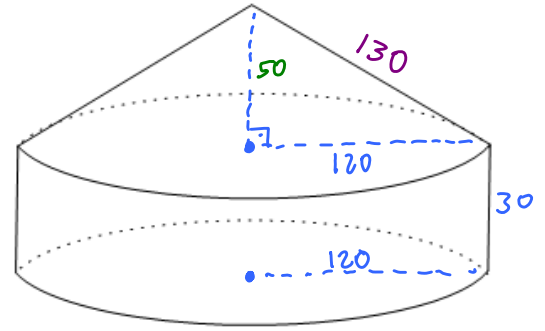


3. A circus tent is going to be built as a cylinder with a circular base of radius 120 feet and height 30 feet, topped off with a cone of height 50 feet.

(a) Find the volume of the circus tent.

$$V = \text{volume of cylinder} + \text{volume of cone}$$

$$= \pi(120)^2 \cdot 30 + \frac{1}{3} \pi(120)^2 \cdot 50$$



(b) The following is the flat pattern for the tent's surface before it's stitched together. Find the unknown angle (in degrees).

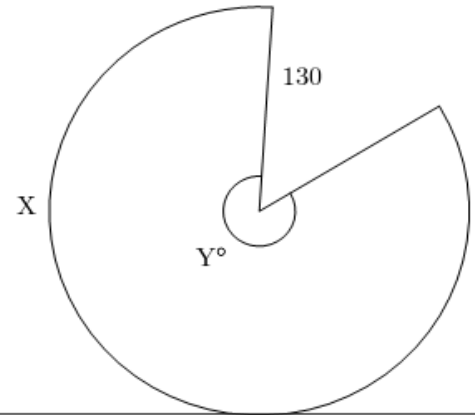
$$X = \text{perimeter of base of cylinder}$$

$$= 2\pi \cdot 120 = 240\pi$$

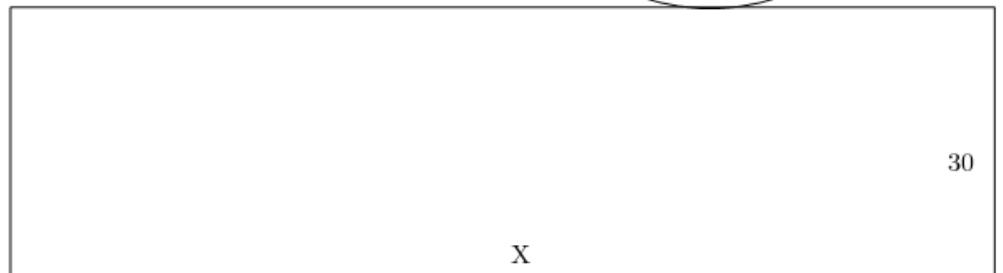
$$\frac{Y^\circ}{360^\circ} = \frac{240\pi}{2 \cdot \pi \cdot 130} = \frac{240\pi}{260\pi}$$

$$Y^\circ = 360 \cdot \frac{12}{13} \approx 332.3^\circ$$

The sector is  $\frac{12}{13}$  of the full circle.



(c) Find the tent's surface area.



Surface area = side area + roof area

$$= 2\pi \cdot 120 \cdot 30 + \frac{12}{13} \cdot \pi \cdot (130)^2$$