A Simple Gauge in a Tank - II

For the convenience of storing some types of solids (grains, sand) or liquids, some tanks have a conical shape. The volume of a cone is given by

$$V = \frac{1}{3}\pi R^2 h$$

In this picture, the diameter of the top of the tank is 6 meters and its height is 7.5 meters. What is the total volume of this tank in gallons if 1 gallon is 3.85 liters and 1meter^3 = 1000 liters.

Answer: V = 0.33 (3.14)(3)^2 (7.5)
= 70 meters^3
= **18,182 gallons**

Problem 1 – What is the linear equation that gives the radius of the tank, R, at a height h in meters above the ground?

Problem 2 - An engineer wants to store an expensive solvent in this tank and needs to know when there is only 200 gallons remaining so that he can re-order. He will install a gauge at a height, Z, in the tank that will be triggered when the solvent level is just under the gauge.

Problem 3 – How high up on the slanted side of the tank from its vertex will the gauge be located?

Problem 1 – What is the linear equation that gives the radius of the tank, R, at a height h in meters above the ground?

Answer: At h = 7.5 meters, R = 3 meters, so the slope of the linear equation for h is just m = 3/7.5 = 0.4 and so **R(h) = 0.4h**.

Problem 2 - An engineer wants to store an expensive solvent in this tank and needs to know when there is only 200 gallons remaining so that he can re-order. He will install a gauge at a height, Z, in the tank that will be triggered when the solvent level is just under the gauge.

Answer: $V = 1/3\ (3.14)\ (0.4h)^2\ (h)$ so $V = 0.167\ h^3$
200 gallons equals 770 liters or 0.77 $meters^3$, then
$0.77 = 0.167\ z^3$ and solving for z we get **z = 1.66 meters**.

Problem 3 – How high up on the slanted side of the tank from its vertex will the gauge be located?

Answer: The slope of the side of the tank is just 1/0.4 = 2.5 so the 'hypotenuse' of the tank side makes an angle of $Tan(\theta) = 2.5$ or 68 degrees. Since Hsin(68) = 1.66 meters, we have **H = 1.8 meters**.