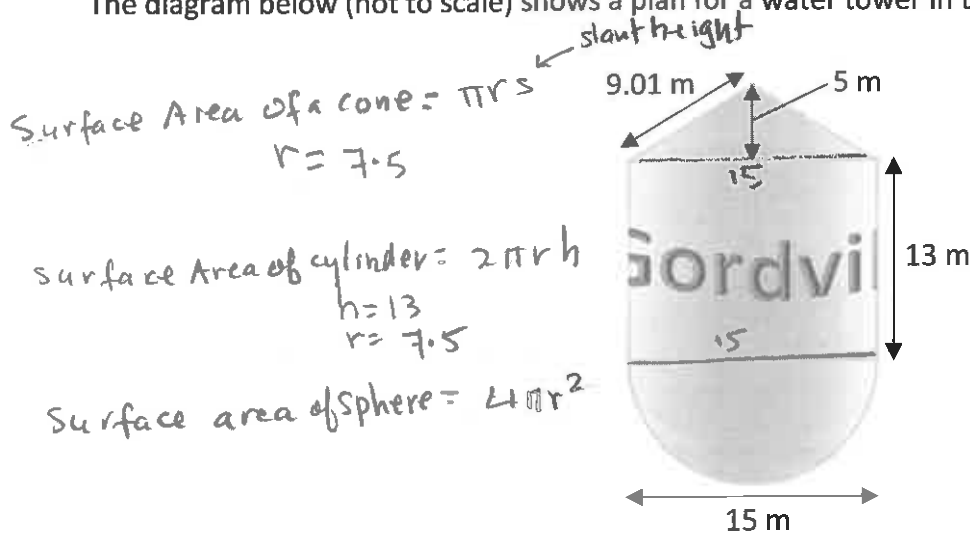


Example 2: Surface Area Addition AND Subtraction

The diagram below (not to scale) shows a plan for a water tower in the town of Gordville:



Volume
 cone = $\frac{\pi r^2 h}{3}$ $h = 5, r = 7.5$
 cylinder = $\pi r^2 h$ $h = 13,$
 sphere = $\frac{4}{3} \pi r^3$

Calculate the amount of metal needed to construct the outside of the structure shown. The inside of the structure is hollow.

TOTAL AMOUNT of metal = Area of cone + area of cylinder + Area of $\frac{1}{2}$ sphere

① Area of cone = $\pi r s \Rightarrow \pi (7.5) 9.01 \text{ m}$
 $= 212.2931 \text{ m}^2$

② Area of cylinder = $2\pi r h \Rightarrow 2\pi (7.5) 13 \text{ m}$
 $= 612.6106 \text{ m}^2$

③ Area of $\frac{1}{2}$ sphere = $\frac{4\pi r^2}{2} \Rightarrow \frac{4\pi (7.5^2)}{2} = \frac{706.858341}{2}$
 $= 353.4291 \text{ m}^2$

TOTAL METAL = $212.2931 \text{ m}^2 + 612.6106 \text{ m}^2 + 353.4291 \text{ m}^2$
 $= 1178.33 \text{ m}^2$

Example 3: Volume Addition

Calculate the amount of water the water tower shown in example 2 could hold, in cubic centimetres.

Amount of water = volume of cone + Volume of cylinder + Volume $\frac{1}{2}$ sphere

① Volume of cone = $\frac{\pi r^2 h}{3} \Rightarrow \frac{\pi (7.5)^2 (5)}{3}$
 $= 294.5243 \text{ m}^3$

② Volume of cylinder = $\pi r^2 h \Rightarrow \pi (7.5)^2 (13)$
 $= 2297.2896 \text{ m}^3$

③ Volume of $\frac{1}{2}$ sphere = $\left(\frac{4}{3} \pi r^3\right) \div 2 \Rightarrow \frac{4}{3} \times \pi (7.5^3) \div 2$
 $= 883.5729 \text{ m}^3$

TOTAL WATER = $294.5243 \text{ m}^3 + 2297.2896 \text{ m}^3 + 883.5729 \text{ m}^3$
 TOTAL $\Rightarrow 3475.393868 \text{ m}^3 \times 1000000 \text{ cm}^3 = 3475386800 \text{ cm}^3$