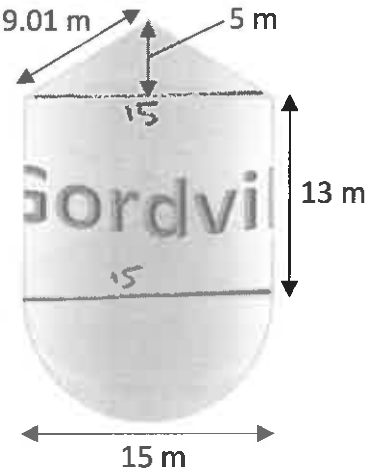
Example 2: Surface Area Addition AND Subtraction

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



slant height

Surface Area of a cone = $\pi r s$

$r = 7.5$

surface Area of cylinder = $2\pi r h$

$h = 13$

$r = 7.5$

Surface area of Sphere = $4\pi r^2$

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 = $\pi r s$ $\Rightarrow$ $\pi (7.5)$ m 9.01 m

$= 212.2931 m^2$

② Area of cylinder = $2\pi r h$ $\Rightarrow$ $2\pi (7.5)\ 13$ m

$= 612.6106 m^2$

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

$= 353.4291 m^2$

TOTAL METAL = $212.2931 m^2 + 612.6106 m^2 + 353.4291 m^2$

$= 1178.33 m^2$

Example 3: Volume Addition

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

$1 m^3 = 1000000 cm^3$

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

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

$= 294.5243 m^3$

② Volume of cylinder = $\pi r^2 h$ $\Rightarrow$ $\pi (7.5)^2 (13)$

$= 2297.2896 m^3$

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

$1763.145 \div 2$

$= 883.5729 m^3$

TOTAL WATER = $294.5243 m^3 + 2297.2896 m^3 + 883.5729 m^2$

TOTAL $\Rightarrow$ $3475.393868 m^3 \times 1000000 cm^3$ $= 3\,475\,386\,800 cm^3$