5. A sculpture is composed of a square pyramid on top of a cylindrical base.
The sculpture is designed to sit on the floor as shown.
The cylinder has diameter 3 m and height 3 m. The pyramid has all edges measuring 6 m.
The sculpture is to be painted. Determine the area to be painted.

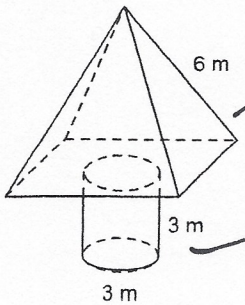
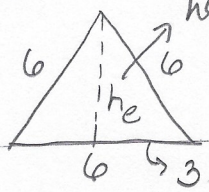


Figure 1 (A pyramid)

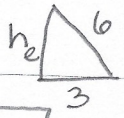
Figure 2 (A cylinder; r = 1.5 m)

Let's start with Figure 1

Figure 1: 3 equilateral triangles + 1 square



height! Use pythagorean theorem to get the height



$$h_e = \sqrt{6^2 - 3^2} = \sqrt{36 - 9} = \sqrt{27} = 5.19\ m$$

So, All 4 triangles are equal:

$$S_A \triangle = \frac{b \times h}{2} = \frac{6\ cm \times 5.19\ cm}{2} = \frac{30.18}{2}\ cm^2 = 15.58\ cm^2$$

Total area of triangles $= 4 \times 15.58\ cm^2 = \cancel{62.18}\ cm^2 \rightarrow 62.35\ cm^2$

Area of base $\rightarrow$ $\square 6 = b \times h = (6 \times 6)\ cm^2 = 36\ cm^2$

So

Total area = Area of 4 triangles + Area of Base

$$S_A = 62.35\ cm^2 + 36\ cm^2$$

$$S_A = \cancel{[illegible]}\ 98.35\ cm^2 \Rightarrow$$ this is the surface area of Fig. 1

Overlap $\rightarrow$ top circle of cylinder

$$= 2 \times (\pi r^2) = 2 \times \pi \times 1.5^2\ m^2 = 14.137 \approx 14.14\ m^2$$

Figure 2: A cylinder with radius = 1.5 m
height = 3 m

$$S_A = 2\pi r^2 + (2\pi r \times \text{height})$$
$$= 2 \times \pi \times 1.5^2\ m^2 + (2 \times \pi \times 1.5 \times 3)\ m^2$$
$$= 14.14\ m^2 + 28.27\ m^2$$
$$= 42.41\ m^2$$ this is the area of Fig. 2

So,

Total Area of Composite Figure = S_A Figure 1 + S_A Figure 2 − Overlap

$$98.35\ m^2 + 42.41\ m^2 - 14.14\ m^2$$

Total Area = $140.76\ m^2 - 14.14\ m^2$

$$S_A = 126.62\ m^2$$