

Surface & Base Area in Polyhedra

General SA equation:

$$S = L + 2B$$

← base area

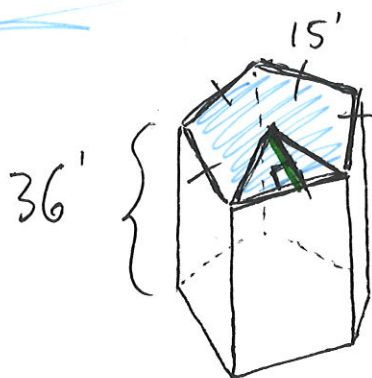
↗ Lateral (face) area

• For a circle, $B = \pi r^2$

• For any polygon, $B = \frac{1}{2} nsa$

→ use trig. and find one internal \angle to get a .

ex Find the surface area of a pentagonal prism that is 36' high and where the side lengths are 15'.



$$h = 36' \quad A = \frac{1}{2} n s a$$

$$s = 15'$$

$$n = 5$$

• Find apothem

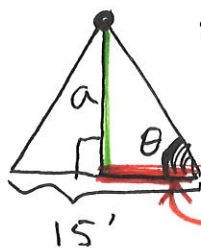
★ Find one internal \angle

$$\frac{\Sigma}{n} = \frac{(n-2)180}{n} = \frac{3(180)}{5}$$

$$\angle = 108^\circ$$

★ $\frac{\angle}{2}$ = angle inside triangle

$$\theta = \frac{108^\circ}{2} = 54^\circ$$



$$\tan 54^\circ = \frac{a}{7.5'}$$

$$7.5' \tan 54^\circ \approx 10.32'$$

• Area 5-gon = $\frac{1}{2} \times 5 \times 15 \times 10.32$

$$A = 387 \text{ sq. ft.}$$

Now I can find Surface Area...?

$$S = L + 2B$$

$$S = 2700 + 2(387)$$

$$S = 3,474 \text{ sq. ft.}$$

$$L = ph = 75' \cdot 36' = 2700 \text{ sq. ft.}$$

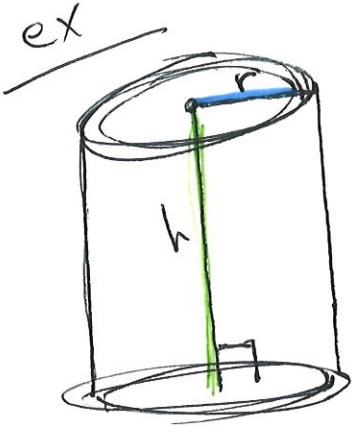
$$P = 5 \times 15 = 75'$$

$$h = 36'$$

Volume of Prisms

$$V = bh$$

← height
↑ Base area



Circumference of a base is 476". The cylinder (circular prism) is 902" tall. What's the volume?

$$\bullet C = 2\pi r \rightarrow \frac{476}{2\pi} = \frac{2\pi r}{2\pi}; \frac{476}{2\pi} = r$$

$$r \approx 747.7''$$

$$\text{So } A = \pi r^2 = \pi (747.7)^2 \approx 1,756,324$$

$$\bullet V = bh$$

$$= (1,756,324) (902'')$$

sq. in.

$$V = 1,584,204,248 \text{ in}^3$$