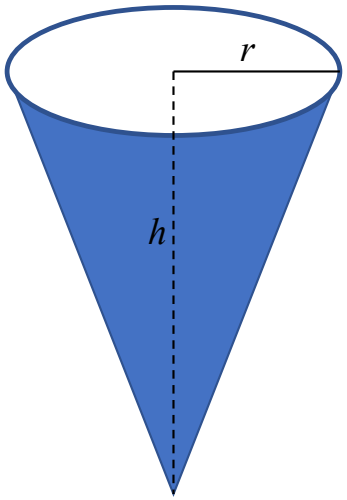
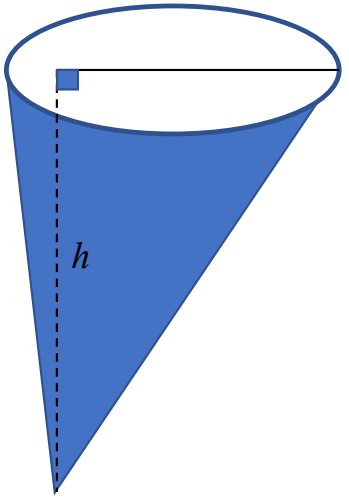
Spheres & Cones

The volume of a cone is similar to the volume of a pyramid in that it is one third of the volume of the cylinder from which it is extracted

$$V_{cone} = \frac{1}{3}\pi r^2 h$$



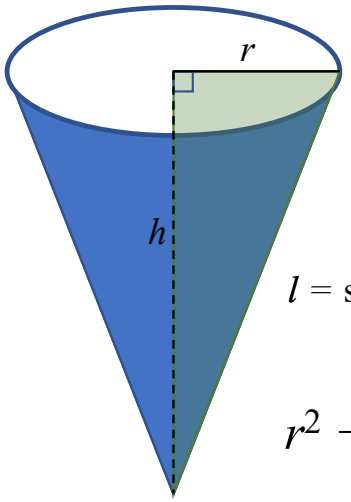


How would we find the surface area of this cone?

Lateral area or area around the cylinder

$$A_{surface} = A_{bases} + A_{lateral\ area}$$

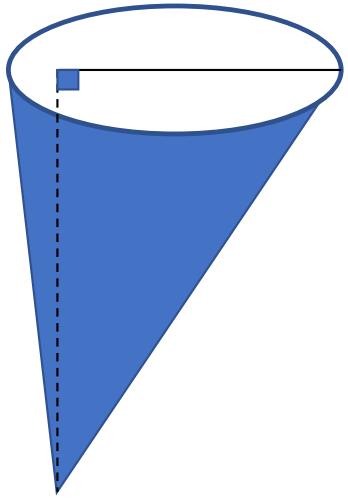
$$A_{surface} = \pi r^2 + \pi rl$$



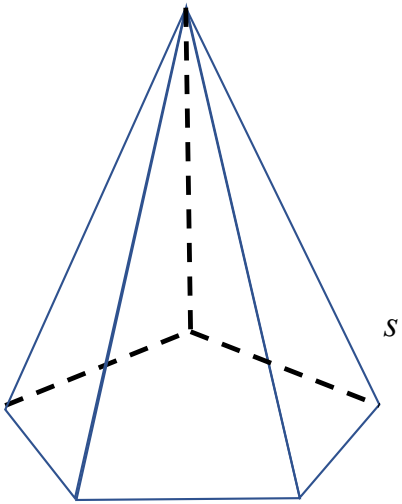
l = slant height

$$r^2 + h^2 = l^2$$

The lateral area formula does not apply unless it's a right cylinder



To see how we got this formula, let's go back to pyramids for a minute.



For the surface area of a pyramid, we had this:

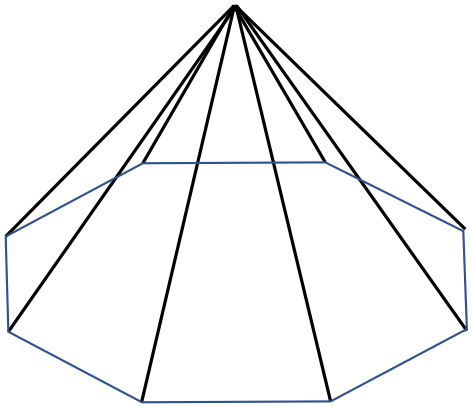
$$A_{surface} = \frac{1}{2}nsl$$

n is the number of sides
s is the length of each side of the polygon base
l = the slant height

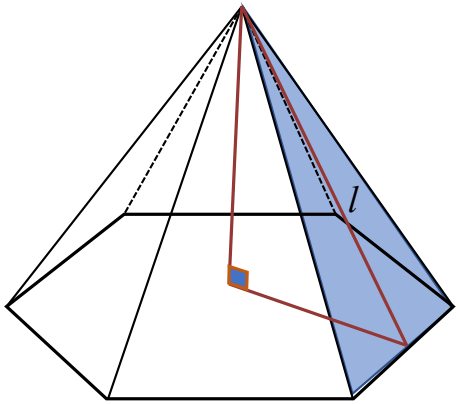
We then simplified it to

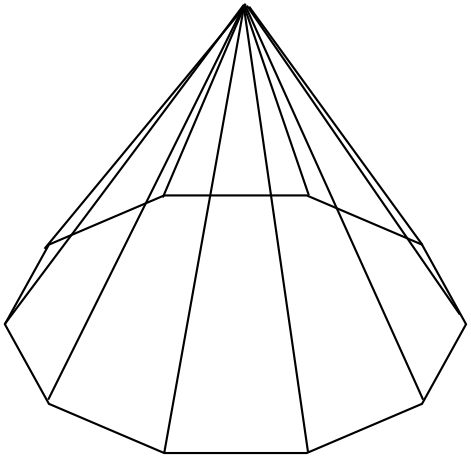
$$A_{surface} = \frac{1}{2}Pl$$

P is the perimeter of the base
l = the slant height

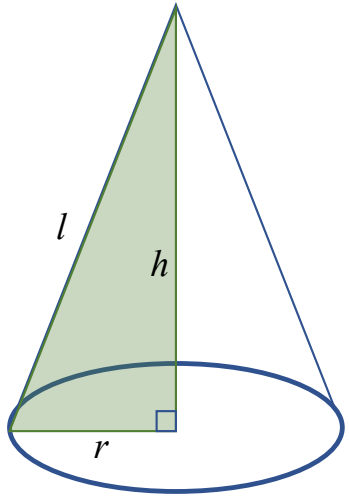


As n keeps getting bigger, the base starts looking like a circle





So we end up with a cone



Since the perimeter of a circle is the circumference, we can change the formula from

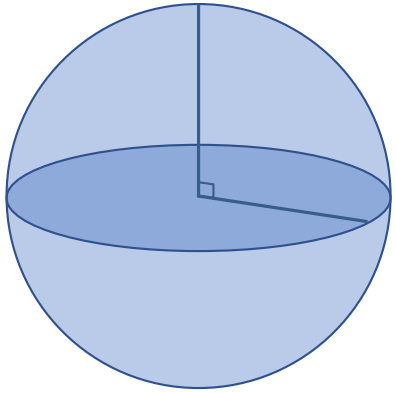
$$A_{surface} = \frac{1}{2}Pl$$

to

$$A_{surface} = \frac{1}{2}Cl = \pi rl$$

How would we find the volume of this sphere?

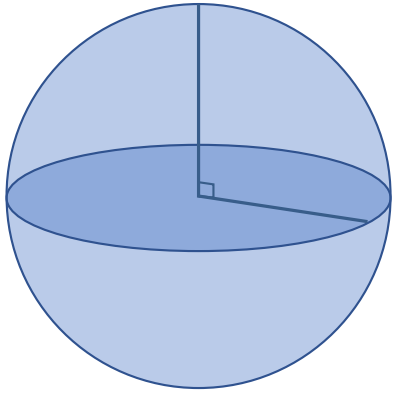
$$V_{sphere} = \frac{4}{3}\pi r^3$$



How would we find the surface area of this sphere?

$$A_{sphere} = 4\pi r^2$$

Suppose that the volume of this sphere is $36\pi\ cm^3$



Calculate the surface area

First we need to solve for the radius.

$$V = \frac{4}{3}\pi r^3 = 36\pi\ cm^3$$

$$\pi r^3 = \frac{3}{4}36\pi\ cm^3$$

$$r^3 = 27\ cm^3$$

$$r = 3\ cm$$

$$A = 4\pi r^2$$

$$A = 4\pi 3^2$$

$$A = 36\pi\ cm^2$$