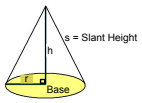
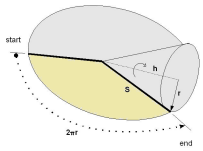
A cone is a three dimensional solid with a circular base.
The lateral surface is curved and extends from the base to a point called the vertex.



Developing a formula for surface area of a cone:

The lateral surface is a circle-sector.
This sector is some fraction (one n^{th}) of a circle with radius s.

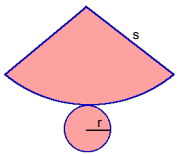


$A_{sector} = \frac{1}{n}\pi s^2$

The circumference of the sector is one n^{th} of the circumference the whole circle with radius s.

$C_{sector} = \frac{1}{n}(2\pi s)$

Since the circumference of the sector wraps around the circumference of the base (which is a circle with radius r),



$$\frac{1}{n}(2\pi s) = 2\pi r$$
$$\frac{1}{n}\pi s = \pi r$$

substituting this into $A_{sector} = \frac{1}{n}\pi s^2$

$$A_{lateral\ side} = \frac{1}{n}\pi s \times s$$
$$= \pi r \times s$$
$$= \pi rs$$

So, the formula for Surface area of a cone is:

$$A_{total} = A_{base} + A_{lateral\ side}$$
$$= \pi r^2 + \pi rs$$

Example 1:

Calculate the surface area of a paper cone (before it is filled with french fries) with height 4.2 cm and radius 1.8 cm.

** Note: the paper cone has no circular base so we only need the lateral surface area!!

Example 2:

The slant height of a cone is tripled. Does this triple the surface area of the cone? Explain.

Example 3:
A cone is formed from a circle with a 90° sector removed. Another cone is formed from a semicircle with the same radius. How do the two cones differ? How are they the same?

Example 4: The lateral area of a cone with slant height 14 cm is 132 cm^2.

a) Find the radius of the cone, to the nearest cm.

b) Find the height of the cone, to the nearest cm.

Example 5:

An old construction pylon needs to be painted. The base the pylon sits on is 20cm by 20 cm by 1.5 cm, the radius of the cone is 8 cm and the height of the pylon is 31 cm. If only the part that shows is to be painted, find the surface area to be painted. (Round to 1 decimal place).