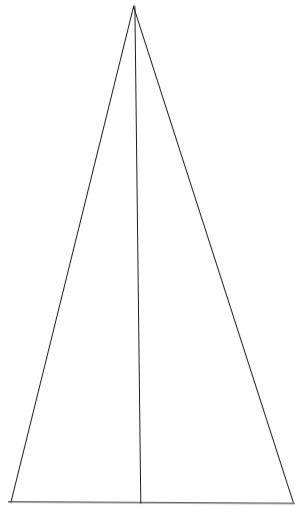
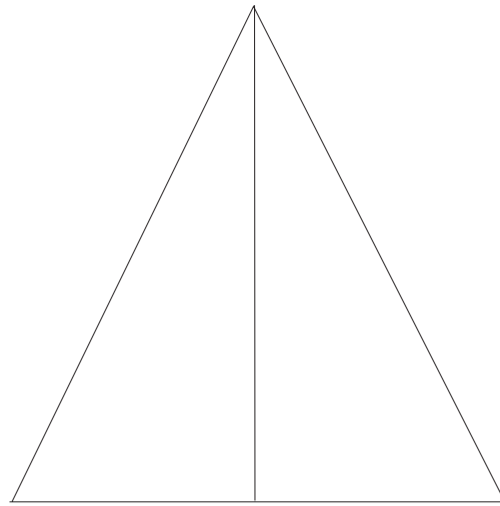


Patella vulgata measurement options

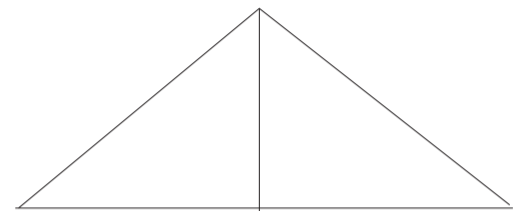
Height, length, width can be used to derive ratios, volumes or surface areas



height:length ratio = 40 / 20 = 2.0



height:length ratio = 40 / 40 = 1.0



height:length ratio = 20 / 40 = 0.5

Limpets approximate to cones and an estimate of volume and surface area can be calculated

Volume of cone

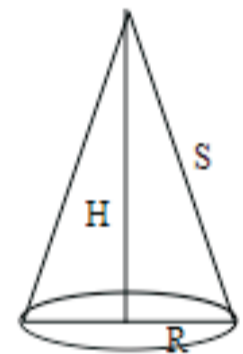
$$= \frac{1}{3} \times \text{area of base (A)} \times \text{height (H)}$$

$$= \frac{1}{3} AH$$

$$= \frac{1}{3} \pi R^2 H$$

Curved surface area of cone

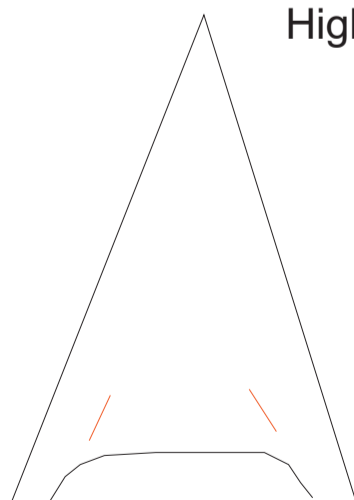
$$= \pi RS$$



Limpet shape will affect drag and lift imposed by wave energy see Denny (1987) and Koehl(1996) for details

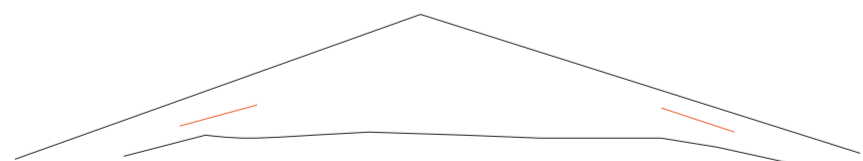
Effect of wave energy on Limpet shape

High wave energy



foot contracted, shell secreting membranes have small circumference, therefore shell secreted over small area and steeper angle

Low wave energy



foot relaxed, shell secreting membranes have larger circumference, therefore shell secreted over a larger area and shallower angle

N.B. Limpets should not be removed for measurement as they may be damaged and may not successfully re-attach to the rock.