4. Prove that for a cone made by rolling up a semi-circle, the area of the curved surface is twice the base area.

Let the radius of the semicircle be R.

Its arc length $= \frac{1}{2} \times 2\pi R = \pi R$

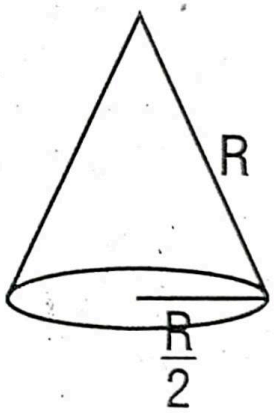
Let the radius of the cone $= r$

Since the base circumference of the cone is πR

$2\pi r = \pi R$, $r = \frac{\pi R}{2\pi} = \frac{R}{2}$

Curved surface area of the cone

$$= \pi r l = \pi \times \frac{R}{2} \times R = \frac{1}{2}\pi R^2$$



Base area of the cone $= \pi r^2 = \pi \times \left(\frac{R}{2}\right)^2$

$$= \pi \times \frac{R^2}{4} = \frac{1}{4}\pi R^2$$

$2 \times \frac{1}{4}\pi R^2 = \frac{1}{2}\pi R^2$

That means the curved surface area of this cone is twice its base area.