

By what factor does the volume of a right circular cylinder increase when the radius is doubled?

1) Because we're not told the radius, assume it's just r .

2) The volume when the radius is r is $V = \pi r^2 h$.

3) When we double the radius, we replace r with $2r$.

So the new volume is $V_{\text{new}} = \pi (2r)^2 h$

To simplify the expression on the right side, we proceed as shown:

$$V_{\text{new}} = \pi 2^2 \cdot r^2 \cdot h \quad \text{Distribute the exponent of 2 individually to the 2 and the } r$$

$$V_{\text{new}} = \pi \cdot 4 \cdot r^2 \cdot h \quad 2^2 = 4$$

$$V_{\text{new}} = 4 \cdot \pi r^2 h$$

$$V_{\text{new}} = 4 \cdot V \quad \pi r^2 h \text{ is the old volume, however, so the new one is 4 times the old.}$$