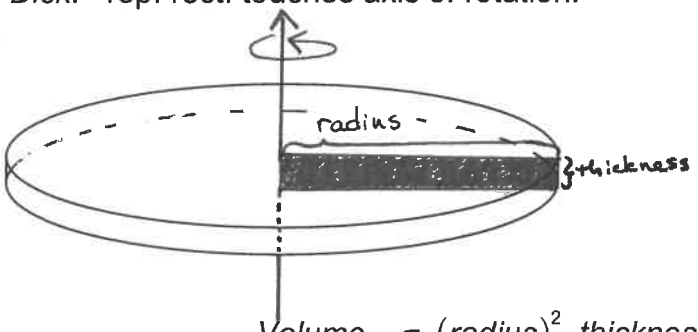
Summary: Formulas and Measurements for Volume Problems

Disks and Washers:

Representative rectangle perpendicular to the axis of rotation.

Disk: rep. rect. touches axis of rotation.

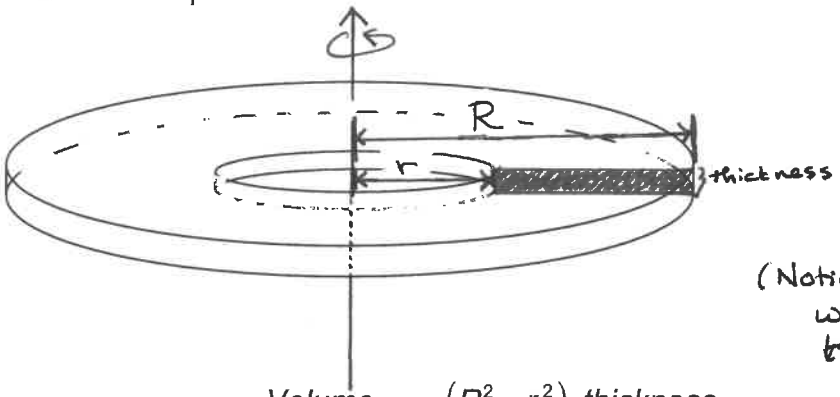


$$Volume = \pi \cdot (radius)^2 \cdot thickness$$

measurements:

thickness = width of the representative rectangle
start = where you start counting rectangles
end = where you stop counting rectangles
radius = from the axis of rotation to the outside edge of the representative rectangle

Washer: rep. rect. does not touch axis of rotation.



(Notice! we don't care what the length of the rectangle is here.)

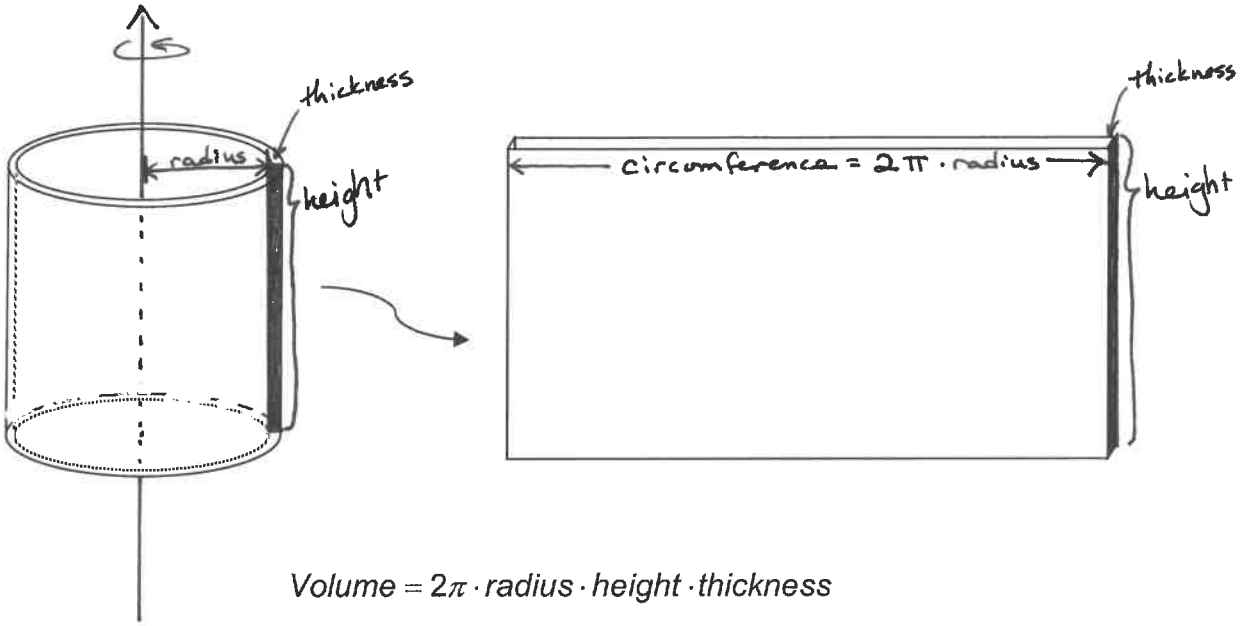
$$Volume = \pi \cdot (R^2 - r^2) \cdot thickness$$

measurements:

thickness = width of the representative rectangle
start = where you start counting rectangles
end = where you stop counting rectangles
R = *outer radius* = from the axis of rotation to the outside edge of the representative rectangle
r = *inner radius* = from the axis of rotation to the inside edge of the representative rectangle

Cylindrical Shells:

Representative rectangle parallel to the axis of rotation.



$$Volume = 2\pi \cdot radius \cdot height \cdot thickness$$

Measurements:

thickness = width of the representative rectangle

start = where you start counting rectangles

end = where you stop counting rectangles

radius = from the axis of rotation to the representative rectangle

height = the height of the representative rectangle