A student measures distance x to be 5 meters and area A to be 25 ft^2.
Discuss with neighbors which of the following are true; then vote for all that are true.

1. $[x^2] = [A]$
2. $[5x] = A$
3. $x^2 = [A]$
4. $x^2 = A$
5. None of the above

Which equation represents the quantity on the left?

A. The area of a circle.

B. The volume of a sphere.

C. The circumference of a circle.

D. The surface area of a sphere.

1. $2\pi R$

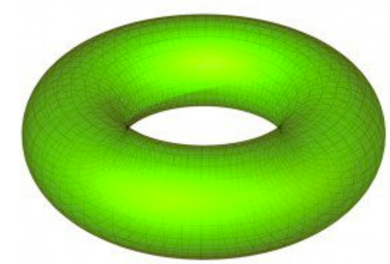
2. $4\pi R^2$

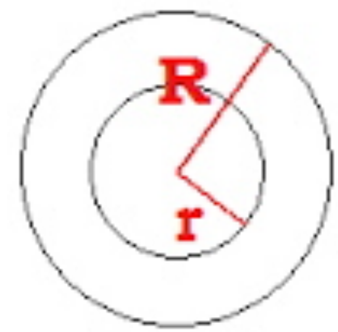
3. $\frac{4}{3}\pi R^3$

4. πR^2

Example

A torus is the mathematical name for the shape of a donut or bagel. Its volume can be expressed as a function of the inner and outer radii of the torus (distance from the center to the inner and outer edge). Which of the following equations could be the correct equation for the volume of the torus?





$$A.\ \ V = (2\pi R)(\pi r^2)$$

$$B.\ \ V = \frac{\pi^2}{4}(R+r)(R-r)^2$$

$$C.\ \ V = \pi R r$$

$$D.\ \ V = \frac{\pi^2}{4}(Rr)^2$$

Example

One of the essential elements of the animal immune system is the macrophage: a cell that ingests an destroys harmful bacteria. The bacterium might contain molecules of a chemical safe for it, but harmful to the macrophage. But the macrophage is bigger, so the density of the harmful molecules will be less. (Assume they are both spherical.) Suppose the macrophage has a diameter of 20 μm and the bacterium has a diameter of 1 μm. If the density of these molecules in the bacterium is *D*, what will be their approximate density in the macrophage once the bacterium has been ingested, broken up, and distributed throughout the macrophage?

A. D

B. $D/20$

C. $D/400$

D. $D/8000$

E. Something else