Exam Hunter
Education Consulting

GEOMETRY
3 Dimensional Objects

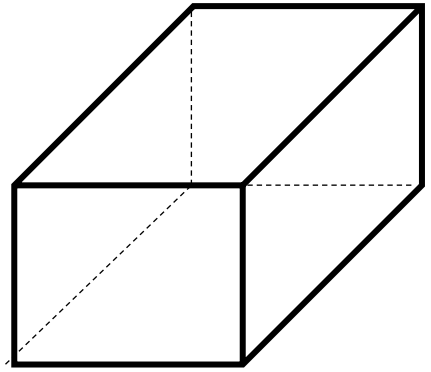
Rectangular Solid

A *rectangular solid* is a three-dimensional figure formed by 6 rectangular surfaces, as shown below.

Each rectangular surface is a *face*.

Each solid or dotted line segment is an *edge*, and each point at which the edges meet is a *vertex*.

A rectangular solid has 6 faces, 12 edges, and 8 vertices. Opposite faces are parallel rectangles that have the same dimensions.

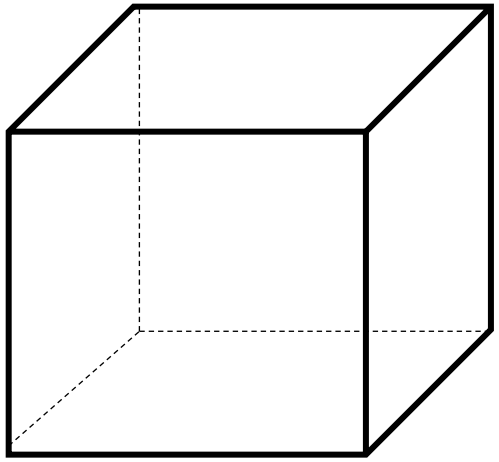


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Cube

A rectangular solid which all edges have equal length is called a cube

Surface area = area of 1 face * 6
Volume = Edge ^ 3



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Surface Area and Volume

The *surface area* of a rectangular solid is equal to the sum of the areas of all the faces.

= 2*(width*length) + 2*(length*height)+ 2*(width*height)

And The *volume* is equal to

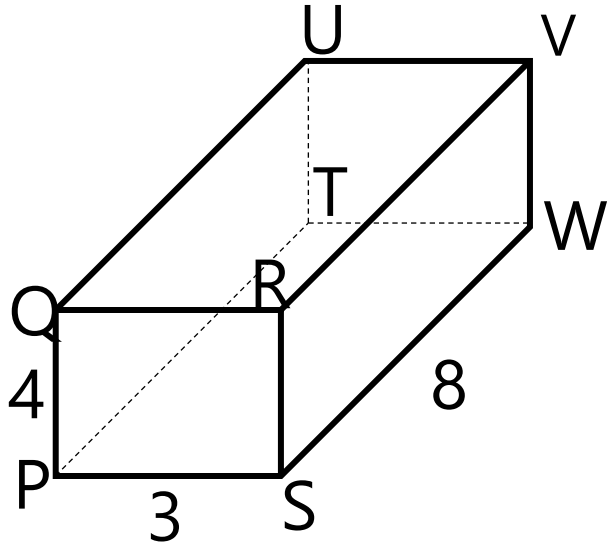
(length) x (width) x (height);

in other words, (area of base) x (height).

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Example

In the rectangular solid below, the dimensions are 3, 4, and 8. The surface area is equal to 2(3x4)+2(3x8)+2(4x8) = 136. The volume is equal to 3x4x8 = 96.



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Example (2) Pythagoras and Rectangular Solid/Cube

Find the volume and surface area of this cube if the red line has the length of ‘k’.

‘E’ → $E\sqrt{2}$

E, $E\sqrt{2}$ →

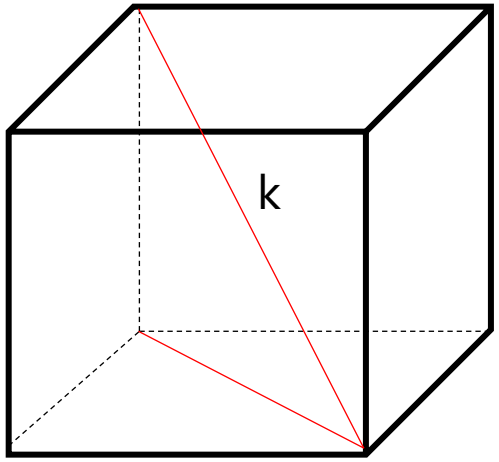
E^2 + $(E\sqrt{2})$^2 = K^2

E^2 + 2*E^2 = K^2

3E^2 = K^2

K = $\sqrt{3}E$

K/$\sqrt{3}$ = E ,,,,,, (K/$\sqrt{3}$)^3



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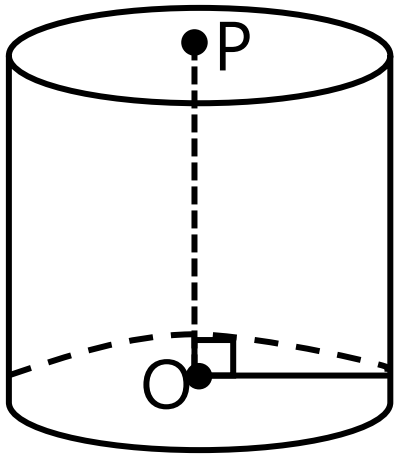
Cylinder

Volume of right cylinder = base area * height

Base of a right cylinder is circle. Base area = πr^2 if the base is circle

Surface area = 2*base area + circumference*height

SA if the base is circle = $2*\pi r^2 + 2\pi r*$ height



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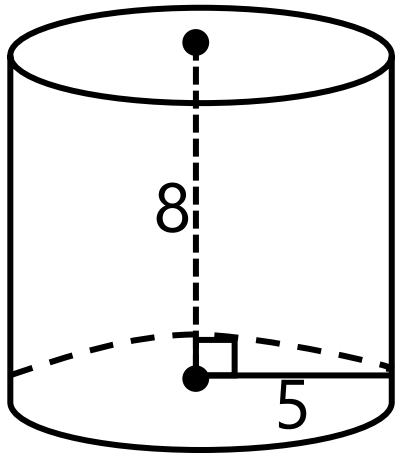
Example

In the circular cylinder below, the surface area is equal to

$$2(25\pi)+2\pi(5)(8) = 130\pi,$$

and the volume is equal to

$$25\pi(8) = 200\pi.$$



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Cone

The **Right Circular Cone** is the cone in which the line of the axis is perpendicular to the base.

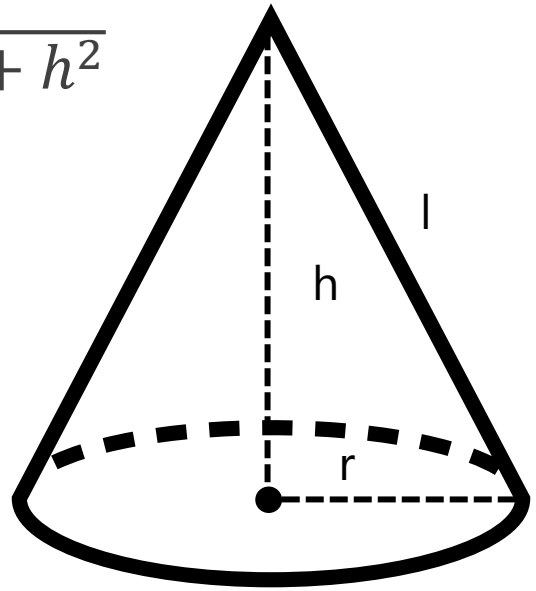
Volume = $\frac{1}{3}\pi r^2 * h$

Curved Surface Area = $\pi r\sqrt{r^2 + h^2}$

Or πrl

Total surface area = $\pi r^2 + \pi r$l

πr(r+l)



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Cone and Pythagoras

The **Right Cone** is the cone in which the line of the axis is perpendicular to the base.

Volume = $\frac{1}{3}\pi r^2 * h$ or $\frac{1}{3} * base\ area\ * h$ ← if the base is not circle

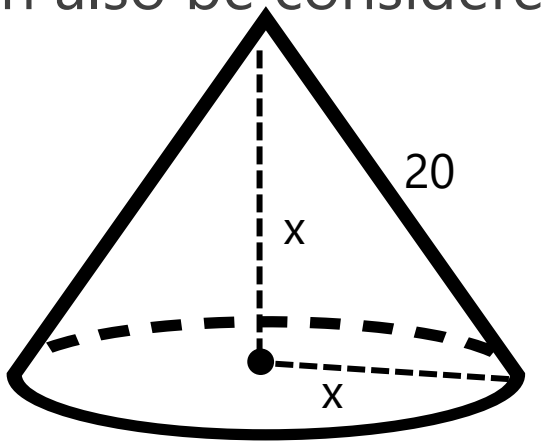
Surface Area = $\pi r\sqrt{r^2 + h^2}$

Length from base to the top can also be considered hypothenuse in 3D

1/3 $\pi r^2 * h$

1/3 π (20/root2)^3

π*20/root2 * 20 + $\pi \left(\frac{20}{\text{root2}}\right)^2$



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π

Cone and Pythagoras

Length from base to the top can also be considered hypothenuse in 3D

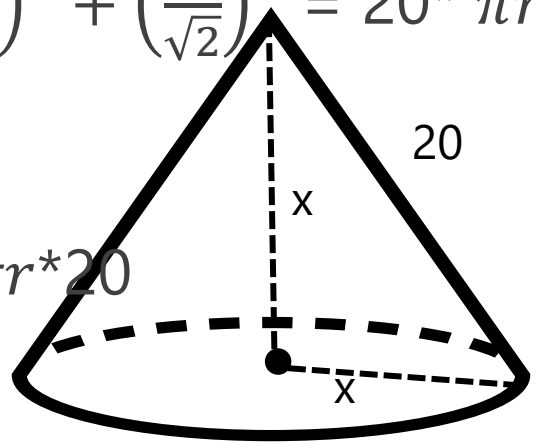
$X = \frac{20}{\sqrt{2}}$

Volume = $\frac{1}{3}\pi\left(\frac{20}{\sqrt{2}}\right)^2 * \left(\frac{20}{\sqrt{2}}\right)$

Curved Surface Area = $\pi r\sqrt{\left(\frac{20}{\sqrt{2}}\right)^2 + \left(\frac{20}{\sqrt{2}}\right)^2}$ = 20* πr

Base area = $\pi\left(\frac{20}{\sqrt{2}}\right)^2$

Total surface area = $\pi\left(\frac{20}{\sqrt{2}}\right)^2 + \pi r$*20



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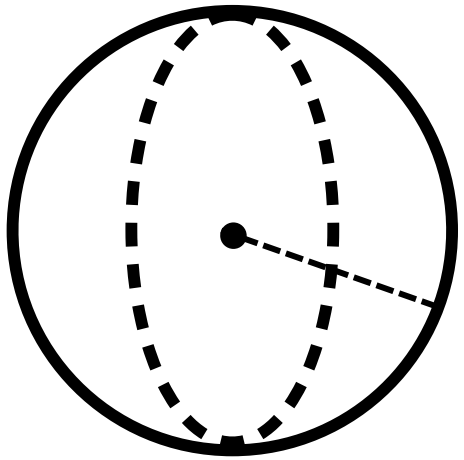
Sphere

Sphere: A sphere is the set of points that are all at the same distance *r* from a given point in three-dimensional space.

Surface Area = $4\pi r^2$

Volume = $\frac{4}{3}\pi r^3$

R = radius



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Example

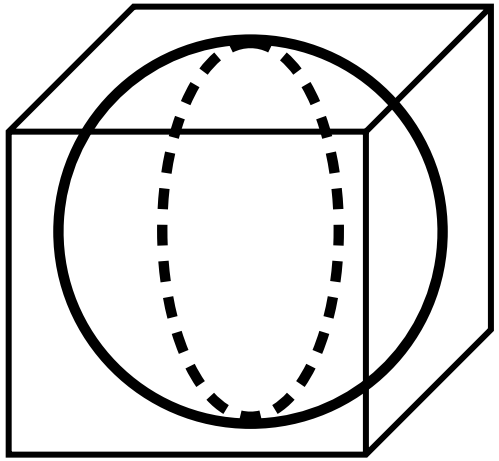
What is volume of a largest sphere that can be placed inside a cube that has 6cm edge.

Volume = $\frac{4}{3}\pi r^3$

4/3 * π(3)^3 = ANS

Surface Area = 4 πr^2

4* π*(3)^2



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