

## THREE-DIMENSIONAL GEOMETRY/ MEASUREMENT

Three-dimensional geometry/measurement refers to three-dimensional (3-D) shapes and the measurement of their shapes concerning volume and surface area. The figures of prisms, cylinders, pyramids, cones and spheres are all 3-D figures.

**Volume** measures the amount a solid figure can hold. Volume is measured in terms of units<sup>3</sup> and can be measured in inches, feet, meters, centimeters, and millimeters.

- The **volume of a rectangular prism** is  $V = l \cdot w \cdot h$ , where  $l$  is the length,  $w$  is the width, and  $h$  is the height.

- The **volume of a cube** is  $V = s^3$  where  $s$  is a side of the square.



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**Surface area** is the sum of the areas of all the surfaces of an object.

- The **surface area of a rectangular prism** is:  $SA = 2wl + 2lh + 2hw$ .
- The **surface area of a triangular prism** is:  $SA = bh + (a + b + c)h$ , where  $bh$  refers to base times height and  $a$ ,  $b$  and  $c$  are the sides of a triangle and  $h$  is the height.
- The **surface area of a cylinder** is:  $SA = 2\pi r \cdot h + 2\pi r^2$ , where  $r$  is the radius and  $h$  is the height.
- The **surface area of a square pyramid** is:  $SA = s^2 + 2sl$ , where  $s$  is a base side and  $l$  is the slant height.

- The **surface area of a cone** is:  $SA = \pi r(r + s)$ , where  $r$  is the radius and  $s$  is the slant height.
- The **surface area of a sphere** is:  $SA = 4\pi r^2$ .

## How to use 3-D geometry/measurement

The **volume** of 3-D figures can be determined by using the formula that corresponds to the figure. The volumes of all figures can be determined as long as the needed information is given. For example, what is the volume of a cone with a radius of 6 cm and a height of 15 cm? The number 3.14 is used for  $\pi$ .

**Ex.  $V_{\text{cone}} = (1/3)\pi r^2 \cdot h$**

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5 inches?

$$= (4)(3.14)(5^2)$$

$$= (4)(3.14)(25) = 314 \text{ inches}$$

If the surface area and all other dimensions are given except one dimension, the missing dimension can be found by plugging in the surface area and given dimensions and solving for the missing dimension.

## Try This!

1. What is the **volume of the rectangular prism** with a length of 4m, a width of 6 m and a height of 12 m?  $V = l \cdot w \cdot h$
2. What is the **volume of a triangular prism** with a length of 9 cm, a width of 10 cm and a height of 3 cm?  $V = (1/2) \cdot l \cdot w \cdot h$
3. What is the **volume of a pyramid** with a height of 15 cm and a base of 8 cm?  $V = (1/3) b^2 \cdot h$



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7. What is the **surface area** of a rectangle with a length of 4 cm, a width of 7 cm and a height of 11 cm?
8. What is the **surface area** of a cylinder with a radius of 14 in. and a height of 30 in.?
9. What is the **surface area** of a sphere with a diameter of 16 ft?