

Lesson 7 – Volume and Surface Area.  
Cone and Pyramid

# Grade 9

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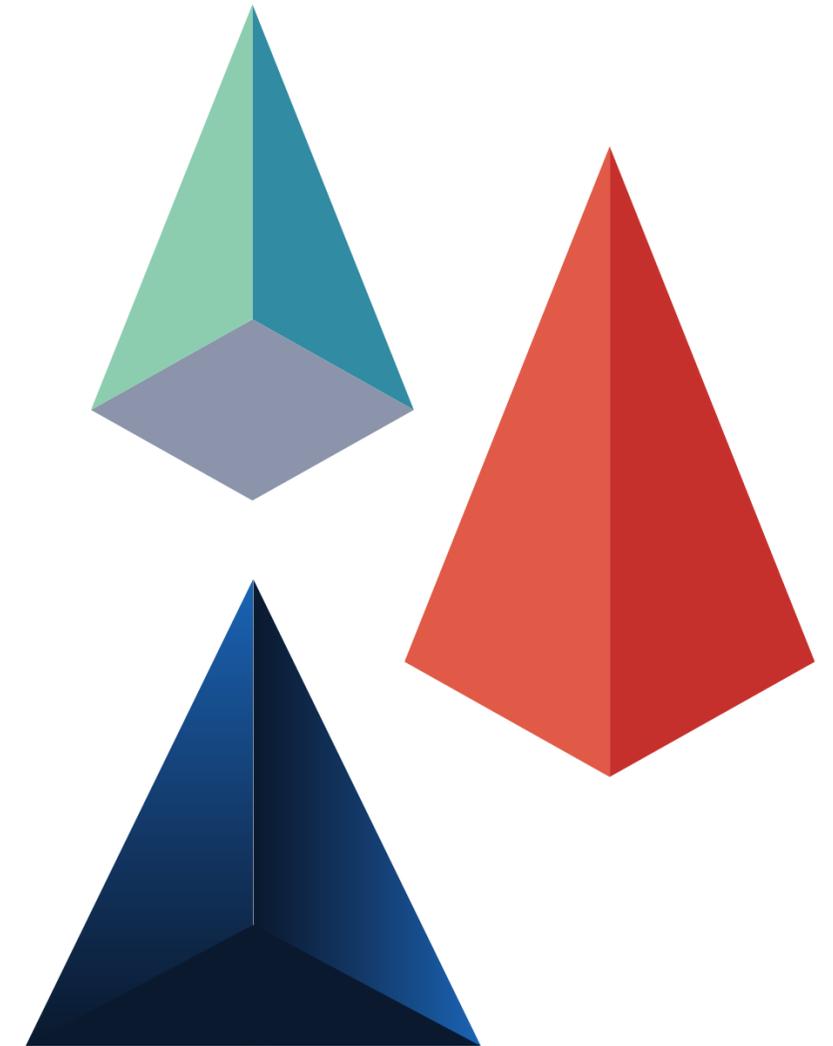


**Pyramid** – a 3D geometric figure, consisting of a 2D base, a point (vertex) that is not in the same plane as the base and all of the line segments that connect the base to the vertex.

The base of the pyramid can be a triangle, a rectangle, a square or any other 2D polygon.

Every slant side of a pyramid is a triangle.

**Surface Area (SA)** of the pyramid is the sum of the area of the base and areas of all slant triangles.

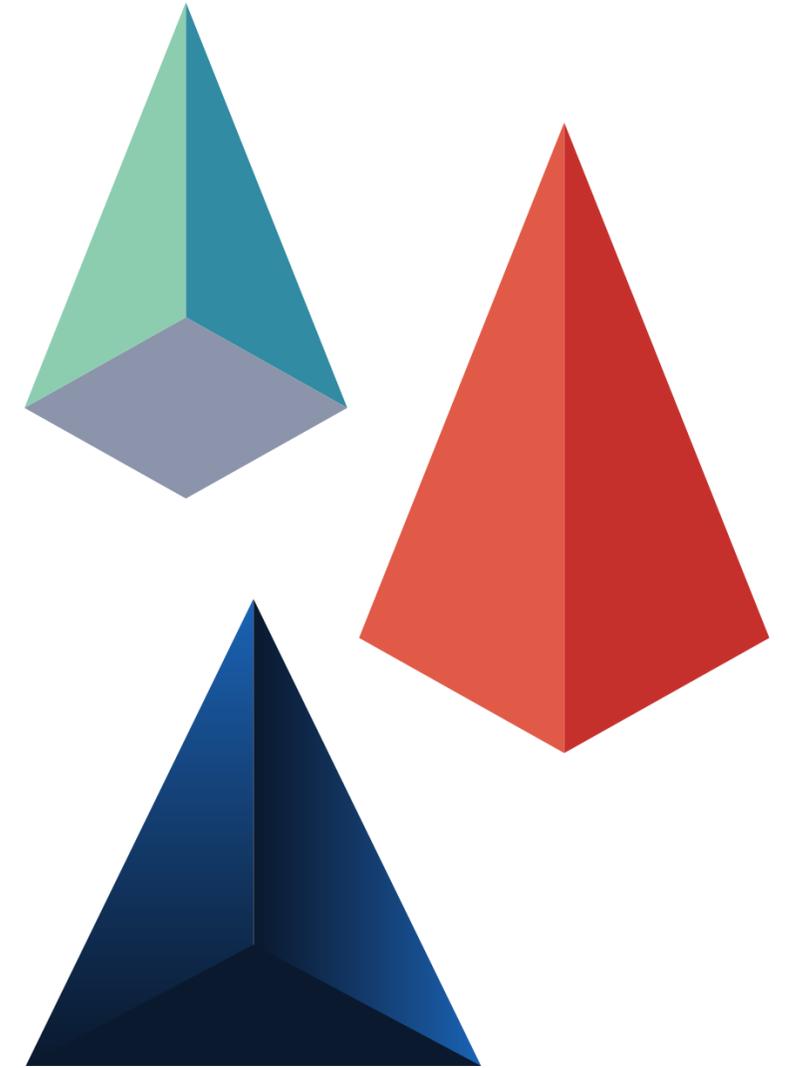


The **height** of a pyramid is a line segment, coming from the vertex of the pyramid to the base of the pyramid, which is perpendicular to the base.

Volume of a 3D figure is its capacity.

**Volume (v)** of the pyramid, whose base is a square, is equal to the area of the base multiplied by the height of the pyramid and the total product then divided by 3.

Sometimes we are required to use the Pythagorean Theorem to calculate the height of a slant side or the height of a pyramid.

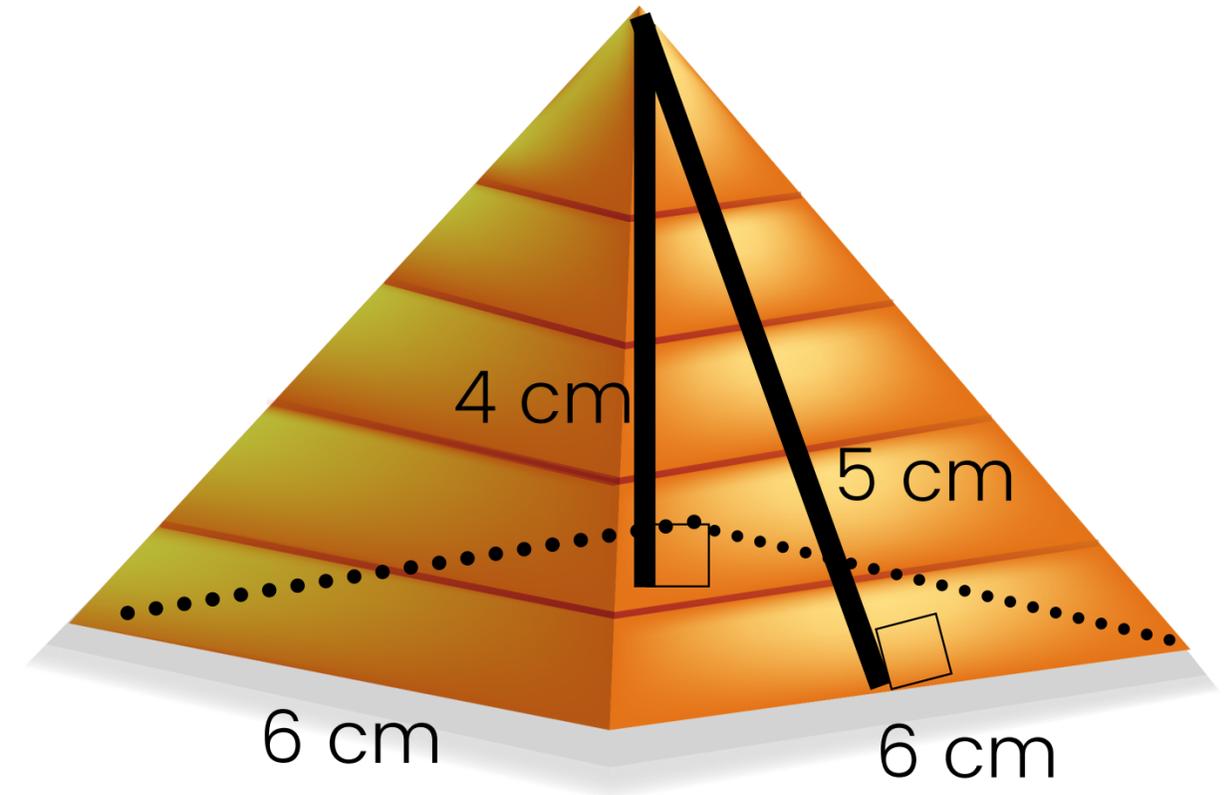


Let the base of the pyramid be a square with the side length of 6 cm. The height of the pyramid is equal to 4 cm and the slant height is 5 cm. Determine the Volume and the Surface Area of the Pyramid.

$$\text{Volume} = \frac{6 \times 6 \times 4}{3} = \frac{144}{3} = 48 \text{ cm}^3$$

$$\text{SA} = 6 \times 6 + 4 \left( \frac{6 \times 5}{2} \right) = 36 + 4(15) = 36 + 60 = 96 \text{ cm}^2$$

Therefore, Volume of the pyramid is  $48 \text{ cm}^3$  and its Surface Area is  $96 \text{ cm}^2$

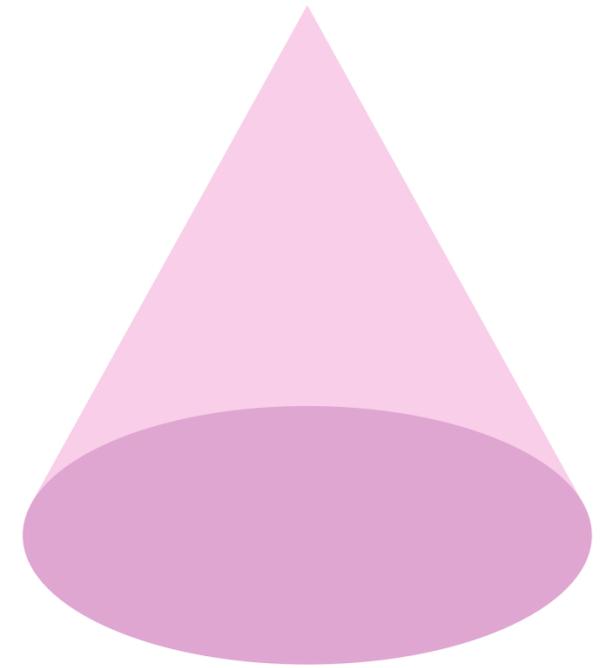


**Cone** - a 3D geometric figure, consisting of a 2D base, which is a circle, a point (vertex) that is not in the same plane as the base and a lateral surface connecting the vertex and the base along the circumference of the base.

The **height** of a cone is a line segment, coming from the vertex of the cone to the base of the cone, which is perpendicular to the base.

**Surface Area** of a cone is the sum of the area of the base ( $\pi r^2$ ) and the lateral area ( $\pi rs$ )

**Volume** of a cone is the product of the area of the base and height divided by 3.

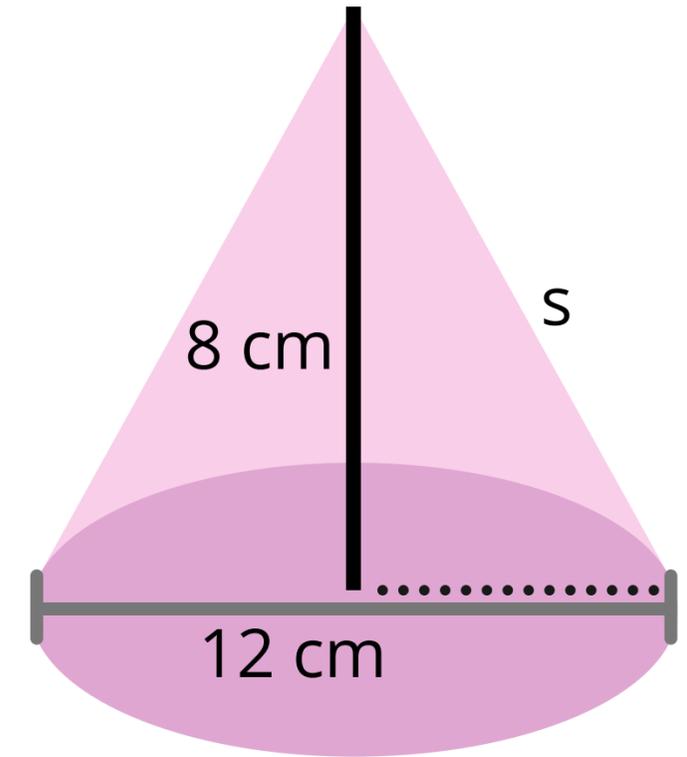


The height of a cone is 8 cm and the diameter of the base is 12 cm. Find its Volume and Surface Area.

If the diameter is 12 cm, than the radius is  $r = 6$  cm

$$V = \frac{\pi \times 6 \times 6 \times 8}{3}$$

$$V = 301.59 \text{ cm}^3$$



To determine SA, we first need to find the value of  $s$  using the Pythagorean Theorem

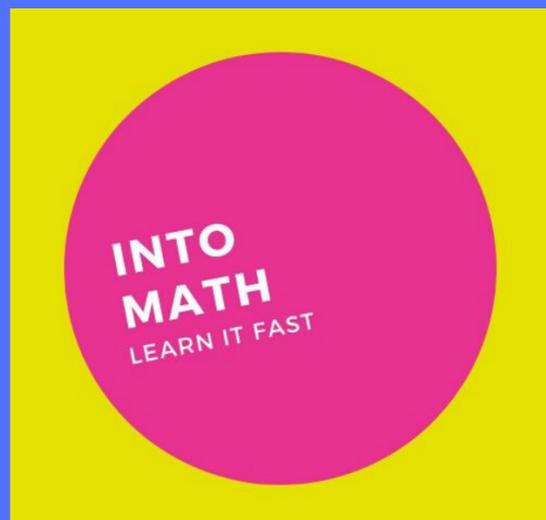
$$6^2 + 8^2 = s^2$$

$$\sqrt{36 + 64} = s$$

$$10 \text{ cm} = s$$

$$SA = \pi \times 6 \times 6 + \pi \times 6 \times 10$$

$$SA = 301.59 \text{ cm}^2$$



**EXCELLENT!**  
**You've completed**  
**Grade 9**

**GREAT**  
**WORK!**