Lesson 10.3 – Volume of Pyramids and Cones

Pyramid-Cone Volume Conjecture:

If B is the area of the base of a pyramid or cone and H is the height of the solid, then the formula for the volume is $V = \frac{1}{3}BH$.

Important Area Formulas that you will need:

Rectangle: $A = bh$

Parallelogram: $A = bh$

Triangle: $A = \frac{1}{2}bh$

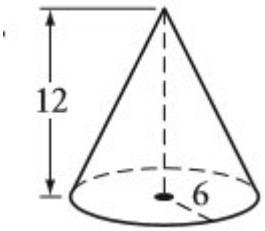
Trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$

Circle: $A = \pi r^2$

Sector: $A = \frac{a}{360}\pi r^2$

Regular Polygon: $A = \frac{1}{2}asn$

Example 1: Volume of a Cone



The base is a circle.

$B = \pi r^2$

$B = \pi(6)^2$

$B = 36\pi$

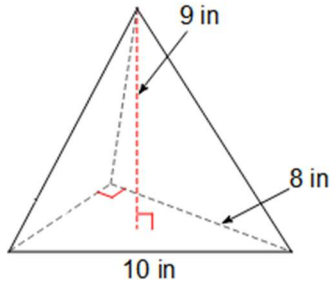
$V = \frac{1}{3}BH$

$V = \frac{1}{3}(36\pi)(12)$ **To calculate this, we can multiply 12 and 36, then divide by 3.

$V = 144\pi$

The volume of the cone is **144π units^3**, or about **452.39 units^3**.

Example 2: Volume of a Right Triangular Pyramid



The base is a triangle. We need to know the missing side of the triangle, so we will use the Pythagorean Theorem

$a^2 + b^2 = c^2$

$a^2 + 8^2 = 10^2$

$a^2 + 64 = 100$

$-64 \quad -64$

$a^2 = 36$

$\sqrt{a^2} = \sqrt{36}$

$a = 6$

The base is a triangle.

$B = \frac{1}{2}bh$

$B = \frac{1}{2}(6)(8)$

$B = 24$

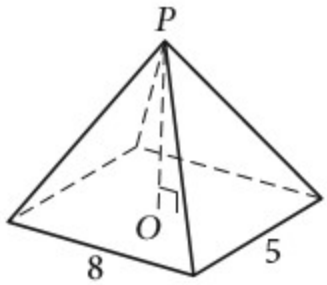
$V = \frac{1}{3}BH$

$V = \frac{1}{3}(24)(9)$

$V = 72$

The volume of the right triangular pyramid is **72 in^3**.

Example 3: Volume of a Rectangular Pyramid



$OP = 6$

The base is a rectangle.

$B = bh$

$B = (8)(5)$

$B = 40$

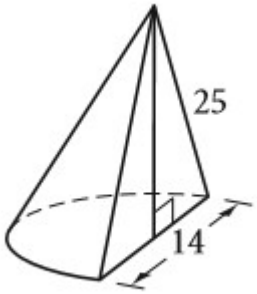
$V = \frac{1}{3}BH$

$V = \frac{1}{3}(40)(6)$

$V = 80$

The volume of the rectangular pyramid is **80 units^3**.

Example 4: Volume of a Semicircular Cone



The base is a semicircle (half of a circle). The diameter of the semicircle is 14 units. So, the radius of the semicircle is 7 units.

$B = \frac{1}{2}\pi r^2$

$B = \frac{1}{2}\pi(7)^2$

$B = 24.5\pi$

To find volume, we need height of the figure. We can use the Pythagorean Theorem on the right triangle that uses a radius (7) as one of the legs and 25 as the hypotenuse.

$a^2 + b^2 = c^2$

$7^2 + b^2 = 25^2$

$49 + b^2 = 625$

$-49 \qquad -49$

$b^2 = 576$

$\sqrt{b^2} = \sqrt{576}$

$b = 24$ **So, the height of the figure is 24 units.

$V = \frac{1}{3}BH$

$V = \frac{1}{3}(24.5\pi)(24)$

$V = 196\pi$

The volume of the semicircular cone is **196π units^3**, or about **615.75 units^3**.