MPM 1DI U9D1

Warm Up: What is Volume?

Volume of 3-D Shapes

Polyhedron: A three-dimensional object with faces that are polygons.

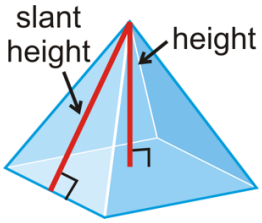
Prism:

A prism is a three-dimensional solid (a polyhedron). The top and bottom (the bases) are parallel, identical polygons. The lateral faces are rectangles; they meet the bases at right angles. A prism are named by the shape of its bases, for example, rectangular prism, triangular prism, square-based prism.

Volume of any Prism: $V = A_{base} \times height$

Pyramid:

A pyramid is a three-dimensional solid (a polyhedron) with a polygon-shaped base. The remaining sides are triangles that come to a point at the top.



https://www.youtube.com/watch?v=qXC8uzy_HFw

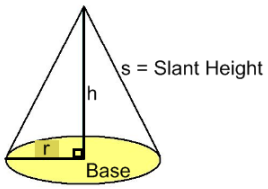
Volume of any Pyramid: $V = \frac{1}{3}(A_{base} \times height)$

or $V = A_{base} \times height \div 3$

A ***cylinder*** is a three-dimensional solid with identical parallel circular bases. The lateral surface is curved and extends from one base to the other base.

Volume of a Cylinder is the same as a prism: $V = A_{base} \times height$ or $V = \pi r^2 h$

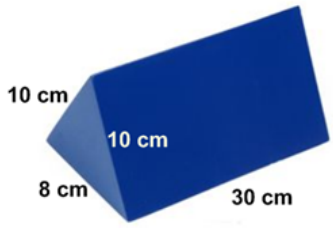
Similar to the relationship between the pyramid and the prism, the volume of a **cone** is one third the volume of a prism with the same radius and height.



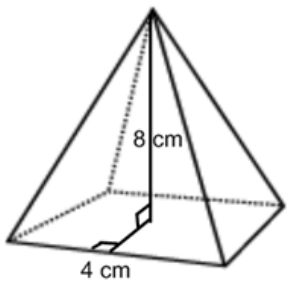
Volume of a Cone $= \frac{1}{3} A_{base} \times height$ or $V = \frac{1}{3}\pi r^2 h$

Volume of a Sphere: $V = \frac{4}{3}\pi r^3$ or $V = 4\pi r^3 \div 3$

Example 1: Calculate the volume of the following triangular-based prism.



Example 2: Calculate the volume of the following square-based pyramid.



Example 3: A box of chocolates has a volume of 80 cm^3. If its length is 10 cm and its height is 2 cm, what is its width?

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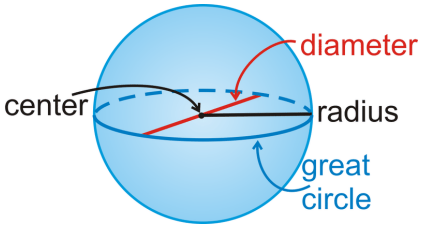
Example 4: A grain bin has a radius of 12 ft and a height of 48 ft. How much grain will the farmer need to order to fill the bin? (Note: 1 kg of grain fills 1 ft^3 of space. Also, assume grain (oats) is ordered in tonnes (1 metric ton = 1000kg).) (Note: the cone portion has a height of 18 feet)

Example 5: A roll of toilet paper has a height and diameter of 11.2cm. If the inner cardboard roll is 4cm in diameter, what is the volume of toilet paper on the roll?

Example 6: The radius of a sphere is tripled. How does this affect the volume of the sphere? Explain.



Example 7: A spherical gemstone just fits inside a plastic cube with edges 10 cm.

a) Calculate the volume of the gemstone, to the nearest cubic centimetre.

b) How much empty space is there?