Name _____ Date _____

Day 4 – Spheres

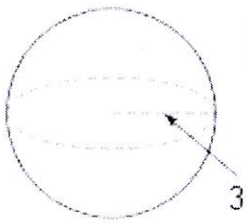
Volume is amount of space contained in an object or the number of unit cubes of a given size that will exactly fill the interior of a three dimensional figure. **Surface Area** is the total area of the surface of a three-dimensional object. Today we will learn the formulas for the volume and surface area of a sphere.

Surface Area & Volume of a Sphere

$$SA = 4\pi r^2 \qquad V = \frac{4}{3}\pi r^3$$

Where *r* is the radius.

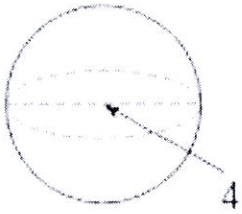
1. SA = $36\pi\ km^2$ & V = $36\pi\ km^3$



$SA = 4\pi 3^2$
$= 4\pi 9$
$= 36\pi$

$V = \frac{4}{3}\pi r^3$
$= \frac{4}{3}\pi 3^3$
$= \frac{4}{3}\pi(27)$
$= 36\pi$

2. SA = $16\pi\ km^2$ & V = $32/3\ \pi\ km^3$

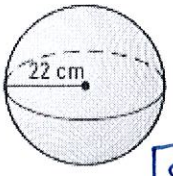


$SA = 4\pi r^2$
$= 4\pi 2^2$
$= 4\pi(4)$
$= 16\pi$

$V = \frac{4}{3}\pi r^3$
$= 4/3\pi 2^3$
$= 4/3\pi(8)$
$= \frac{32}{3}\pi$

Practice

A. Find the volume and surface area of the spheres.

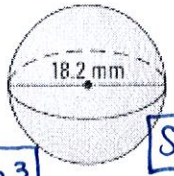


$SA = 4\pi 22^2$
$= 4\pi(484)$
$= 1936\pi$

$SA = 1936\pi\ cm^2$

$V = 4/3\ \pi\ 22^3$
$= 4/3\pi(10648)$
$= \frac{42592}{3}\pi$

$V = 42592/3\ \pi\ cm^3$



$r = 9.1$
$SA = 4\pi(9.1)^2$
$= 4\pi(82.81)$
$= 331.24\pi$

$SA = 331.24\pi\ mm^2$

$V = 4/3\pi(9.1)^3$
$= 4/3\pi(753.571)$
$= 1004.76\pi$

$V = 1004.76\pi\ mm^3$

B. A rubber ball has a radius of 30 cm. What is the surface area of the ball?

$SA = 4\pi r^2$
$= 4\pi(30)^2$
$= 4\pi(900)$
$= 3600\pi$

$SA = 3600\pi\ cm^2$

C. Find the diameter of a sphere with a volume of $972\pi\ in^3$.

$\frac{\frac{4}{3}\pi r^3}{4/3\pi} = \frac{972\pi}{4/3\pi}$

$\sqrt[3]{r^3} = \sqrt[3]{729}$

$r = 9$

$d = 2r$
$d = 2(9)$
$d = 18\ in$

D. Given that the volume of a sphere is 5276 cm^3, find its radius.

$\frac{4/3\pi r^3}{4/3\pi} = \frac{5276}{4/3\pi}$

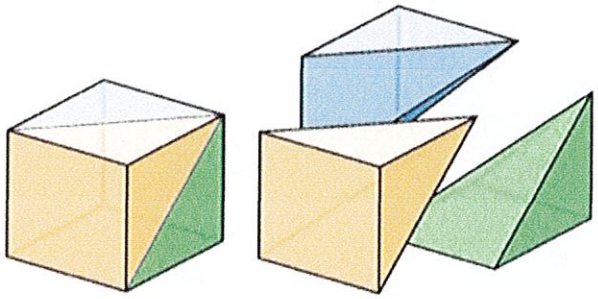
$\sqrt[3]{r^3} = \sqrt[3]{1259.55}$

$r = 10.8$

Day 5 – Volume of Prisms and Pyramids

A **prism** is a solid object with, identical ends, flat rectangular faces and bases, and the same cross section all along its length. A **pyramid** is a solid object that has a base and three or more triangular faces that meet at a point above the base. *A square prism and a rectangular prism are made up of three pyramids of equal volume.*

The volume of a prism is V = Bh,
where B is the *area of the base* (possible base formulas are listed below) and h is the height of the prism (distance from base to base).



Thus if I told you the volume of the above cube (a square prism) is 51 m^3, what would you tell me is the volume of one of the pyramids that make up the cube? 17 m^3 51/3 = 17

Find the following using the same logic:

1. Volume of square prism = 126 in^3 Volume of pyramid = 42 in^3
2. Volume of square prism = 216 ft^3 Volume of pyramid = 72 ft^3
3. Volume of square prism = 87 m^3 Volume of pyramid = 29m^3

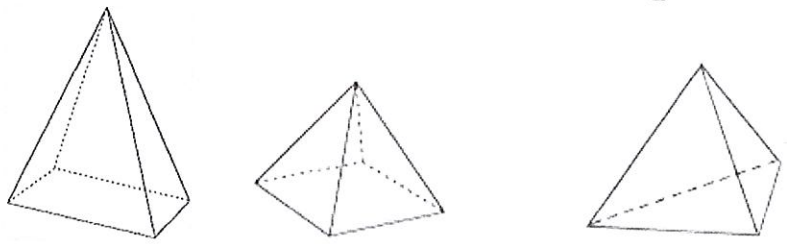
Using the information given above and our calculations, we can conclude that the volume of a pyramid is:

Volume of a Pyramid* = $\frac{1}{3}Bh$ or $\frac{Bh}{3}$

*Considering that a pyramid can have multiple bases, whatever shape the base is you will replace B with the formula for that shape.

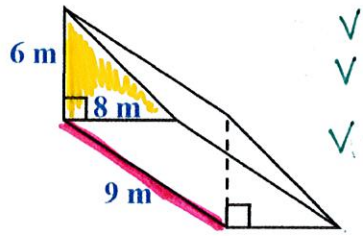
Possible Base Formulas

Rectangle/Square: $A = lw$ **Triangle:** $A = \frac{bh}{2}$ or $\frac{1}{2}bh$



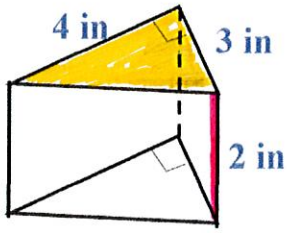
Practice: Find the volume of the following prisms and pyramids.

1) V = 216 m³



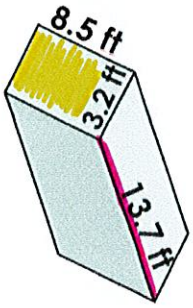
Base = triangle
B = 1/2 Bh | V = Bh
V = 1/2 Bh(h)
V = 1/2(8)(6)·(9)
V = 216 m³

2) V = 12 in³



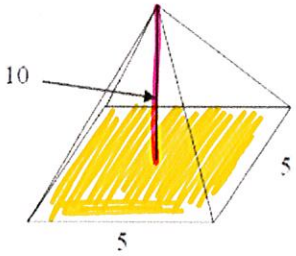
Base = triangle
B = 1/2 Bh | V = Bh
V = 1/2 Bh(h)
V = 1/2(3)(4)·(2)
V = 12 in³

3) V = 372.64 ft³



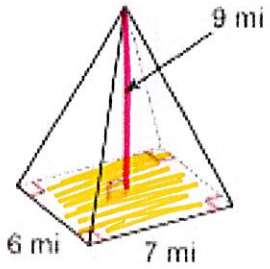
Base = Rectangle
B = l·w | V = Bh
V = l·w·(h)
V = 8.5·3.2·(13.7)
V = 372.64 ft³

4) V = 83.33 units³



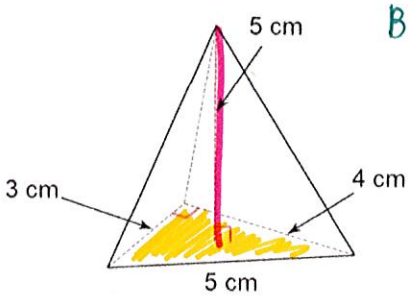
Base = square
B = l·w | V = Bh/3
V = l·w·(h)/3
V = 5·5·(10)/3
V = 83.33 units³

5) V = 126 mi³



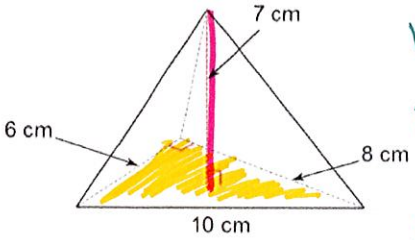
Base = rectangle
B = l·w | V = Bh/3
V = l·w·(h)/3
V = 6·7·(9)/3
V = 126 mi³

6) V = 10 cm³



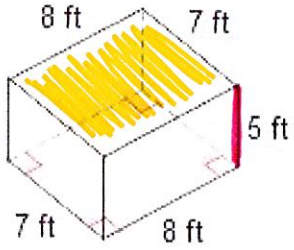
Base = triangle
B = 1/2 Bh | V = Bh/3
V = 1/2 Bh·(h)/3
V = 1/2(3)(4)·(5)/3
V = 10 cm³

7) V = 56 cm³



Base = triangle
B = 1/2 Bh | V = Bh/3
V = 1/2 Bh·(h)/3
V = 1/2(6)(8)·(7)/3
V = 56 cm³

8) V = 280 ft³



Base = Rectangle
B = l·w | V = Bh
V = l·w·(h)
V = 8·7·(5)
V = 280 ft³