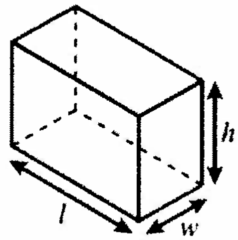
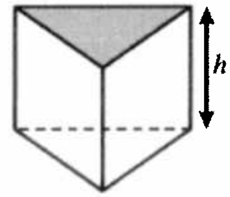
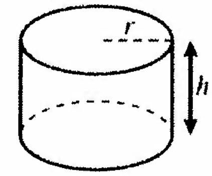
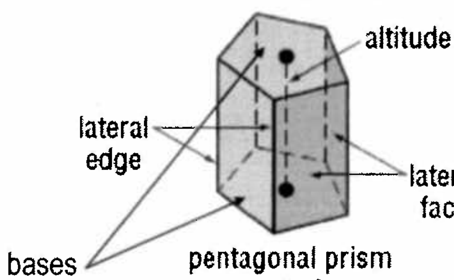
12-2 & 12-4 Surface Area & Volume of Prisms & Cylinders

Master Ee

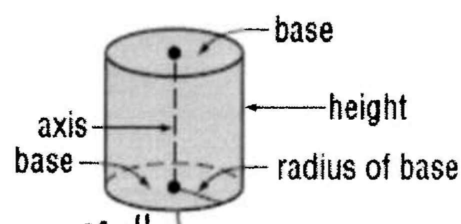
RECTANGULAR PRISM	ANY TYPE OF PRISM	CYLINDER
 $V = lwh$ $S.A. = 2lw + 2lh + 2wh$	 $V = Bh$ $L.A. = hp$ $S.A. = L.A. + 2B$	 $V = \pi r^2 h$ $L.A. = 2\pi rh$ $S.A. = 2\pi r^2 + 2\pi rh$
l = prism's base length **w** = prism's base width **h** = prism's height	**p** = Base's Perimeter **B** = Base's Area **h** = prism's height	**r** = radius of the Base **h** = prism's height
Lateral Area – sum of areas of all lateral faces	**Surface Area** - the total of the areas of all faces	**Volume** - the number of cubic units in the interior

Parts of a Prism:



- Polyhedron with 2 parallel and ≅ bases.
- It is named by the shape of its base.
- Right – each lateral edge is ⊥ to both bases.
- Oblique – lateral edge is not ⊥ to both bases.

Parts of a cylinder:



- A solid with 2 parallel and ≅ circular bases.
- Height - ⊥ distance between the bases.
- The height is equal to the axis of rotation.
- Oblique – axis is not ⊥ to both bases.

***Edge** – segment formed by intersecting faces.

***Lateral Faces** – faces that connect the bases.

***Lateral Edges** – intersection of lateral faces.

***Vertices** – intersection of 3 or more faces.

***Base Edges** – intersection of lateral face and base

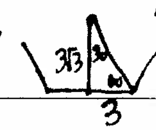
***Total Faces** – lateral faces + the 2 bases.

***Total Edges** – Sum of lateral & base edges

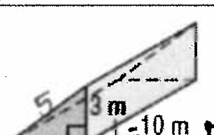
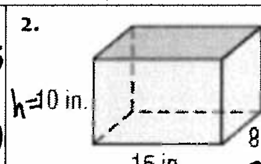
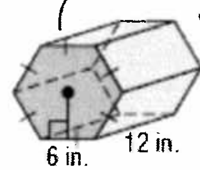
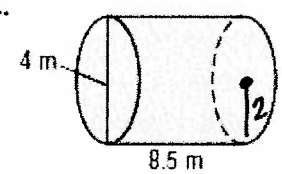
Height - ⊥ distance between the bases.

** Pertains only to a Prism, not a Cylinder*

B= 6A = 6(½·6·3√3) 93.5



1-4: Find the Lateral Area, Surface Area, and Volume of each.

1.	2.	3.	4.
 P=3+4+5 =12 B=½(4)(3) =6	 P=30 +16 = 46 B=15·8	 P=6·6 =36	
LA: $10 \cdot 12 = 120 m^2$	**LA:** $10(46) = 460 in^2$ 120	**LA:** $12(36) = 432 in^2$	**LA:** $2\pi(2)(8.5) = 106.8 m^2$
SA: $120 + 2(6) = 132 m^2$	**SA:** $460 + 2(120) = 700 in^2$	**SA:** $432 + 2(93.5) = 619 in^2$	**SA:** $2\pi(2)^2 + 2\pi(2)(8.5) = 131.9 m^2$
V: $6 \cdot 10 = 60 m^3$	**V:** $120 \cdot 10 = 1200 in^3$	**V:** $93.5(12) = 1122 in^3$	**V:** $\pi(2)^2(8.5) = 106.8 m^3$

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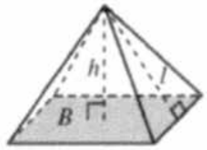
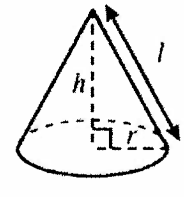
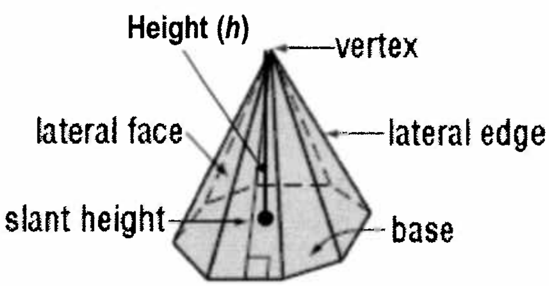
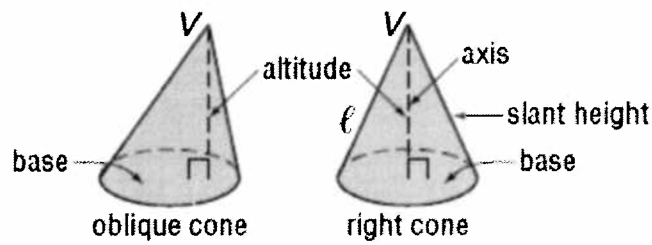
12-3 & 12-5 Surface Area & Volume of Pyramids & Cones

PYRAMID	CONE
 $V = \frac{1}{3}Bh$ $L.A. = \frac{1}{2}lp$ $S.A. = \frac{1}{2}lp + B$	 $V = \frac{1}{3}\pi r^2 h$ $L.A. = \pi r l$ $S.A. = \pi r^2 + \pi r l$
p – Perimeter of the base ***l*** – slant height (height of the lateral face) ***h*** – Height of the pyramid **B** - Base area	**r** – radius of the circular base ***l*** – slant height ***h*** – height of the cone

Parts of a Pyramid:



Parts of a Cone:



Polyhedron - the base is a polygon.

Regular Pyramid - the base is regular (≅∡s & sides)

A pyramid is named by its base.

Lateral Faces – will all be isosceles triangles.

Total Edges – Sum of lateral & base edges

The difference between the cone & the pyramid is:

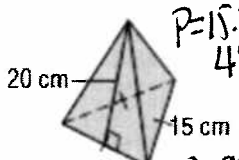
The base is always a circle!

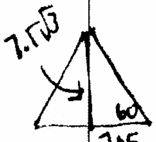
Height - ⊥ distance between the base and vertex.

Slant Height - the height of the lateral face.

1-4: Find the Lateral Area, Surface Area, and Volume of each.

1.





P=15.3
45

$B = \frac{1}{2}(15)(7.5\sqrt{3}) = 97.4$

LA: $\frac{1}{2}(20)(45) = 450\text{ cm}^2$

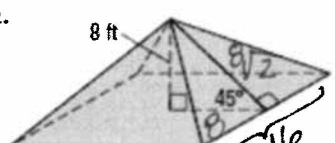
SA: $450 + 97.4 = 547.4\text{ cm}^2$

V: $\frac{1}{3} \cdot 97.4 \cdot 18.5$ = 600.6 cm^3

$7.5^2 + h^2 = 20^2$

$h = \sqrt{343.75} = 18.5$

2.



$P = 16 \cdot 4 = 64$

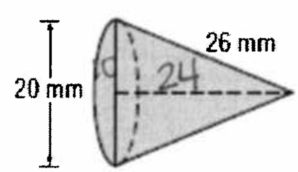
$B = 16 \cdot 16 = 256$

LA: $\frac{1}{2}(8\sqrt{2})(64) = 362.0\text{ ft}^2$

SA: $362.0 + 256 = 618.0\text{ ft}^2$

V: $\frac{1}{3}(256)(8) = 682.7\text{ ft}^3$

3.

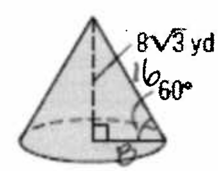


LA: $\pi(10)(26) = 816.8\text{ mm}^2$

SA: $\pi(10)^2 + 816.8 = 1131.0\text{ mm}^2$

V: $\frac{1}{3}\pi(10)^2(24) = 2513.3\text{ mm}^3$

4.



LA: $\pi(8)(16) = 402.1\text{ yd}^2$

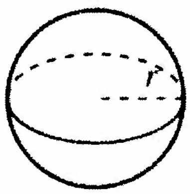
SA: $402.1 + 64\pi = 603.2\text{ yd}^2$

V: $\frac{1}{3}\pi(8)^2(8\sqrt{3}) = 928.7\text{ yd}^3$

12-6 Surface Area & Volume of Spheres

Master ≡

SPHERE FORMULAS:

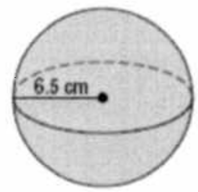


$$V = \frac{4}{3}\pi r^3$$

$$S.A. = 4\pi r^2$$

Find the Surface Area & Volume of each sphere.

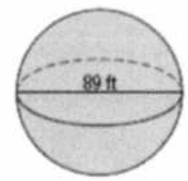
1.



S.A. = $4\pi(6.5)^2 = 530.9\text{ cm}^2$

V = $\frac{4}{3}\pi(6.5)^3 = 1150.3\text{ cm}^3$

2.

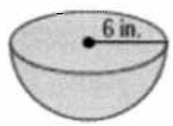


$r = 44.5$

S.A. = $4\pi(44.5)^2 = 24{,}884.6\text{ ft}^2$

V = $\frac{4}{3}\pi(44.5)^3 = 369{,}120.9\text{ ft}^3$

3. Find the Surface Area ~~or~~ AND Volume of the hemisphere.



$SA = \frac{4\pi(6)^2}{2} = 226.2\text{ in}^2$

$V = \frac{\frac{4}{3}\pi(6)^3}{2} = \boxed{452.4\text{ in}^3}$

4. Find the radius of a sphere if the surface area of a hemisphere is 92π cm².

$\frac{4\pi r^2}{2} = 92\pi$

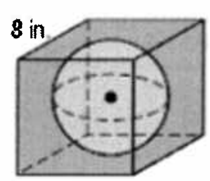
$2\pi r^2 = 92\pi$

$r^2 = \frac{92\pi}{2\pi}$

$r^2 = 46$

$r = \sqrt{46} = \boxed{6.8\text{ cm}}$

5. The sphere is tangent to the sides of the cube. Find the empty space not taken up by the sphere.



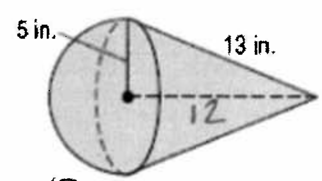
BOX − SPHERE

$8^3 - \frac{4}{3}\pi(4)^3$

$512 - 268.1$

$\boxed{243.9\text{ in}^3}$

6. Find the volume of the shape below.



HEMISPHERE + CONE

$\frac{\frac{4}{3}\pi(5)^3}{2} + \frac{1}{3}\pi(5)^2(12)$

$261.8 + 314.2$

$\boxed{576.0\text{ in}^3}$

Master

12-8 Congruent & Similar Solids

If two similar solids have a scale factor of a : b or $\frac{a}{b}$, then the following will always be true:

- The ratio of their perimeters or any part(s) of the solid will be = a : b or $\frac{a}{b}$
- The ratio of their surface areas will be: a^2 : b^2 or $\frac{a^2}{b^2}$
- The ratio of their volumes will be: a^3 : b^3 or $\frac{a^3}{b^3}$

1-4: For each pair of similar figures below, do the following:

A. Find the scale factor B. Find the ratio of their surface areas C. Find the ratio of their volumes

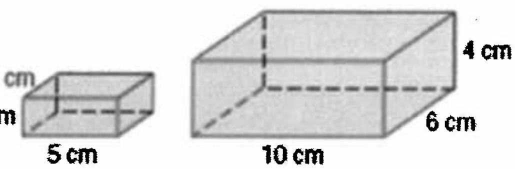
1.

A. 1:2

B. 1:4 $(1^2:2^2)$

C. 1:8 $(1^3:2^3)$

$\frac{2}{4} = \frac{3}{6} = \frac{5}{10} = \frac{1}{2}$

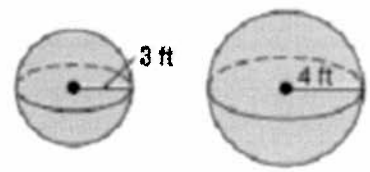


2.

A. 3:4

B. 9:16 $(3^2:4^2)$

C. 27:64 $(3^3:4^3)$



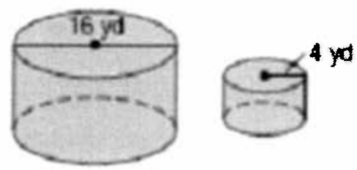
3.

A. 2:1

B. 4:1 $(2^2:1^2)$

C. 8:1 $(2^3:1^3)$

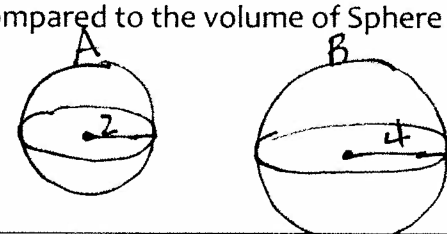
8:4
= 2:1



4. ***SOL Question:*** The radius of Sphere A is 2 inches and the radius of Sphere B is 4 inches. How many times larger is the volume of Sphere B compared to the volume of Sphere A?

A. 2
B. 3
C. 4
D. 8

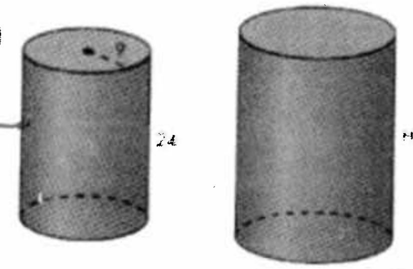
It's 8x bigger!



SF = 2:4
= 1:2
VOL = 1:8

5. If the 2 right cylinders shown are similar and the volume of the larger cylinder is 4608 ft³, find the height of the larger cylinder

$V = \pi(9)^2(24)$
$= 1944\pi$



V=4608π

$\left(\frac{24}{H}\right)^3 = \frac{1944\pi}{4608\pi}$

$\frac{13824}{H^3} = \frac{1944}{4608} \Rightarrow 1944H^3 = 63700992$

$H^3 = 32768$

$(H^3)^{\frac{1}{3}} = (32768)^{\frac{1}{3}}$

$H = 32$