Geometry 3D-presentation 2

Surface Area and Volume: Pyramids and Cones, Spheres

Worksheets posted on Edmodo

+ 6 worksheets on my-imaths (see last slide)

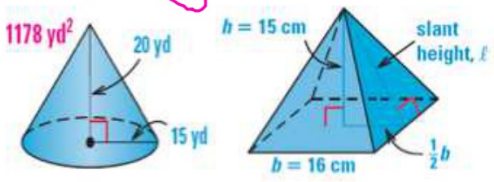
Surface Area and Volume

Pyramids

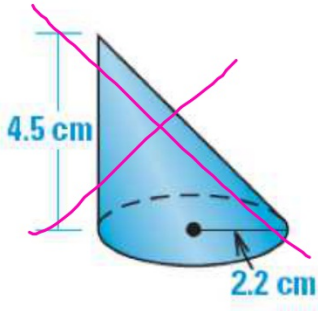
Cones

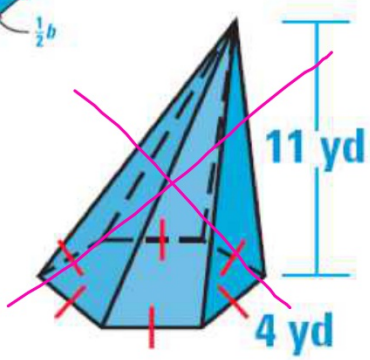
Spheres

Right



b.

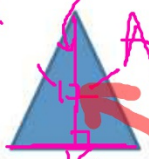




Pyramids: Square base

Surface area:

$A_{\square} = s^2$



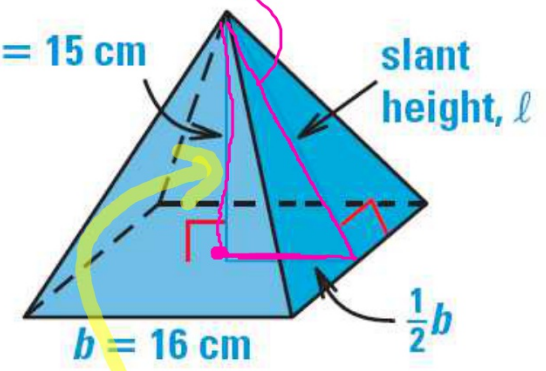
$A_{\triangle} = \frac{b \times h}{2}$

- Square + 4 Isosceles Triangles

$(16^2) + 4\left(\frac{16 \times 17}{2}\right)$

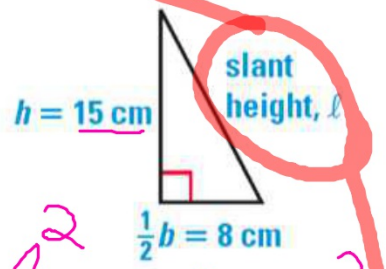
S.A. $= 256 + 4(136)$

S.A. $= 800\ cm^2$



Volume: $= \frac{1}{3} B \times h$ or $\frac{B \times h}{3}$

$= \frac{1}{3} \times 256 \times 15$



$\ell^2 = 15^2 + 8^2$

$\ell = \sqrt{15^2 + 8^2} = 17$ cm

Cones

- Surface Area:

1 circle + 1 lateral area (PACMAN)

BASE

$\pi r^2 + \pi r \ell$

S.A. $= \pi(15)^2 + \pi(15)(25)$

- Volume:

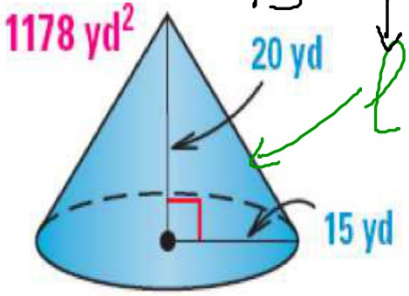
$V = \frac{1}{3}(\text{Base})h$

$V = \frac{1}{3}(\pi 15^2)(20)$

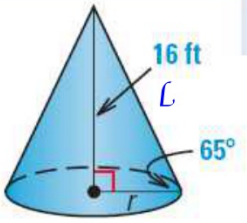
$V = 1500\pi\ yd^3$

$\ell = \sqrt{20^2 + 15^2}$

$\ell = 25$



Examples 1 & 2



Solve for r and slanted height ℓ first: use SOH CAH TOA:

$\tan(65^\circ) = \frac{16}{r}$

$r = \frac{16}{\tan(65^\circ)}$

$r = 7.46\text{ft}$

$\sin(65^\circ) = \frac{16}{\ell}$

$\ell = \frac{16}{\sin(65^\circ)}$

$\ell = 17.65$

Now solve for the Surface Area:

BASE = πr^2 + Lateral Area = $\pi r \ell$

$SA = \pi (7.46) + \pi (7.46)(17.65)$

$SA = 437.09\ ft^2$

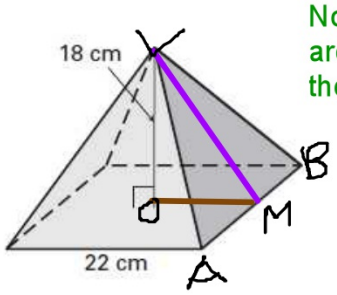
Solve for Volume:
(1/3) BASE X Height

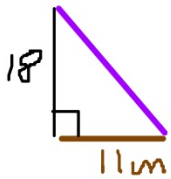
$$\text{Volume} = \tfrac{1}{3}\left[\pi \bullet 7.46^2\right]\left[16\right]$$

$$\text{Volume} = 932.45\,\text{ft}^3$$

AREA of the BASE = 22 X 22 = 484 cm^3

Now the area of the lateral faces. These are isosceles Δs , for that we need to find the slanted height (purple segment VM)

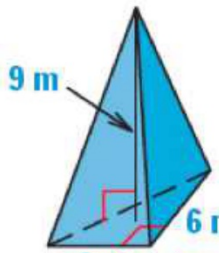




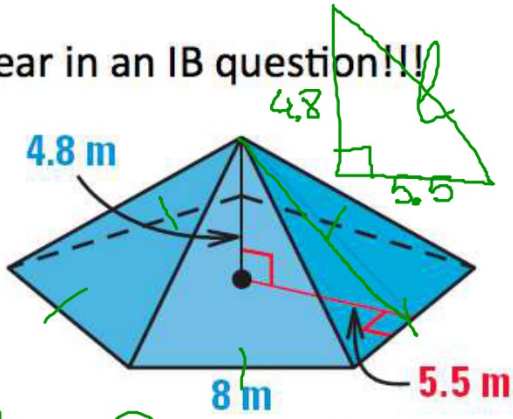
$VM^2 = 11^2 + 18^2$

Other pyramids: unlikely to appear in an IB question!!!

a.

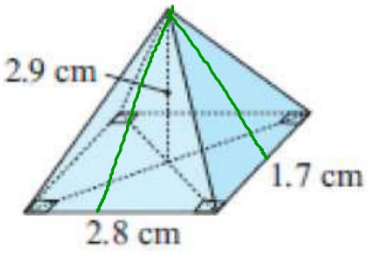


Base = $\frac{b \times h}{2} = \frac{4 \times 6}{2} = 12\ m^2$



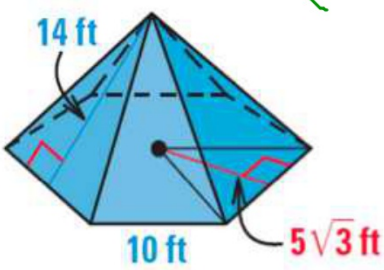
Base = 5 Δ

$= 5\left(\frac{5.5 \times 8}{2}\right)$



Base = 2.8×1.7

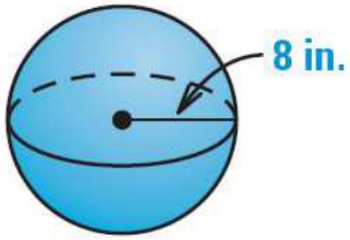
$=$



Sphere

- **Surface Area:**

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



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

Example 13

In Exercises 24–26, use the following information. $r = 0.68$ in

Golf Balls A standard golf ball has a diameter of 1.68 inches. Golf balls are often sold in a box of four. Assume that the balls are packed tightly so that they touch the lateral sides and the bases of the box.

24. What is the surface area of a golf ball?

$SA = 4\pi r^2$

$SA = 4\pi(0.84)^2$

$SA = 8.866831105\,\text{in}^2$

$SA = 8.87\ \text{in}^2$

25. What is the volume of a golf ball?

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

$V = \frac{4}{3}\pi(0.84)^3$

$V = 2.48271271$

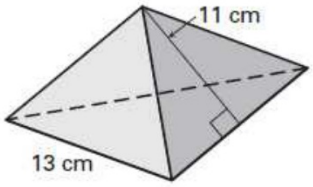
$V = 2.48\,\text{in}^3$

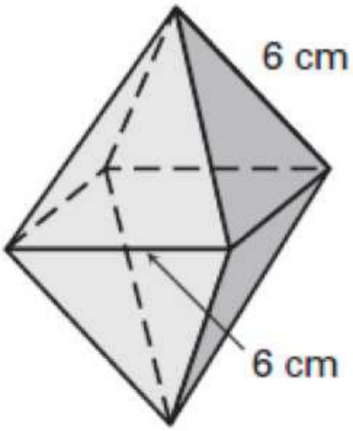
26. What is the amount of volume inside the box that is not taken up by the golf balls?

Because the 4 balls are packed tightly, we know the dimensions of the box:
Height = 1 diameter (1.68) ; width = 2 diameters (2x1.68); lenght = 2 diameters (2x1.68)

$V = V_{box} - V_{balls} = (2 \cdot 1.68)(2 \cdot 1.68)(1.68) - (4 \cdot 2.48) = 9.047\text{in}^3$

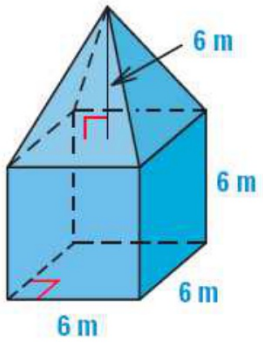
Example 3 & 4 (composite shapes)





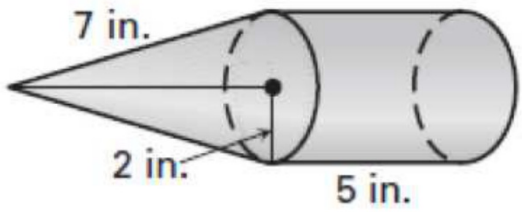
Example 5

- Typical: the house

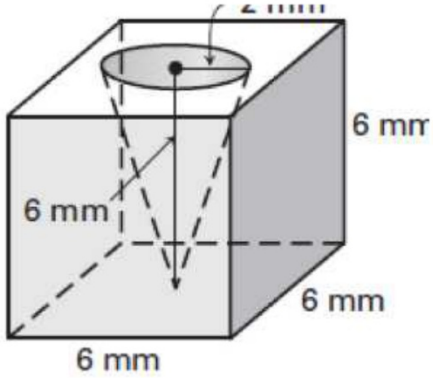


Example 6

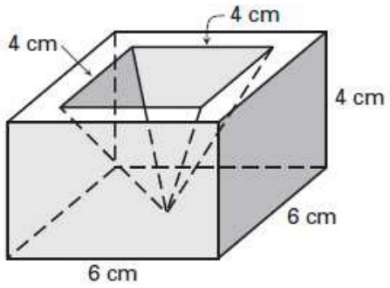
Example 7



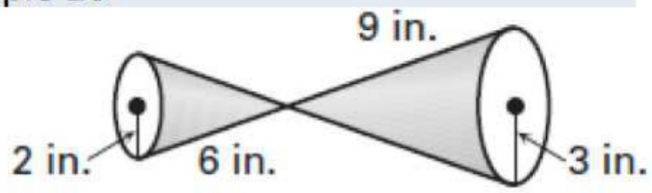
Example 8



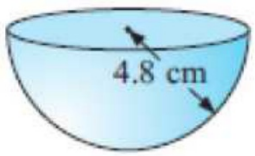
Example 9

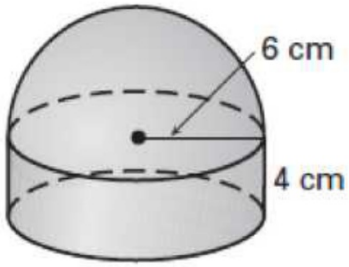


Example 10

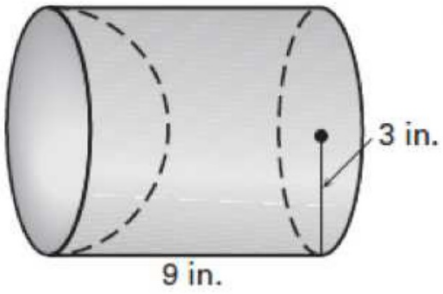


Examples 11 & 12

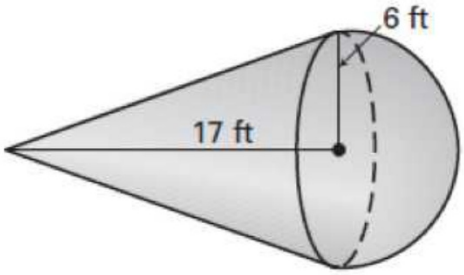




Example 13



Example 14



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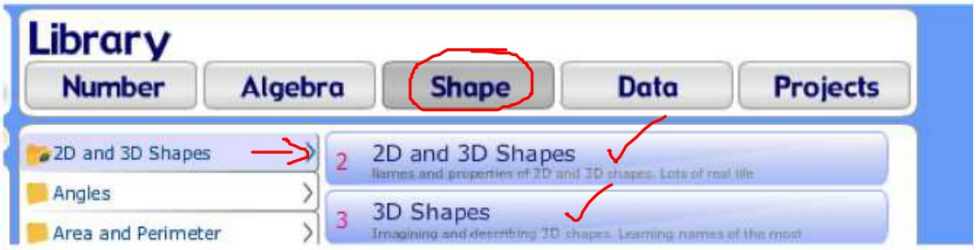

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