

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

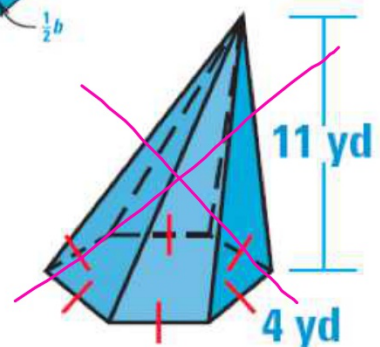
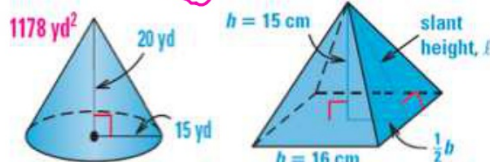
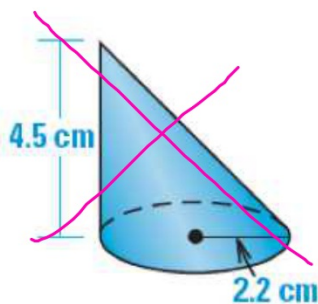
Pyramids

Cones

Spheres

Right

b.

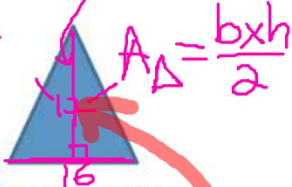


Pyramids: Square base

Surface area:



$$A_{\square} = s^2$$



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

• Square + 4 Isosceles Triangles

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

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

$$S.A. = 800 \text{ cm}^2$$

Volume:

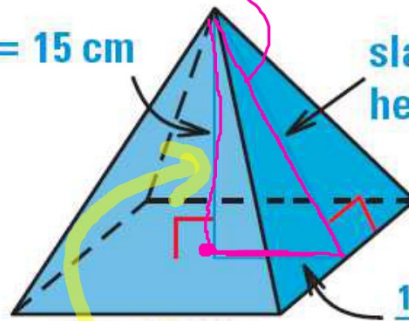
$$= \frac{1}{3} B \times h \text{ or } \frac{B \times h}{3}$$

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

$h = 15 \text{ cm}$

$b = 16 \text{ cm}$

slant height, l



$\frac{1}{2}b$

$h = 15 \text{ cm}$

$\frac{1}{2}b = 8 \text{ cm}$

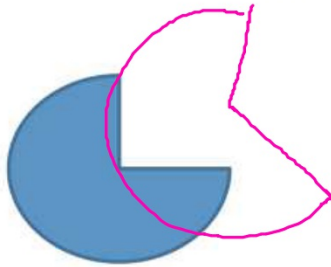
slant height, l

$$l^2 = 15^2 + 8^2$$

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

Cones

• Surface Area:



1 circle + 1 lateral area (PACMAN)

$$\pi r^2 + \pi r l$$

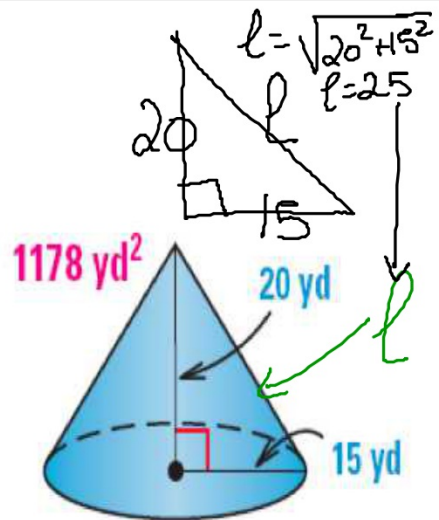
$$S.A. = \pi(15)^2 + \pi(15)(25)$$

• Volume:

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

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

$$V = 1500 \pi \text{ yd}^3$$



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

$$l = 25$$

1178 yd^2

20 yd

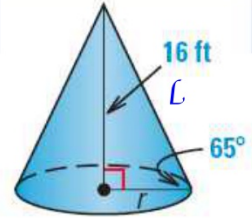
15 yd

Examples 1 & 2

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

$$\begin{aligned}\tan(65^\circ) &= \frac{16}{r} \\ r &= \frac{16}{\tan(65^\circ)} \\ r &= 7.46\text{ft}\end{aligned}$$

$$\begin{aligned}\sin(65^\circ) &= \frac{16}{l} \\ l &= \frac{16}{\sin(65^\circ)} \\ l &= 17.65\end{aligned}$$



Now solve for the Surface Area:

$$\text{BASE} = \pi r^2 + \text{Lateral Area} = \pi r l$$

$$SA = \pi (7.46)^2 + \pi (7.46) (17.65)$$

$$SA = 437.09 \text{ ft}^2$$

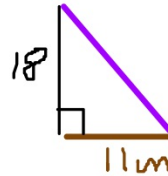
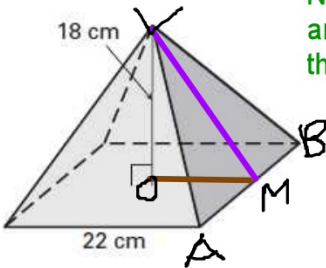
Solve for Volume:
(1/3) BASE X Height

$$\text{Volume} = \frac{1}{3} [\pi \cdot 7.46^2] [16]$$

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

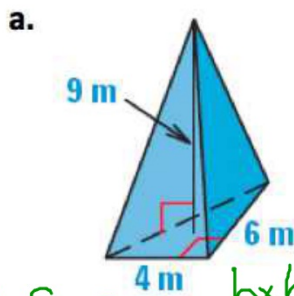
$$\text{AREA of the BASE} = 22 \times 22 = 484 \text{ cm}^2$$

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

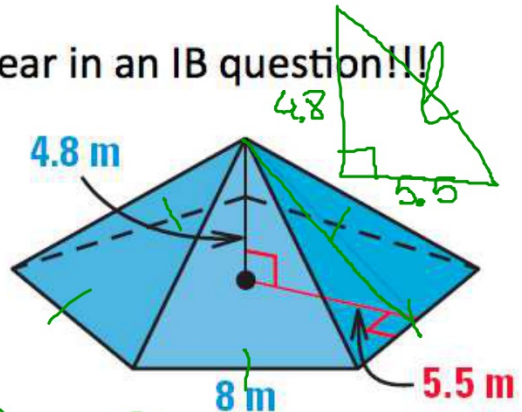


$$VM^2 = 11^2 + 18^2$$

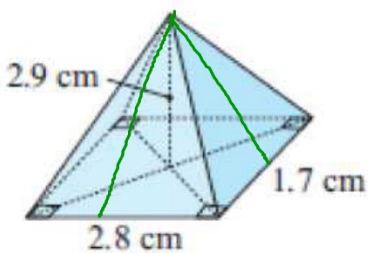
Other pyramids: unlikely to appear in an IB question!!!



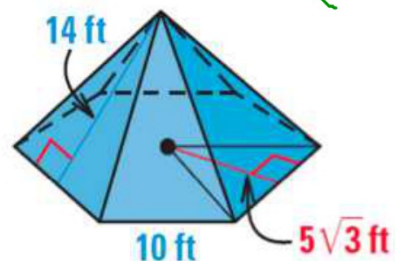
$$\text{Base} = \frac{b \times h}{2} = \frac{4 \times 6}{2} = 12 \text{ m}^2$$



$$\begin{aligned}\text{Base} &= 5 \Delta \\ &= 5 \left(\frac{5.5 \times 8}{2} \right)\end{aligned}$$



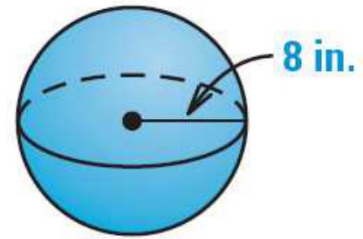
$$\begin{aligned}\text{Base} &= 2.8 \times 1.7 \\ &= \end{aligned}$$



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.

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.

$\rightarrow r = 0.84 \text{ in}$



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?

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

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

$$V = 2.48271271$$

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

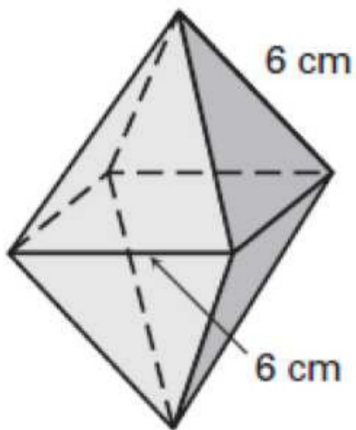
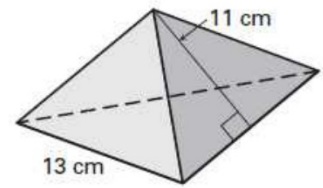
26. What is the amount of volume inside the box that is not taken up by the golf balls?

Because the 4 balls are packed tightly, we know the dimensions of the box:

Height = 1 diameter (1.68) ; width = 2 diameters (2x1.68); length = 2 diameters (2x1.68)

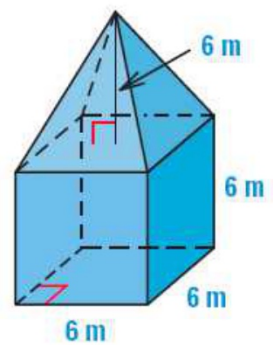
$$V = V_{\text{box}} - V_{\text{balls}} = (2 \cdot 1.68)(2 \cdot 1.68)(1.68) - (4 \cdot 2.48) = 9.047 \text{ in}^3$$

Example 3 & 4 (composite shapes)



Example 5

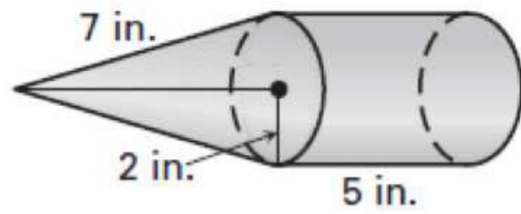
- Typical: the house



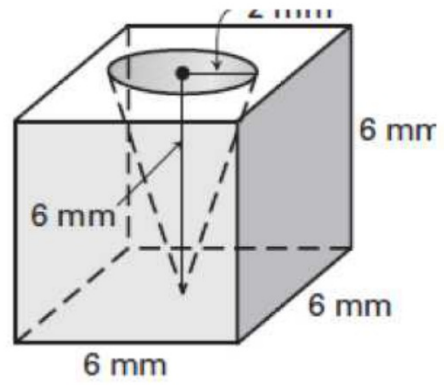
Example 6



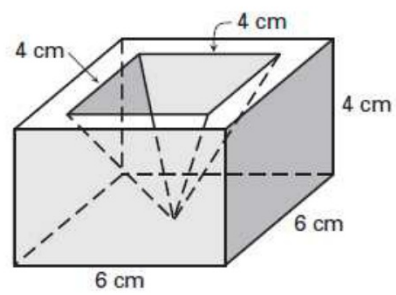
Example 7



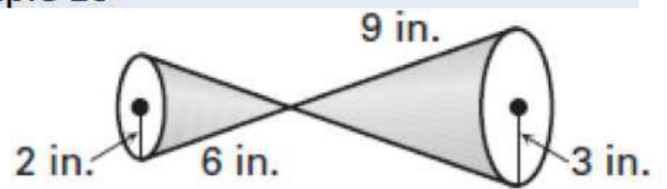
Example 8



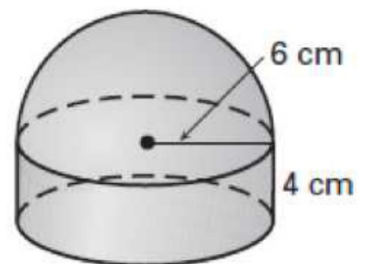
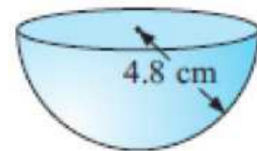
Example 9



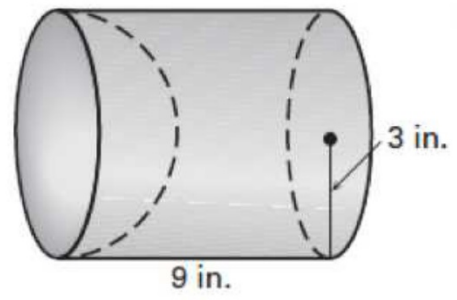
Example 10



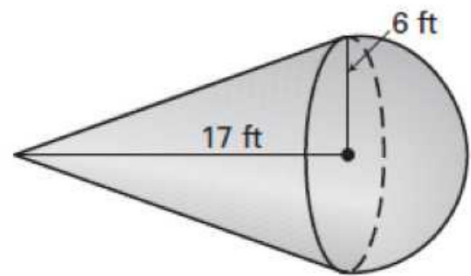
Examples 11 & 12



Example 13



Example 14



Go to Library → Shape →

Library

Number Algebra **Shape** Data Projects

- 2D and 3D Shapes
- Angles
- Area and Perimeter

2 2D and 3D Shapes
Names and properties of 2D and 3D shapes. Lots of real life

3 3D Shapes
Imagining and describing 3D shapes. Learning names of the most

Go to Booster Packs → Ds to Cs

Booster Packs

Three Boosters Four Boosters Six Boosters

Ds to Cs Cs 2 Bs A 2 A Star

- Arithmetic
- Numbers and Powers
- Decimals
- Fractions
- Frac Dec Perc
- Ratio
- Expressions
- Sequences, Formulae
- Equations
- Coordinates, Graphs
- Angles
- Transformations
- Area and Perimeter
- Volume and 3D Shapes**
- Measures

6 Cuboids
This introduction to volume gets you counting cubes and working

7 Prisms
Prisms come in all shapes and sizes. This lesson shows you a way

7 Cylinders
The volume of a cylinder has a lot to do with areas of circles. This

6 Nets, Surface Area
Animations showing cubes, cuboids, cylinders and triangular prisms

Revise Volume and 3D Shapes **Revision Lesson**
Get some more help with Volume and 3D Shapes

Volume and 3D Shapes - OW **Online Worksheet**
4 Pages of Questions to test your skills. Good Luck