12.5 Volume of Pyramids and Cones

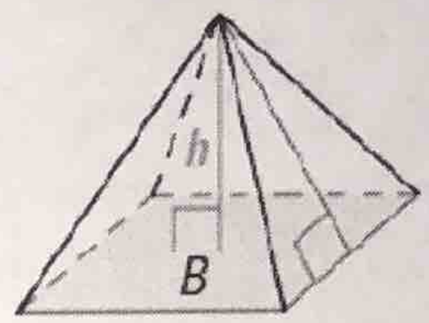
THEOREMS *For Your Notebook*

THEOREM 12.9 Volume of a Pyramid

The volume V of a pyramid is

$$V = \frac{1}{3}Bh,$$

where B is the area of the base and h is the height.



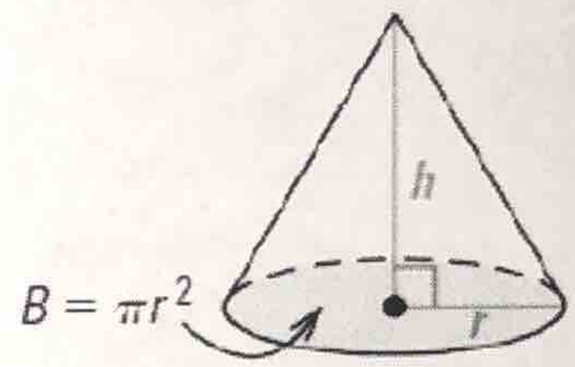
$V = \frac{1}{3}Bh$

THEOREM 12.10 Volume of a Cone

The volume V of a cone is

$$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h,$$

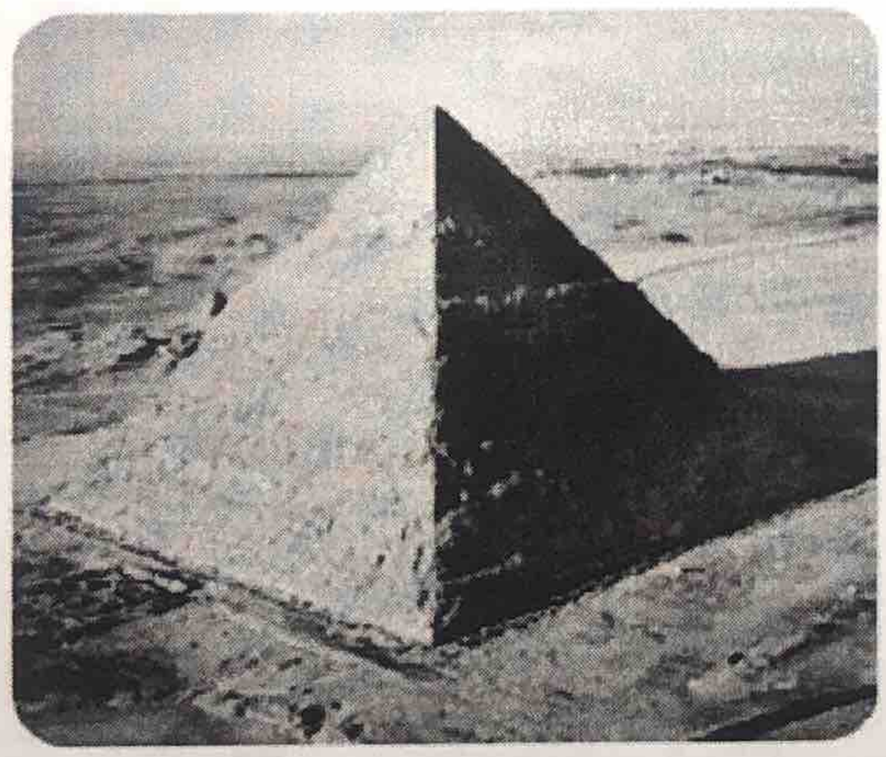
where B is the area of the base, h is the height, and r is the radius of the base.



$B = \pi r^2$

$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h$

Ex 1: Originally the pyramid had height 144 meters and volume 2,226,450 cubic meters. Find the side length of the square base.



Khafre's Pyramid, Egypt

$V = \frac{1}{3}Bh$

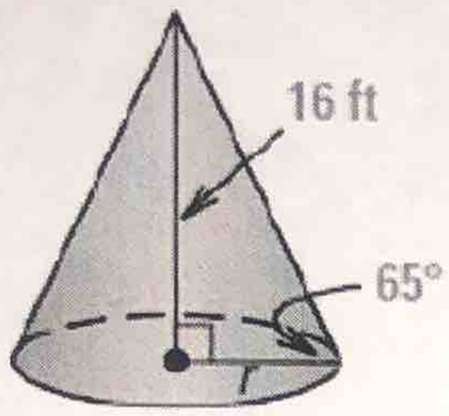
$2{,}226{,}450 = \frac{1}{3}(x^2)(144)$

$6{,}679{,}350 = 144x^2$

$x^2 \approx 46{,}384$

$\boxed{x \approx 215\text{ m}}$

Ex 2: Find the volume of the right cone.



$\tan(65°) = \frac{opp}{adj}$

$\tan(65°) = \frac{16}{r}$

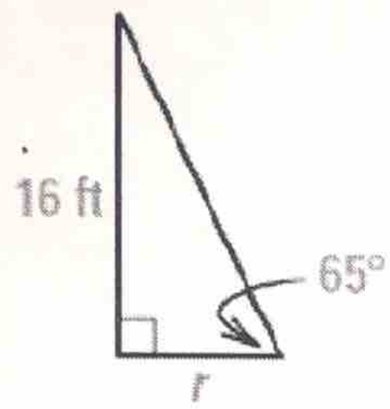
$r = \frac{16}{\tan(65°)}$

$r \approx 7.46$

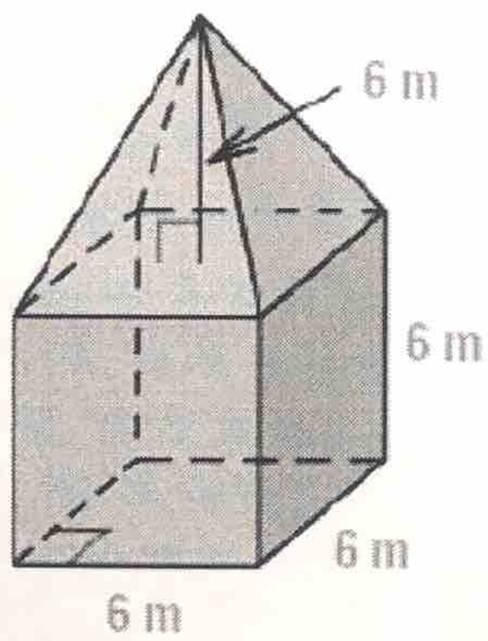
$V = \frac{1}{3}(\pi r^2)h$

$V \approx \frac{1}{3}\pi(7.46)^2(16)$

$\boxed{V \approx 932.45 \text{ ft}^3}$



Ex 3: Find the volume of the solid shown.



Total Volume = Volume cube + Volume Pyramid

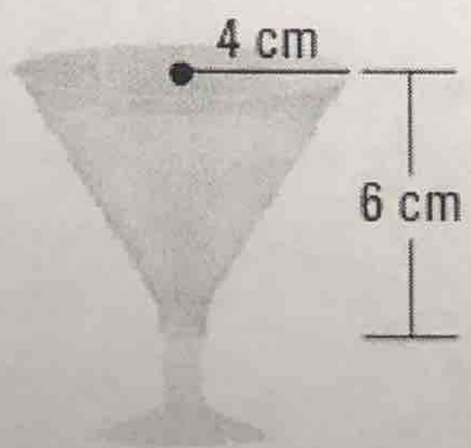
$V = s^3 + \frac{1}{3}Bh$

$V = (6)^3 + \frac{1}{3}(6)^2(6)$

$V = 216 + 72$

$\boxed{V = 288 \text{ m}^3}$

Ex 4: It takes 2.8 seconds for the sand to empty out of the funnel shown. Find the flow rate of the sand in milliliters per second (1 mL = 1 cm³)



$V = \frac{1}{3}(\pi r^2)h$

$V = \frac{1}{3}\pi(4)^2(6)$

$V \approx 101 \text{ cm}^3$

$V \approx 101 \text{ mL}$

flow rate $= \frac{101 \text{ mL}}{2.8 \text{ s}}$

$\boxed{\text{rate} \approx 36.07 \text{ mL/s}}$