
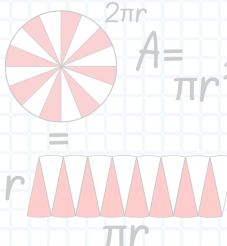
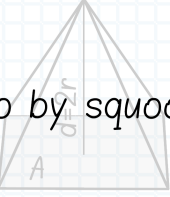
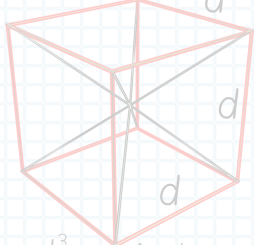


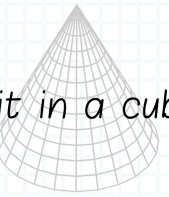
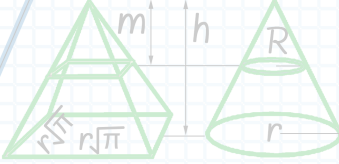
Name: *Magical Graph Paper* for Squoosh Sum Slice "SSS" Volume Lab (Common Core 8.G.C.9)

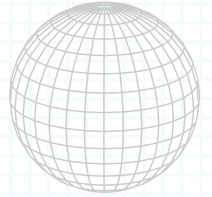

**PROVE BY SQUOOSHING!**  
Empirically find out each volume ratio by squooshing to fit in a cube.

**CUBE**  
 $H=2r$   
 $L=W=H=d$   
 $A=L \times W=2r \times 2r$   
 $V_1=A \times h=L \times W \times h=2r \times 2r \times 2r$   
 $V_2=A \times 2h=8 \times V_1$   
 $V_3=A \times 3h=27 \times V_1=3^3 \times V_1$   
 $V_n=A_n \times n \times h=n \times V_1$   
 $H=n \times h$   
 $V=A \times H$   
 $V=L \times W \times H=d^3=8r^3$

**CYLINDER**  
  
 $A=\pi r^2$   
  
 $V_2=A \times 2h=2 \times V_1$   
 $V_n=A \times n \times h=n \times V_1$   
 $H=n \times h$   
 $V=A \times H$   
 $V=\pi r^2 \times H=2\pi r^2$

**PYRAMID**  
  
 $d=2r$   
  
 $q=1/3$  3 full sized pyramids fit in 1 cube  
 $V=\frac{1}{3} A \times H=\frac{d^3}{3}=\frac{8}{3} r^3$   
 side length =  $d$

**CONE**  
  
 radius =  $r$   
  
 $L=\frac{m}{h}(r\sqrt{\pi})$   $R=\frac{m}{h}r$   
 Cavalieri's Principle  
 each pyramid slice = each cone slice therefore, the volumes are equal  
 A pyramid with base area  $A$  defined by:  $A=(r\sqrt{\pi})^2$   
 Derive the volume of a cone from the volume of a pyramid  
 $V=\frac{\pi r^2}{3} H=\frac{2}{3}\pi r^3$   
 Plug this base area into the volume of a pyramid  
 The base area of the cone is a circle:  $\pi r^2$

**SPHERE**  
  
 radius =  $r$   
  
 Unwrapped sphere begets surface area  
 $S=4\pi r^2$   
 A sphere can be broken into a bunch of unit pyramids of height  $r$   
 of volume:  $V_{unit}=\frac{1}{3}r$   
 Sum all those icicles over the surface:  
 $V=(\frac{1}{3}r)(4\pi r)^2$   
 $V=\frac{4}{3}\pi r^3$

After having the students examine this cheat sheet in the guise of magical graph paper ...

a mathematician's notebook beta  
**PLATOAR**

This is a page of magical graph paper from the iOS/Android app *PLATOAR: A Mathematician's Notebook*. Load up the current module and join your device here to operate with magic!

**Prove by summing.**

**Prove by slicing!**

Volume after taking delta H slice to 0.0001...

Scan to load the module! ->

