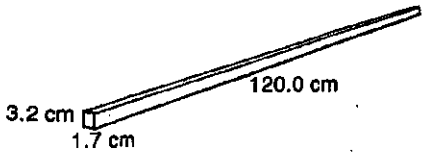
Geometry B Name KEY

Ch. 9 & 11 Review - Surface Area & Volume

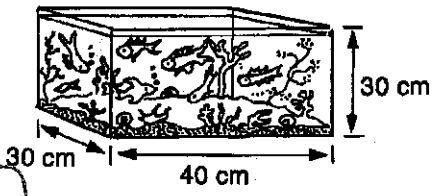
1. If 1 cm^3 of iron has a mass of 7.52 g, what is the mass of an iron bar of rectangular cross section with the dimensions shown?



$3.2 \cdot 1.7 \cdot 120 = 652.8 cm^3$

$\frac{652.8 cm^3}{1} \cdot \frac{7.52 g}{1 cm^3} = 4909.06 g$

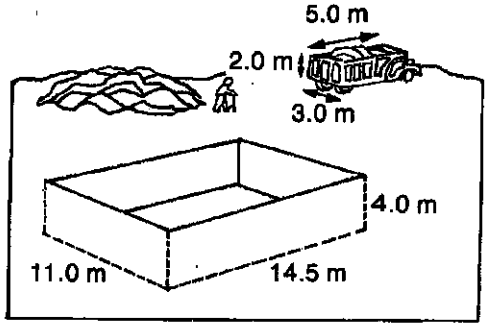
2. If one guppy requires 5 L of water to live happily, what is the maximum number of guppies that should be kept in this aquarium?



$Vol = 30 \cdot 40 \cdot 30 = 36000 cm^3$

$\frac{36000 cm^3}{5000 cm^3} = 7.2$ So 7 guppies

3. The excavation for a house and the trucks to carry away the material have the dimensions shown. About how many level truck loads are necessary to remove all the dirt?



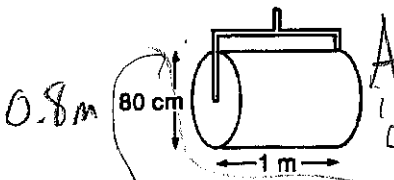
$V_{dirt} = 11 \cdot 14.5 \cdot 4 = 638 m^3$

$V_{Truck} = 2 \cdot 3 \cdot 5 = 30 m^3$

$\frac{638}{30} = 21.3$

So 22 truck loads

4. A lawn roller is 1 m wide and 80 cm high. What area is covered in each revolution?

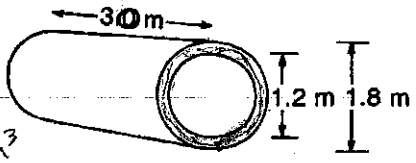


$A = 2\pi \cdot 40 \cdot 100 = 25132.74 cm^2$ in cm

100cm

$A = 2\pi \cdot 0.4 \cdot 1 = 2.51 m^2$ in m

5. A section of concrete pipe 30 m long has an inside diameter of 1.2 m and an outside diameter of 1.8 m. What is the volume of concrete in this section of pipe?



Using 30m

$V_{large} = \pi \cdot 0.9^2 \cdot 30 = 76.34 m^3$

$V_{small} = \pi \cdot 0.6^2 \cdot 30 = 33.93 m^3$

Using 3m

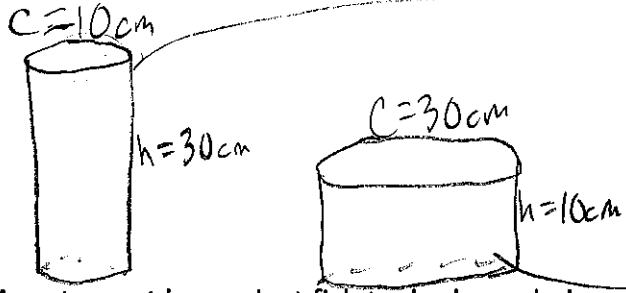
$V_{large} = 7.63 m^3$

$V_{small} = 3.39 m^3$

$V_{space} = 4.24 m^3$

$V_{space\ in\ between} = 76.34 - 33.93 = \boxed{42.41 m^3}$

6. A rectangular strip of aluminum, 30 cm long and 10 cm wide, is rolled into the form of a cylinder. Which would have the greater volume, a cylinder 10 cm high with circumference of 30 cm or a cylinder 30 cm high with circumference of 10 cm?



$10 = 2\pi r$, $r = 1.59 cm$

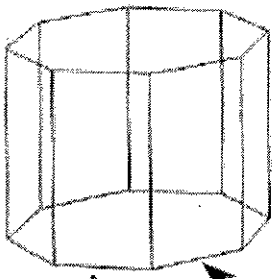
$V_{01} = \pi \cdot 1.59^2 \cdot 30 = 238.73 cm^3$

$30 = 2\pi r$, $r = 4.77$

$V_{01} = \pi \cdot 4.77^2 \cdot 10 = 716.2 cm^3$

Larger Volume.

7. A restaurant has a giant fish tank, shown below, in the shape of an octagonal prism.

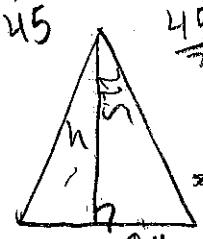


$\frac{360}{8} = 45$

$\frac{45}{2} = 22.5$ Using M.

$\tan(22.5) = \frac{0.4}{h}$

$h = 0.97 m$



$A_{base} = \frac{0.97 \cdot 0.8}{2} \cdot 8 = 3.104 m^2$

$V = 3.104 \cdot 2 = \boxed{6.21 m^3}$

Using cm

$\tan 22.5 = \frac{40}{h}$

$h = 96.57 cm$

$A_{base} = \frac{96.57 \cdot 80}{2} \cdot 8 = 30901.93 cm^2$

$Vol. = 30901.93 \cdot 200 = \boxed{6180386.72 cm^3}$

a. Find the volume and surface area of the fish tank if the base is a regular octagon with side length 0.8 m and the height of the prism is 2 m.

$SA = 0.8 \cdot 2 \cdot 8 + 3.104 \cdot 2$

$SA = \boxed{19.01 m^2}$

$SA = 80 \cdot 200 \cdot 8 + 30901.93 \cdot 2$

$SA = \boxed{189803.86 cm^2}$

b. What is the space (amount of water) each fish takes up if there are 208 fish in the tank?

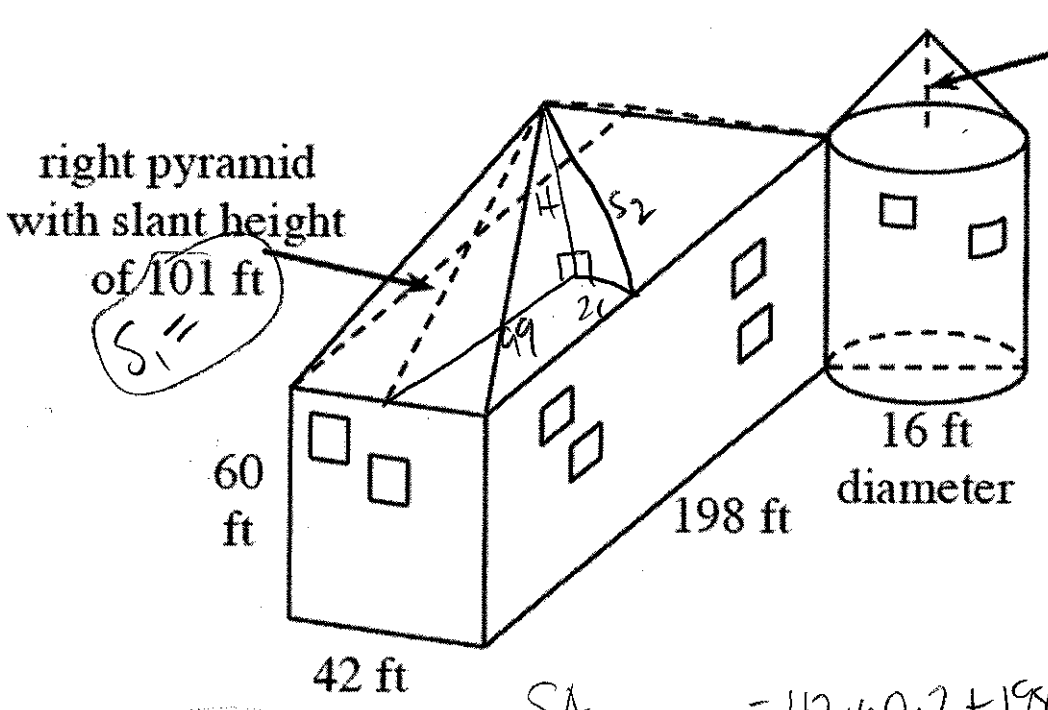
$\frac{6.21 m^3}{208}$

$= 0.0299 m^3$ each

$\frac{6180386.72 cm^3}{208}$

$= 29713.4 cm^3$ each

8. The Germany Historical Society has just acquired a castle on the Rhine River and wishes to turn it into a museum. But for it to be inviting to guests, they must heat the castle and place a new layer of plaster around the outside. If one commercial heater can heat about 16,000 cubic feet, how many heaters will the Society need to purchase? How many square feet of plaster will they need (ignoring the windows)? The Society has modeled the castle with the following diagram:



Ignore SA of cone!!

$H = \sqrt{101^2 - 99^2}$

$H = 20$ ft

$S_2 = \sqrt{21^2 + 20^2}$

$S_2 = 29$ ft

$SA_{rectprism} = 42 \cdot 60 \cdot 2 + 198 \cdot 60 \cdot 2$ (covered bases)

$= 28800 ft^2$

$SA_{rectpyramid} = \frac{101 \cdot 42}{2} \cdot 2 + \frac{198 \cdot 29}{2} \cdot 2$ (covered base)

$= 9984 ft^2$

$SA_{cylinder} = 2\pi \cdot 8 \cdot 60$ (w/o circles b/c covered)

$= 3015.93 ft^2$

★ Total plaster (SA) $= 41799.93 ft^2$ (w/o cone)

$V_{rect\ prism} = 60 \cdot 42 \cdot 198$

$= 498960 ft^3$

$V_{cylinder} = \pi \cdot 8^2 \cdot 60$

$= 12063.72 ft^3$

$V_{Heat} = 511023.72 ft^3$ / # of heaters $= \frac{511023.72 ft^3}{16000} = 31.9$, so 32 heaters ★

Each pair of figures is similar. Use the information given to find the zoom factor (lateral/side ratio) of the given figures.

8.

$V = 1080\pi$ in³

$V = 40\pi$ in³

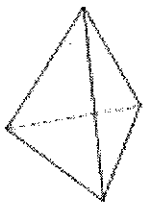
$V_{ratio} = \frac{1080\pi}{40\pi}$

$= 27$

Side ratio $= \sqrt[3]{27} = \boxed{3}$

9.

$V = 9216$ km³



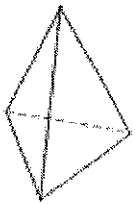
$V = 18000$ km³

$V_{ratio} = \frac{18000}{9216}$

$= \frac{125}{64}$

Side ratio $= \sqrt[3]{\frac{125}{64}} = \boxed{\frac{5}{4}}$ 1.25

10.



$SA = 1152$ mi²

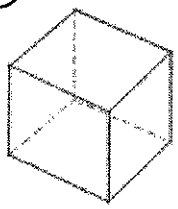
$SA = 162$ mi²

$SA_{ratio} = \frac{1152}{162}$

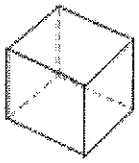
$= \frac{64}{9}$

Side ratio $= \sqrt{\frac{64}{9}} = \boxed{\frac{8}{3}}$ 2.6

11.



$SA = 1700$ ft²



$SA = 833$ ft²

$SA_{ratio} = \frac{1700}{833}$

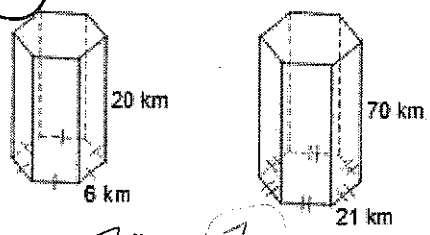
$= \frac{100}{49}$

Side ratio $= \sqrt{\frac{100}{49}} = \boxed{\frac{10}{7}}$ 1.428

Each pair of figures is similar. Find the zoom factor, then find the ratio of surface areas and the ratio of volumes.

r = side ratio, r^2 = SA ratio, r^3 = Vol. ratio

12.

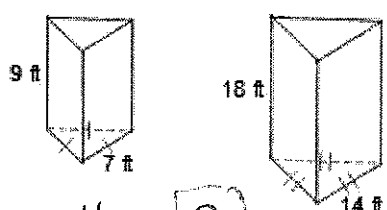


$r = \frac{70}{20} = \frac{7}{2}$

$r^2 = \left(\frac{7}{2}\right)^2 = \frac{49}{4}$

$r^3 = \left(\frac{7}{2}\right)^3 = \frac{343}{8}$

13.



$r = \frac{14}{7} = 2$

$r^2 = 2^2 = 4$

$r^3 = 2^3 = 8$

Some information about the surface area and volume of two similar solids has been given. Find the missing value.

14.

Solid #1	Solid #2
SA = 1377 mi²	SA = 612 mi²
V = 19683 mi³	V = ?

SA ratio $= \frac{1377}{612} = \frac{9}{4}$ → Vol ratio $= \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

Side ratio $= \sqrt{\frac{9}{4}} = \frac{3}{2}$

$V_{smaller} = 19683 \cdot \frac{8}{27} = 5832\ mi^3$

15.

Solid #1	Solid #2
SA = 9 km²	SA = 900 km²
V = 17 km³	V = ?

SA ratio $= \frac{900}{9} = 100$

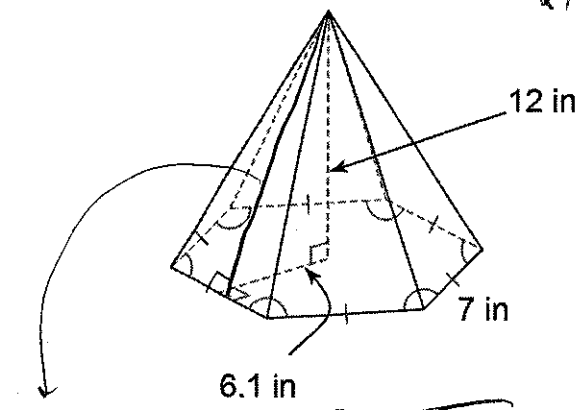
Side ratio $= \sqrt{100} = 10$ → Vol ratio $= 10^3 = 1000$

$V_{larger} = 17 \cdot 1000 = 17000\ km^3$

For #'s 17 – 23, find the volume and surface area of each solid. Name each solid. Show work and label units correctly.

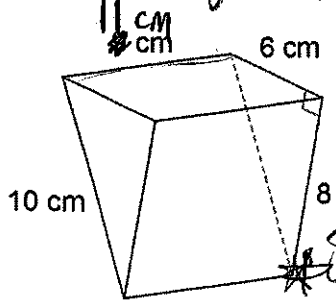
16. Name: Hexagonal Pyramid Volume: $\frac{128.1 \cdot 12}{3} = 512.4\ in^3$ S.A.: $282.66 + 128.1 = 410.76\ in^2$

*A of Base $= \frac{6.1 \cdot 7}{2} \cdot 6 = 128.1\ in^2$



*Slant height $= \sqrt{6.1^2 + 12^2} = 13.46\ in$ *$A_{\Delta's}$ of pyramid $= \frac{7 \cdot 13.46}{2} \cdot 6 = 282.66\ in^2$

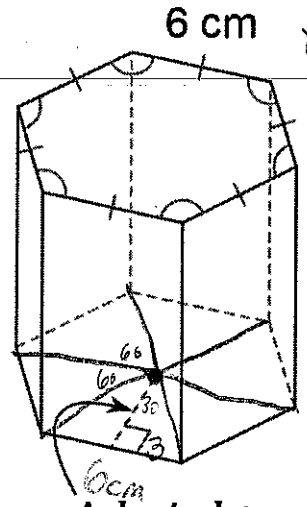
17. Name: Triangular prism Volume: $24 \cdot 11 = 264\ cm^3$ S.A.: $312\ cm^2$



*A of base $= \frac{6 \cdot 8}{2} = 24\ cm^2$

*SA $= 24 \cdot 2 + 10 \cdot 11 + 6 \cdot 11 + 8 \cdot 11$
Δ's

19 Name: Hexagonal prism Volume: 93.53·12 = 1122.37 cm³ S.A.: 619.06 cm²



* $A_{Base} = \frac{5.2 \cdot 6}{2} \cdot 6 = 93.53 cm^2$

* $A_{rect.} = 12 \cdot 6 \cdot 6 = 432 cm^2$

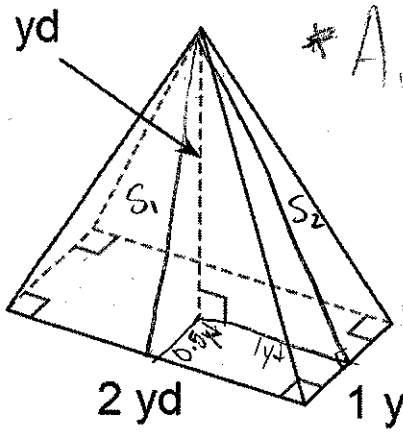
* $SA = 432 cm^2 + 2 \cdot 93.53 cm^2$

Δ height $\tan 30 = \frac{3}{h}$

$\frac{360}{6} = 60$ $h \approx 5.2 cm$

20 Name: Square based pyramid Volume: $\frac{2 \cdot 2}{3} = 1.33 yd^3$ S.A.: $8.36 yd^2$

H A_{Base}



* $A_{of\ base} = 2 \cdot 1 = 2 yd^2$

$A_{\Delta s} = \frac{2 \cdot 2.06}{2} \cdot 2 + \frac{1 \cdot 2.24}{2} \cdot 2$

$A_{\Delta s} = 6.36 yd^2$

$SA = 6.36 + 2$

S_1 & S_2 are two different slant heights

$S_1 = \sqrt{2^2 + 0.5^2}$

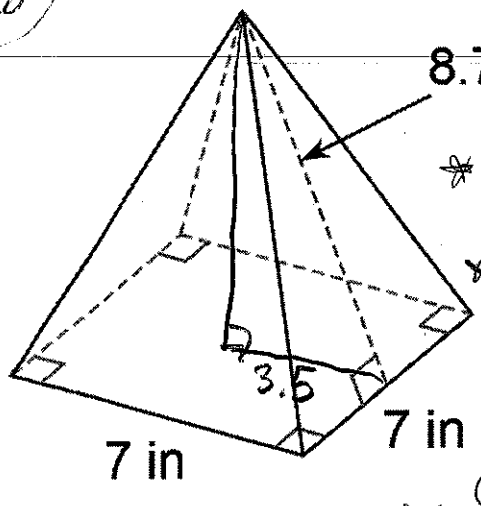
$S_1 \approx 2.06 yd$

$S_2 = \sqrt{2^2 + 1^2}$

$S_2 \approx 2.24 yd$

21. Name: Square Pyramid Volume: $\frac{49 \cdot 7.96}{3} = 130.1 \text{ in}^3$ S.A.: 170.8 in^2

(20)



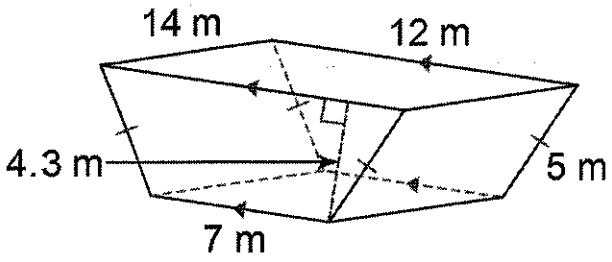
* $A_{Base} = 7.7 = 49 \text{ in}^2$

* Pyramid height $= \sqrt{8.7^2 - 3.5^2} = 7.96 \text{ in}$

* $A_{\triangle's} = \frac{7 \cdot 8.7}{2} \cdot 4 = 121.8 \text{ in}^2$

* $SA = 49 + 121.8 = 170.8 \text{ in}^2$

~~21~~. Name: Trapezoidal prism Volume: $14 \cdot 40.85 = 571.9 \text{ m}^3$ S.A.: 487.7 m^2

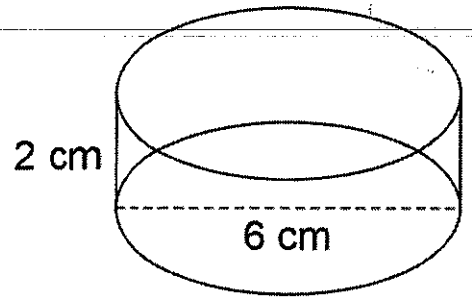


* $A_{base} = \frac{(7+12) \cdot 4.3}{2} = 40.85 \text{ m}^2$

$A_{\square's} = 14 \cdot 12 + (5 \cdot 14)2 + 7 \cdot 14 = 406 \text{ m}^2$

$SA = 406 + 2 \cdot 40.85 = 487.7 \text{ m}^2$

22. Name: Cylinder Volume: 2028.27 = 56.54 cm³ S.A.: 94.24 cm²



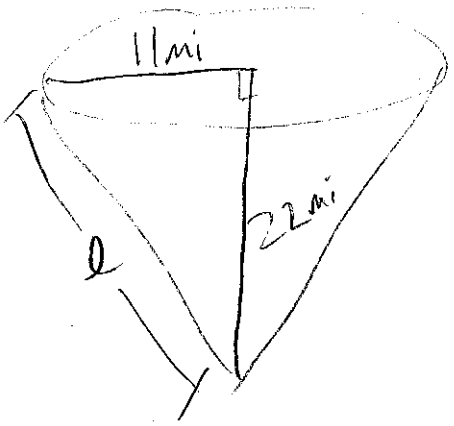
$A_{Base} = \pi \cdot 3^2 = 28.27 cm^2$

$A_{rect} = 2\pi \cdot 3 \cdot 2 = 37.7 cm^2$

$SA = 37.7 + 2028.27$

$SA = 94.24 cm^2$

23



Name: Cone

$Vol: \frac{\pi \cdot 11^2 \cdot 22}{3} = 2787.64 mi^3$

$SA = 1230.14 mi^2$

(not on test)

$11^2 + 22^2 = l^2$

$l = 24.6 mi$