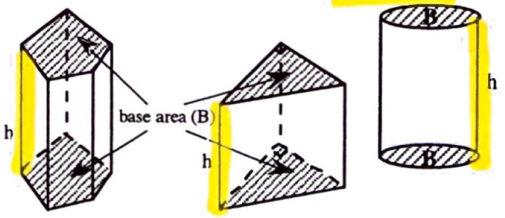
VOLUME AND SURFACE AREA OF POLYHEDRA #17

The **VOLUME** of various polyhedra, that is, the number of cubic units needed to fill each one, is found by using the formulas below.

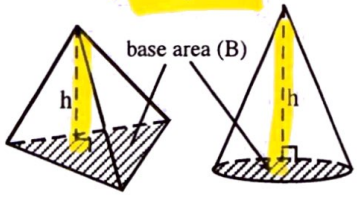
for prisms and cylinders

$V = \text{base area} \times \text{height}$, $V = Bh$



for pyramids and cones

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



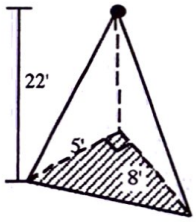
In prisms and cylinders, you may use either base, since they are congruent. Since the bases of cylinders and cones are circles, their area formulas may be expressed as: cylinder $V = \pi r^2 h$ and cone $V = \frac{1}{3}\pi r^2 h$

The **SURFACE AREA** of a polyhedron is the sum of the areas of its base(s) and faces.

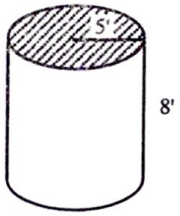
Example 1

Use the appropriate formula(s) to find the volume of each figure below:

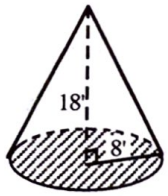
a)



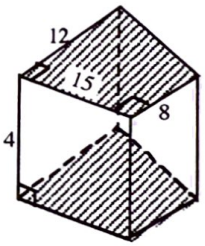
b)



c)



d)



a) This is a triangular pyramid. The base is a right triangle so the area of the base is $B = \frac{1}{2} \cdot 8 \cdot 5 = 20$ square units, so $V = \frac{1}{3}(20)(22) \approx 146.7$ cubic feet.

b) This is a cylinder. The base is a circle, so $B = \pi 5^2$, $V = (25\pi)(8) = 200\pi \approx 628.32$ cubic feet.

c) This is a cone. The base is a circle, so $B = \pi 8^2$. $V = \frac{1}{3}(64\pi)(18) = \frac{1}{3}(64)(18)\pi$ $\Rightarrow = \frac{1}{3}(1152)\pi = 384\pi \approx 1206.37$ feet^3

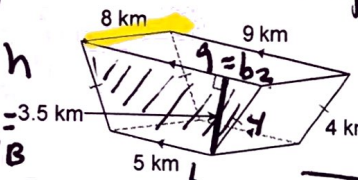
d) This prism has a trapezoidal base, so $B = \frac{1}{2}(12+8)(15) = 150$. Thus, $V = (150)(14) = 2100$ cubic feet.

Math 3 Name _____ ID: 1

Surface Area P. 30 $A_{TRAP} = \frac{1}{2}(b_1 + b_2)h$

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

1) trapezoidal prism



$2B + Ph$

$h_B = 3.5$ km

$P = 5 + 4 + 9 + 4 = 22$

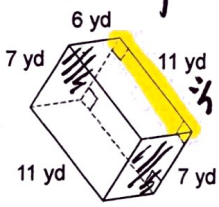
$B = \frac{1}{2}(5+9)3.5$

$B = 24.5$

$S = 2(24.5) + 22(8)$

$= \boxed{225 \text{ Km}^2}$

2) rect. prism → $S = 2B + Ph$



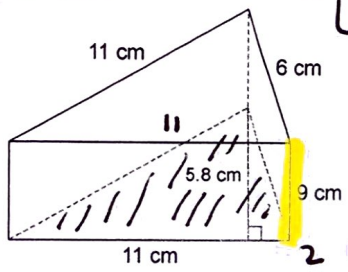
$B = 6(7) = 42$

$P = 2(6) + 2(7) = 26$

$S = 2(42) + (26)(11)$

$\boxed{S = 370 \text{ yd}^2}$

3) Δ prism



$B = \frac{1}{2}(11)(5.8)$

$B = 31.9$

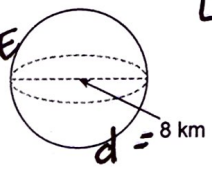
$P = 11 + 11 + 6 = 28$

$2B + Ph$

$S = 2(31.9) + 28(9)$

$\boxed{S = 315.8 \text{ cm}^2}$

4) SPHERE

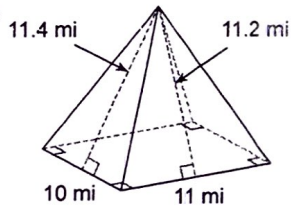


$r = 4$

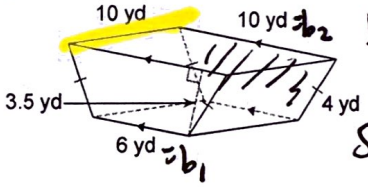
$S = 4\pi(4)^2$

$= 201.06 \text{ Km}^2$

~~5)~~



6) PRISM



$B = \frac{1}{2}(6+10)(3.5) = 28$

$P = 4 + 4 + 6 + 10 = 24$

$S = 2(28) + 24(10)$

$= 296 \text{ yd}^2$

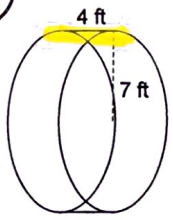
7) CONE!

$S = \pi(11)^2 + \pi(11)(24.6)$

$= 1230.25 \text{ km}^2$

$h^2 + r^2 = s^2$

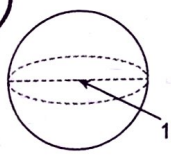
8) CYLINDER



$S = 2\pi(7)(7+4)$

$= 483.81 \text{ ft}^2$

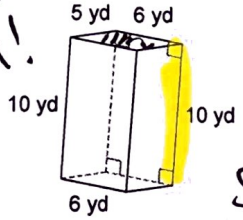
9)



$S = 4\pi(6)^2$

$= 452.39 \text{ m}^2$

10) PRISM!



$B = 5 \cdot 6 = 30$

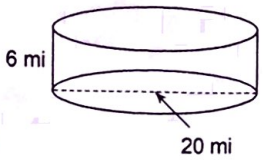
$P = 2(5) + 2(6)$

$= 10 + 12 = 22$

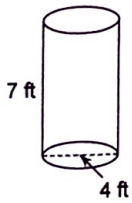
$S = 2(30) + 22(10)$

$= 280 \text{ yd}^2$

11)



12)

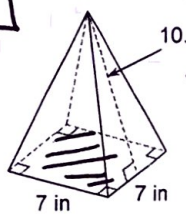


p.31

13) Square Pyramid

$B = 7 \cdot 7 = 49$

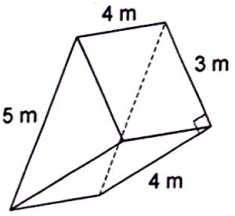
$P = 7(4) = 28$



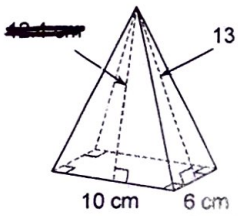
$S = 49 + \frac{1}{2}(28)(10.6)$

$= 197.4 \text{ in}^2$

14)



15)



rect. pyr.

$B = 10(6) = 60$

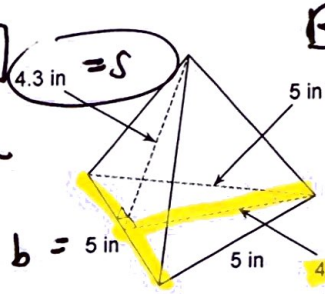
$P = 2(10) + 2(6)$

$= 32$

$S = 60 + \frac{1}{2}(32)(13)$

$= 268 \text{ cm}^2$

16)



Δ Pyramid

$B = \frac{1}{2}(5)(4.3)$

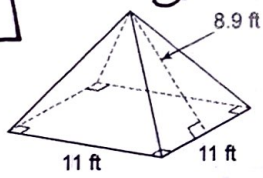
$= 10.75$

$P = 5(3) = 15$

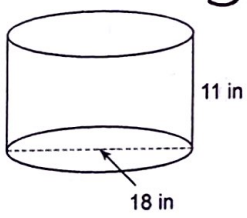
$S = 10.75 + \frac{1}{2}(15)(4.3)$

$= 43 \text{ in}^2$

17)



18)



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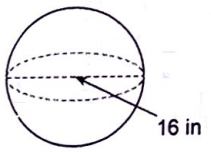
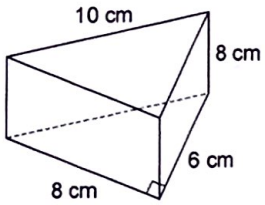


20)



Math 3

Volume P.34

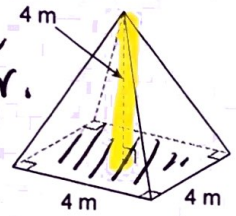
PRISM | CYL. $V = Bh$

PYRAMID | CONE $V = \frac{1}{3}Bh$

Name _____ ID: 1

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

1) square pyr.

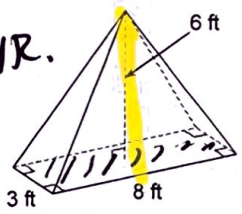


$B = 4 \cdot 4 = 16$

$V = \frac{1}{3}(16)(4)$

$= 21.33 \text{ m}^3$

2) PYR.

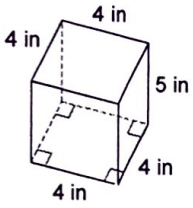


$B = 3 \cdot 8 = 24$

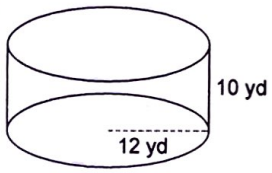
$V = \frac{1}{3}(24)(6)$

$= 48 \text{ ft}^3$

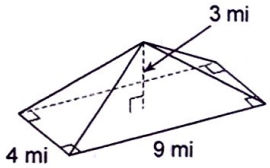
3)



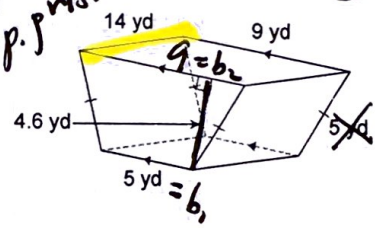
4)



5)



6) Trap. prism



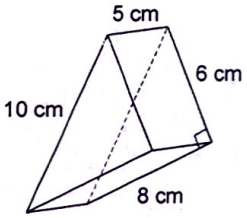
$B = \frac{1}{2}(5+9)(4.6)$

$= 32.2$

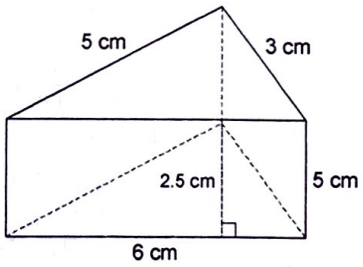
$V = (32.2)(14)$

$= 450.8 \text{ yd}^3$

7)



8)



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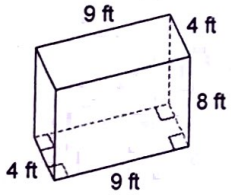

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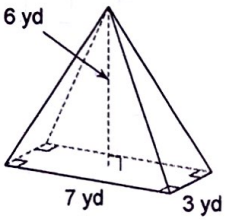

HW:
P.34, 35
P.31 - 34