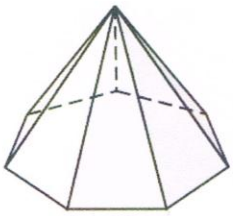
Name: Answer Key Date: _____

Unit 6 Test Review: 3-D Geometry

Directions: Show all work when completing the exercises. **Round all answers** to **two decimal places** and **use the π button** when completing the appropriate formulas.

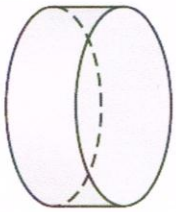
Determine whether the solid is a polyhedron.
If it is, a) then **name the polyhedron** and b) **determine whether it is convex or concave**.

1.



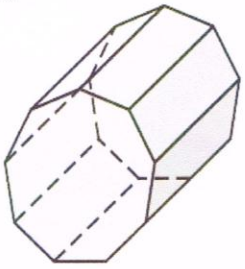
- Yes
- heptagonal pyramid
- convex

2.



Not a polyhedron

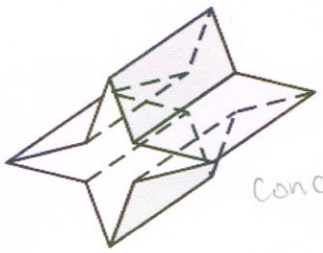
3.



- Yes
- nonagonal prism
- convex

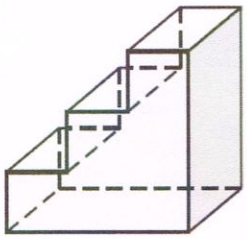
Determine whether the **solid is convex or concave**.

4.



Concave

5.



Concave

6. Use Euler's Theorem to find the value of n.

a. Faces: n
Vertices: 12
Edges: 16

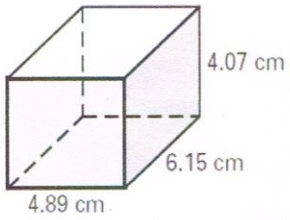
$F+V=E+2$
$n+12=16+2 \Rightarrow \boxed{n=6}$

b. Faces: 29
Vertices: n
Edges: 81

$29+n=81+2$
$29+n=83 \Rightarrow \boxed{n=54}$

Find the surface area of the right prism. Round your answer to two decimal places.

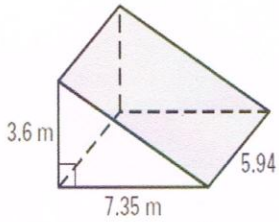
7.



$2(4.89 \cdot 6.15) + 2(4.07 \cdot 6.15) + 2(4.07 \cdot 4.89)$

$150.101\ cm^2$

8.

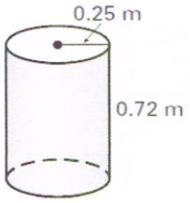


hypotenuse:
$3.6^2 + 7.35^2 = c^2$
$c \approx 8.18\ m$

$2(\frac{1}{2} \cdot 3.6 \times 7.35) + (7.35 \times 5.94) + (3.6 \times 5.94) + (8.18 \times 5.94)$

$140.09\ m^2$

9. Find the surface area of the right cylinder.



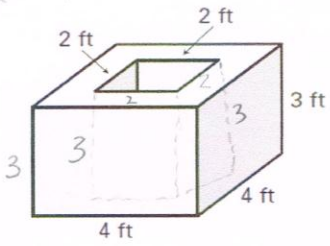
$2\pi r^2 + 2\pi rh$

$2\pi \cdot 0.25^2 + 2\pi(.25)(.72)$

$SA \approx 1.52 m^2$

Find the surface area of the solid.

★ 10.



SA of big prism − SA of smaller prism

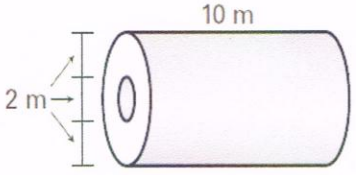
$[(2 \cdot 4 \cdot 4) + (4 \cdot 4 \cdot 3)] - [(2 \cdot 2 \cdot 2)] + (4 \cdot 2 \cdot 3)$

$32 + 48 - 8 + 24$

$104 - 8 = 96\ ft^2$

the hole adds SA

★ 11.



r of big cylinder: 3

SA big cylinder − SA small

$[2\pi 3^2 + 2\pi \cdot 3 \cdot 10] - 2\pi \cdot 1^2 + 2\pi \cdot 1 \cdot 10$

$(18\pi + 60\pi) - 2\pi + 20\pi$

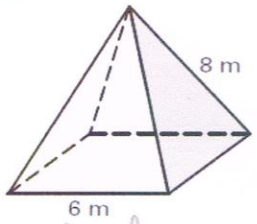
$98\pi - 2\pi = 96\pi$

$\approx 301.59 m^2$

hole in cylinder adds SA

Find the surface area of the regular pyramid.

12.



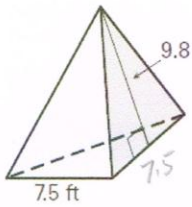
need to find ℓ

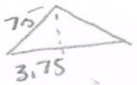
$3^2+b^2=8^2$ $b \approx 7.416$ m

$SA = 6 \cdot 6 + 4\left(\frac{1}{2} \cdot 6 \cdot 7.416\right) \approx \boxed{124.99\ m^2}$

(B, 4 $\triangle$s)

13.





$3.75^2+b^2=7.5^2$

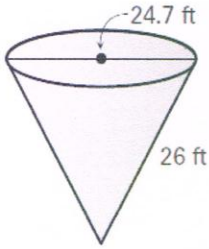
$b \approx 6.495$

$SA = \frac{1}{2} \cdot 7.5 \cdot 6.495 + (3 \cdot \frac{1}{2} \cdot 7.5 \cdot 9.8)$

$SA \approx \boxed{134.61\ ft^2}$

Find the surface area of the right cone.

14.



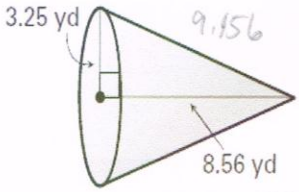
$r = 12.35$

$SA = \pi r^2 + \pi r \ell$

$\pi \cdot 12.35^2 + \pi(12.35)(26)$

$SA \approx \boxed{1487.93\ ft^2}$

15.



9.156

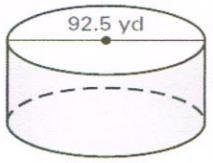
$\ell = \sqrt{3.25^2+8.56^2}$

$\ell \approx 9.156$

$SA \approx \pi \cdot 3.25^2 + \pi(3.25)(9.156)$

$\approx \boxed{126.67\ yd^2}$

16. Find the volume of the right cylinder.



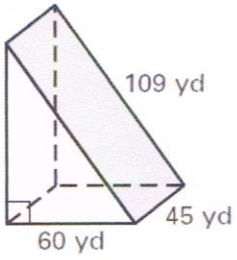
$r = 46.25$ yd

$V = \pi r^2 h$

$V = \pi \cdot 46.25^2 \cdot 44.25$

$V \approx 297362.79\ yd^3$

17. Find the volume of the right prism.



$V = B \cdot h$ (B = area of △)

109, 60, Find h.

$60^2 + b^2 = 109^2$

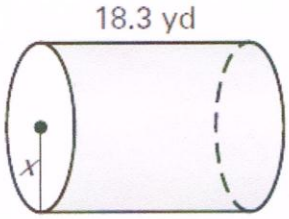
$b = 91$ yd

$V = \frac{1}{2} \cdot 60 \cdot 91 \cdot 45$

$V = 122,850 \text{ yd}^3$

18. Find the length of x given the volume V.

$V = 3148 \text{ yd}^3$



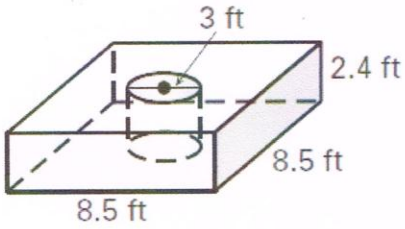
$V = \pi r^2 h$

$3148 = \pi r^2 \cdot 18.3$

$r^2 = \frac{3148}{18.3\pi}$

$r \approx 7.40$ yd

19. Find the volume of the solid.

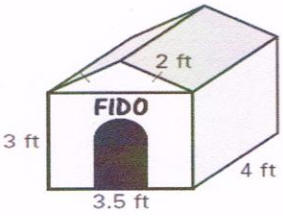


$V_{solid} = V_{prism} - V_{cylinder}$

$= (8.5 \cdot 8.5 \cdot 2.4) - (\pi \cdot 1.5^2 \cdot 2.4)$

$V \approx 156.44 \text{ ft}^3$

20. Find the volume of the doghouse.



2, 2, 1.75

Find h:

$1.75^2 + b^2 = 2^2$

$b \approx .9682$

$V_{doghouse} = V_{rectangular\ prism} + V_{triangular\ prism}$

$V_{doghouse} = (3.5 \times 4 \times 3) + (\frac{1}{2} \times 3.5 \times .9682 \cdot 4)$

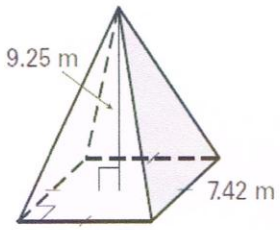
(△ Base)

$= 42 + 6.774$

$\approx 48.78 \text{ ft}^3$

Find the volume of the pyramid.

21.

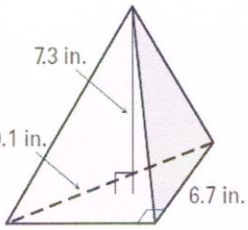


$V = \frac{1}{3} B \cdot h$

$= \frac{1}{3}(7.42^2)(9.25)$

$\approx 169.76 m^3$

22.



Find base

$q^2 + 6.7^2 = 9.1^2$

$q \approx 6.158$

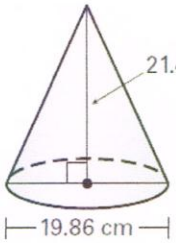
$V = \frac{1}{3} B \cdot h$

$V = \frac{1}{3}(\frac{1}{2} \cdot 6.158 \cdot 6.7)(7.3)$

$V = 50.20 in^3$

Find the volume of the cone.

23.



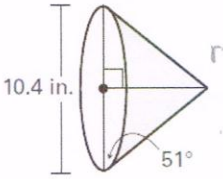
$r = 9.93$

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

$V = \frac{1}{3}\pi \cdot 9.93^2 \cdot 21.42$

$V = 2211.80 cm^3$

24.



$r = 5.2$

Find h:

$\tan 51° = \frac{h}{5.2}$

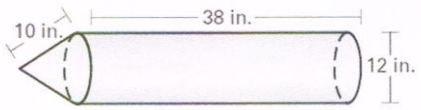
$h \approx 6.421$

$V = \frac{1}{3}\pi \cdot 5.2^2 \cdot 6.421$

$\approx 181.82 in^3$

25.

Rocket A rocket has the dimensions shown at the right. If 60% of the space in the rocket is needed for fuel, what is the volume of the portion of the rocket that is available for nonfuel items? Round your answer to the nearest cubic inch.



$r = 6$

Find h:

$6^2 + h^2 = 10^2$

$h = 8$

$V_{rocket} = V_{cylinder} + V_{cone}$

$= \pi \cdot 6^2 \cdot 38 + \frac{1}{3}\pi \cdot 6^2 \cdot 8$

$1368\pi + 96\pi$

$V_{rocket} = 1464\pi$ ⇒ 40% available for nonfuel

$1464\pi \times .4 = 585.6\pi \approx 1839.72 = 1840 in^3$

26. The circumference of a great circle of a sphere is 24.6π meters. What is the surface area of the sphere?

$C = 2\pi r$

$\frac{24.6\pi}{2\pi} = \frac{2\pi r}{2\pi}$

$r = 12.3\ m$

$\Rightarrow SA = 4\pi \cdot 12.3^2$

$\approx 1901.17\ m^2$

27. Find the radius of the sphere with the given volume.

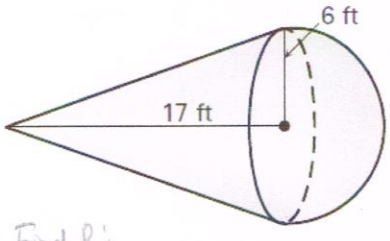
$V = 150\pi\ cm^3$

$\frac{150\pi}{\frac{4}{3}\pi} = \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi}$

$r^3 = 112.5$

$r \approx 4.83\ cm$

28. Find the surface area and volume of the solid.



$V_{solid} = V_{cone} + V_{hemisphere}$

$= \frac{1}{3}\pi \cdot 6^2 \cdot 17 + \frac{1}{2}\left(\frac{4}{3}\pi \cdot 6^3\right)$

$204\pi + 144\pi = 348\pi \approx 1093.27\ ft^3$

Find ℓ:

$6^2 + 17^2 = \ell^2$

$\ell \approx 18.03$

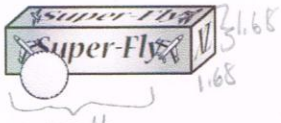
$SA_{solid} = \pi \cdot 6 \cdot 18.03 + \frac{1}{2}(4\pi \cdot 6^2) = 108.18\pi + 72\pi$

$180.18\pi \approx 566.05\ ft$

(only lateral area of cone)

29.

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.



1.68 × 4

6.72

a. What is the surface area of a golf ball?

b. What is the volume of a golf ball?

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

$d = 1.68$

$r = .84$

a. $SA = 4\pi \times .84^2 = 8.87\ in^2$

b. $V = \frac{4}{3}\pi \times .84^3 = 2.48\ in^3$

c. $V_{space} = V_{prism} - V_{golf\ balls}$

$= (1.68^2 \cdot 6.72) - (4 \times 2.48)$

$= 9.05\ in^3$ of space