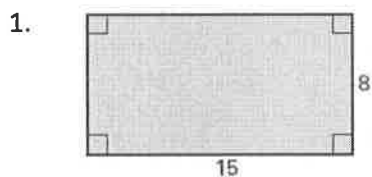


Unit 8 Review: Arc length, Sector Area, Surface Area & Volume

On this assessment, you should be able to...

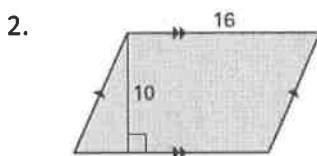
- find the areas of basic geometric shapes
- find arc lengths and sector areas
- find the volume of prisms, cylinders, pyramids, cones, spheres, and composite figures.
- use surface area and volume formulas to solve real-world problems.

Find the area of the following polygons.



$$A = 15(8)$$

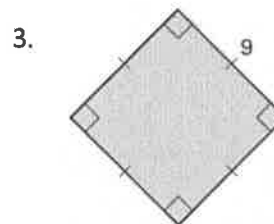
$$= 120u^2$$



$$A = bh$$

$$= 16(10)$$

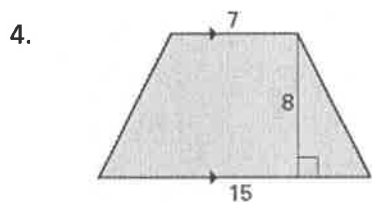
$$= 160u^2$$



$$A = s^2$$

$$= 9^2$$

$$= 81u^2$$

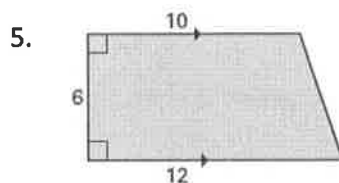


$$A = \frac{1}{2}(b_1 + b_2)h$$

$$= \frac{1}{2}(7 + 15)(8)$$

$$= \frac{1}{2}(22)(8)$$

$$= 88u^2$$

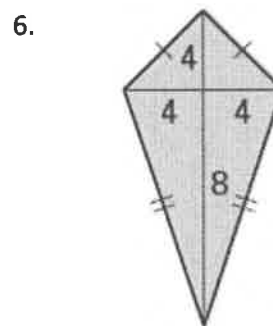


$$A = \frac{1}{2}(b_1 + b_2)h$$

$$= \frac{1}{2}(10 + 12)(6)$$

$$= \frac{1}{2}(22)(6)$$

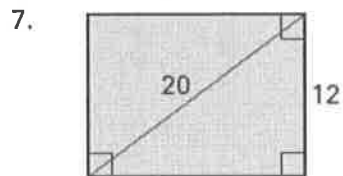
$$= 66u^2$$



$$A = \frac{1}{2}d_1d_2$$

$$= \frac{1}{2}(8)(12)$$

$$= 48u^2$$



$$20^2 = 12^2 + b^2$$

$$400 = 144 + b^2$$

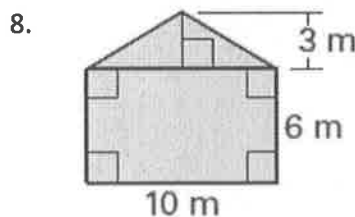
$$b^2 = 256$$

$$b = 16$$

$$A = bh$$

$$= 16(12)$$

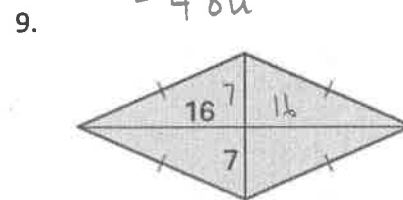
$$= 192u^2$$



$$A = 10(6) + \frac{1}{2}(10)(3)$$

$$= 60 + 15$$

$$= 75m^2$$

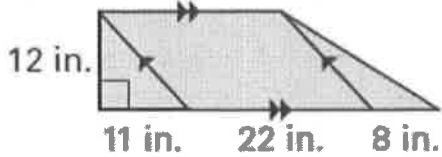


$$A = \frac{1}{2}d_1d_2$$

$$= \frac{1}{2}(14)(32)$$

$$= 224u^2$$

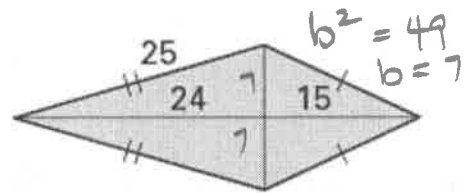
10.



$$\begin{aligned}
 A &= \frac{1}{2}(11)(12) + 22(12) + \frac{1}{2}(8)(12) \\
 &= 66 + 264 + 48 \\
 &= 378 \text{ in}^2
 \end{aligned}$$

$$\begin{aligned}
 25^2 &= 24^2 + b^2 \\
 625 &= 576 + b^2
 \end{aligned}$$

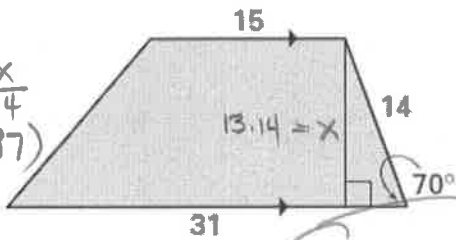
11.



$$\begin{aligned}
 A &= \frac{1}{2}(14)(39) \\
 &= 273 \text{ in}^2
 \end{aligned}$$

~~X~~

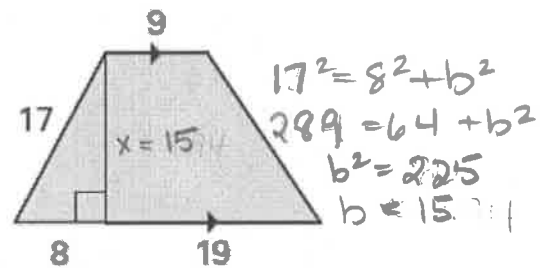
$$\begin{aligned}
 \sin 70^\circ &= \frac{x}{14} \\
 x &= 14(\sin 70^\circ) \\
 &= 13.16
 \end{aligned}$$



$$\begin{aligned}
 A &= \frac{1}{2}(31+15)(13.14) \\
 &= \frac{1}{2}(46)(13.14) \\
 &= 302.22 \text{ in}^2
 \end{aligned}$$

Will not be tested

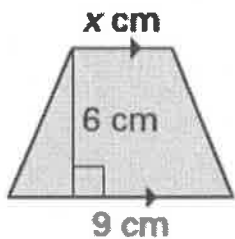
13.



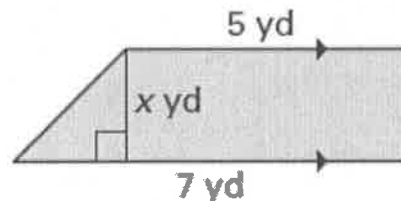
$$\begin{aligned}
 17^2 &= 8^2 + b^2 \\
 289 &= 64 + b^2 \\
 b^2 &= 225 \\
 b &= 15
 \end{aligned}$$

$$\begin{aligned}
 A &= \frac{1}{2}(b_1 + b_2)h \\
 A &= \frac{1}{2}(27 + 9)(15) \\
 &= \frac{1}{2}(36)(15) \\
 &= 270 \text{ in}^2
 \end{aligned}$$

Use the given information to find the value of x.

14. Area = 39 cm²

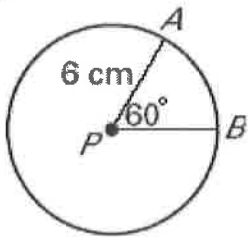
$$\begin{aligned}
 39 &= \frac{1}{2}(x+9)6 \\
 39 &= 3(x+9) \\
 39 &= 3x + 27 \\
 3x &= 12 \\
 x &= 4
 \end{aligned}$$

15. Area = 12 yd²

$$\begin{aligned}
 12 &= \frac{1}{2}(5+7)x \\
 12 &= \frac{1}{2}(12)x \\
 12 &= 6x \\
 x &= 2
 \end{aligned}$$

16. Please find the length of \widehat{AB} .

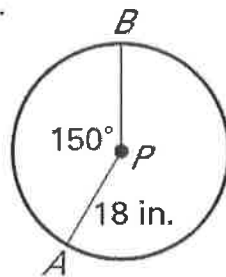
a.



$$= \frac{60}{360} \cdot 2(3.14)(6)$$

$$= 6.28 \text{ cm}$$

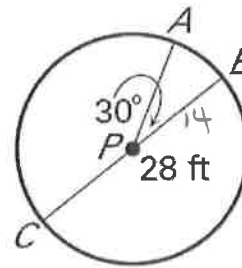
b.



$$= \frac{150}{360} \cdot 2(3.14)(18)$$

$$= 47.1 \text{ in}$$

c.

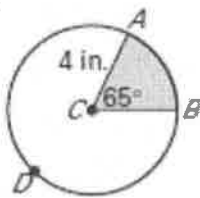


$$= \frac{30}{360} \cdot 2(3.14)(14)$$

$$= 7.33 \text{ ft}$$

17. Please find the area of the sectors formed by $\angle ACB$.

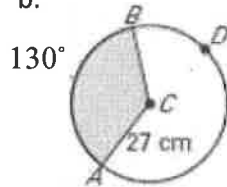
a.



$$= \frac{65}{360} \cdot (3.14)(4^2)$$

$$= 9.07 \text{ in}^2$$

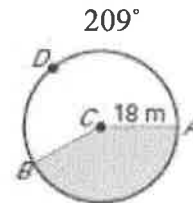
b.



$$= \frac{130}{360} \cdot 3.14(27^2)$$

$$= 826.6 \text{ cm}^2$$

c.



$$= \frac{151}{360} \cdot 3.14(18^2)$$

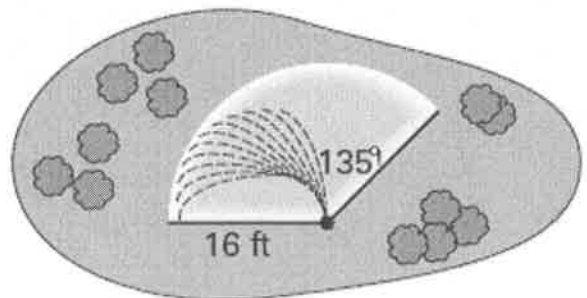
$$= 427.73 \text{ m}^2$$

18. The diagram below shows the area of a lawn covered by a water sprinkler.

a. What is the area of the lawn that is covered by the sprinkler?

$$= \frac{135}{360} \cdot 3.14(16^2)$$

$$= 301.44 \text{ ft}^2$$



b. The water pressure is weakened so that the radius is 10 feet. What is the area of lawn that will be covered?

$$= \frac{135}{360} \cdot 3.14(10^2)$$

$$= 117.75 \text{ ft}^2$$

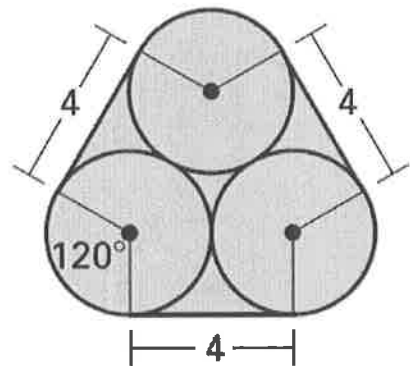
19. Find the perimeter of the region.

$$= \frac{120}{360} \cdot 2(3.14)(2)$$

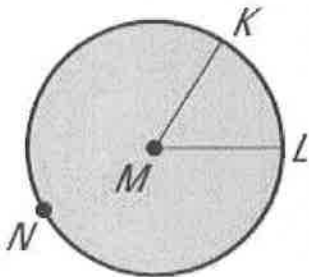
$$= 4.17$$

$$P = 3(4.17) + 3(4)$$

$$= 24.51 \text{ u}$$



20. The area of $\odot M$ is 260.67 in^2 . The area of sector KML is 42 in^2 . Find the measure of $\angle KML$.



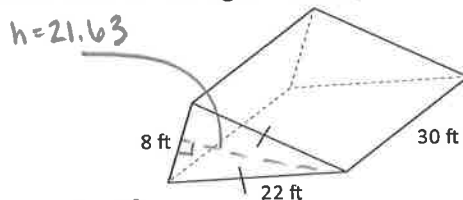
$$\frac{42}{260.67} = .16$$

$$m\angle KML = .16(360)$$

$$= 57.6^\circ$$

21. Please find the surface area of the figure below.

- A) 855.07 ft^2
- B) 1733.07 ft^2
- C) 1342.47 ft^2
- D) 2625.68 ft^2



$$22^2 = 4^2 + a^2$$

$$484 = 16 + a^2$$

$$\sqrt{a^2} = \sqrt{468} \quad a = 21.63$$

$$SA = 2B + Ph$$

$$SA = 2\left(\frac{1}{2}(8)(21.63)\right) + 52(30)$$

$$= 173.04 + 1560$$

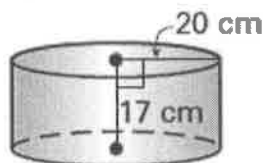
$$= 1733.04 \text{ ft}^2$$

$$P = 2(22) + 8$$

$$= 52$$

22. Please find the surface area of the figure below.

- A) 4647.2 cm^2
- B) 2960 cm^2
- C) 2323.6 cm^2
- D) 1480 cm^2



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

$$B = 3.14(20^2)$$

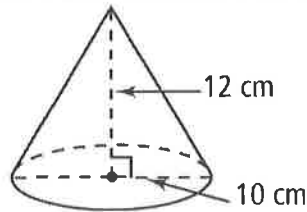
$$= 2(1256) + 2(3.14)(20)(17) = 1256$$

$$= 2512 + 2135.2$$

$$= 4647.2$$

23. Please find the volume of the cone (the diameter is 10 cm).

- A) 1256 cm³
- B) 3768 cm³
- C) 314 cm³
- D) 942 cm³



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

$$= \frac{1}{3} (3.14) (5^2) (12)$$

$$= 314$$

24. Please find the surface area of a globe with a 24-inch diameter.

- A) 1808.64 in²
- B) 7234.56 in²
- C) 904.32 in²
- D) 3627.28 in²

$$r = 12$$

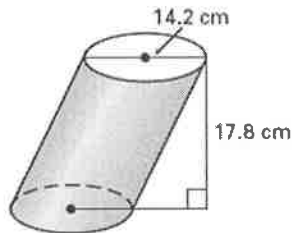
$$SA = 4\pi r^2$$

$$= 4(3.14)(12^2)$$

$$= 1808.64$$

25. Please find the volume of the figure shown.

- A) 11270.1 cm³
- B) 3589.2 cm³
- C) 2817.5 cm³
- D) 897.3 cm³



$$V = \pi r^2 h$$

$$= 3.14 (7.1^2) (17.8)$$

$$= 2817.52$$

26. A grain storage tank is called a silo. A silo is the shape of a cylinder covered by a half-sphere as shown. The height of the cylinder is 50 feet and its diameter is 80 ft. Please find how much grain the silo can hold.

- A) 251200 ft³
- B) 13397.3 ft³
- C) 519146.7 ft³
- D) 385173.3 ft³

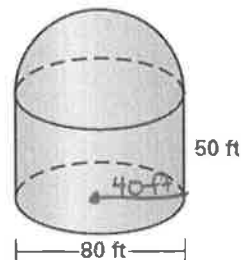
$$V = V_{cyl} + V_{hem}$$

$$= \pi r^2 h + \frac{1}{2} \left(\frac{4}{3} \pi r^3 \right)$$

$$= 3.14 (40^2) (50) + \frac{2}{3} (3.14 (40^3))$$

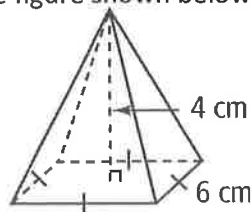
$$= 251,200 + 133,973.33$$

$$= 385,173.33$$



27. Please find the volume of the figure shown below.

- A) 144 cm³
- B) 48 cm³
- C) 156 cm³
- D) 180 cm³



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

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

$$= 48 \text{ cm}^3$$

28. Jon's favorite snack is Pringles. The container has a volume of 223 in^3 . The height of the can is 7 times the radius. What is the radius of the can?



- A) 3.2 in
- B) 14.6 in
- C) 2.2 in
- D) 8 in

$$V = \pi r^2 h$$

$$223 = 3.14x^2(7x)$$

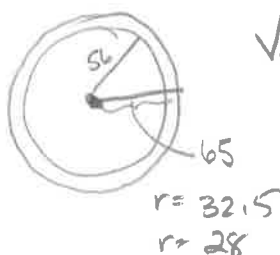
$$\frac{223}{21.98} = \frac{21.98x^3}{21.98}$$

$$x^3 \approx 10.15$$

$$\approx 2.17$$

29. A rubber shell filled with air forms a rubber ball. The shell's outer diameter is 65 millimeters, and its inner diameter is 56 millimeters. Please find the volume of the rubber used to make the ball.

- A) 143720.4 mm^3
- B) 51814.7 mm^3
- C) 91905.7 mm^3
- D) 34719.46 mm^3



$$V_{\text{shell}} = V_{\text{outer}} - V_{\text{inner}}$$

$$= \frac{4}{3}(3.14)(32.5^3) - \frac{4}{3}(3.14)(28^3)$$

$$= 143720.42 - 91905.70$$

$$= 51,814.72$$

30. Kristin is ordering a circular cake for her party. The bakery labels the different cakes by the distance around the cake, rather than by diameter. Kristin ordered a cake that measured 27 inches around. If the cake was 4 inches tall, please find the volume of the cake that Kristin ordered.

- A) 224.13 in^3
- B) 232.2 in^3
- C) 116.12 in^3
- D) 2289 in^3

$$C = 2\pi r = 27$$

$$h = 4$$

$$V = \pi r^2 h$$

$$= 3.14(4.3^2)(4)$$

$$= 232.23$$

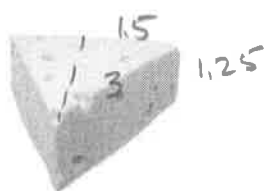
$$2\pi r = 27$$

$$2(3.14)r = 27$$

$$6.28r = 27$$

$$r = 4.3$$

31. Robbie brought cheese and crackers for lunch. The wedge of cheese he brought is shown below. Each side of the cheese is 3 inches and it is 1.25 inches tall. If there are 336 calories in this piece of cheese, how many calories are there per cubic inch?



- A) 1636.32 Cal/in^3
- B) 4.87 Cal/in^3
- C) 68.99 Cal/in^3
- D) 59.7 Cal/in^3

$$3^2 = 1.5^2 + b^2$$

$$9 = 2.25 + b^2$$

$$\sqrt{b^2} = \sqrt{6.75}$$

$$b \approx 2.6$$

$$V = Bh$$

$$= \frac{1}{2}(3)(2.6)(1.25)$$

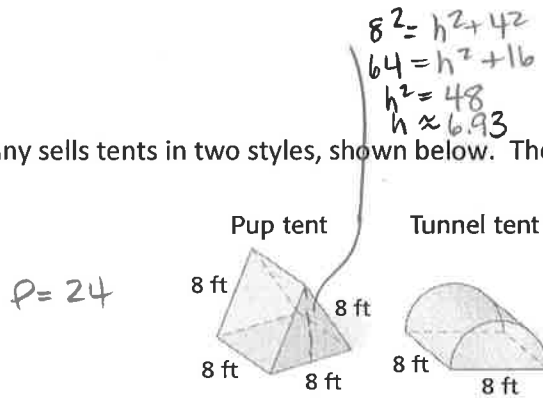
$$= 4.88$$

$$\frac{336 \text{ cal}}{4.88 \text{ in}^3} = 68.85 \text{ cal/in}^3$$

4.88

Open-Ended Problems

32. A sporting goods company sells tents in two styles, shown below. The sides and floor of each tent are made of nylon.



Which tent requires less nylon to manufacture?

Pop

$$SA = 2B + Ph$$

$$= 2\left(\frac{1}{2}(8)(6.93)\right) + 24(8)$$

$$= 55.44 + 192 = 247.44 \text{ ft}^2$$

* Tunnel

$$SA = \frac{1}{2}(2\pi r^2 + 2\pi rh) + 8(8)$$

$$= \frac{1}{2}(2(3.14)(4^2) + 2(3.14)(4)(8)) + 64$$

$$= \frac{1}{2}(100.4 + 200.96) + 64 = 150.68 + 64 = 214.68 \text{ ft}^2$$

33. A steel water tank is a cylinder with a diameter of 30 ft and a height of 18 ft. To prevent rust, it is important to keep them painted. If one gallon of paint will cover about 350 square feet, how many gallons of paint are needed to paint the tank? $r = 15 \text{ ft}$



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

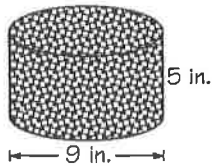
$$= 2(3.14)(15^2) + 2(3.14)(15)(18)$$

$$= 1413 + 1695.6$$

$$= 3108.6 \text{ ft}^2$$

$$3108.6 / 350 \approx 8.89 \text{ gals}$$

34. Mr. Butterworth baked a cake in the shape of a cylinder. The cake had a diameter of 9 inches and a height of 5 inches. He spread icing over the entire cake (except for the bottom). How much frosting did he use?



$r = 4.5$

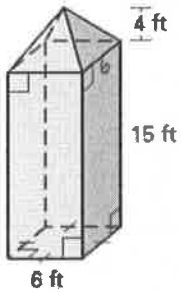
$$SA = \cancel{\pi r^2} + 2\pi rh$$

$$= 3.14(4.5^2) + 2(3.14)(4.5)(5)$$

$$= 63.59 + 141.3$$

$$= 204.89 \text{ in}^2$$

35. Find the surface area of the figure shown below.



SA = SA prism + SA pyramid
 = 4(20)(15) + 100(4)
 = 1200 + 400
 = 1600

Not tested

36. The surface area of an orange is 78.5 in^2 . Please find the approximate volume of the orange.

$$78.5 = 4(3.14)r^2$$

$$78.5 = 12.56r^2$$

$$\sqrt{r^2} = \sqrt{6.25}$$

$$r = 2.5$$

$$V = \frac{4}{3}(3.14)(2.5^3)$$

$$= 65.42 \text{ in}^3$$

37. How much air is needed to fill a standard basketball with a diameter of 7.2 inches?

$$r = 3.6$$

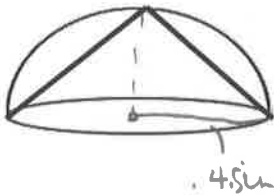
$$V = \frac{4}{3}(3.14)(3.6^3)$$

$$= 195.33 \text{ in}^3$$

38. A pyramid is enclosed inside a prism. The pyramid and prism have equal base areas and equal heights. If the volume of the prism is 60 m^3 , what is the volume of the pyramid?

$$V = \frac{1}{3}(60) = 20 \text{ m}^3$$

39. A cone shaped hole is drilled out of a hemisphere with a radius of 4.5 inches. Please find the volume of the remaining solid.

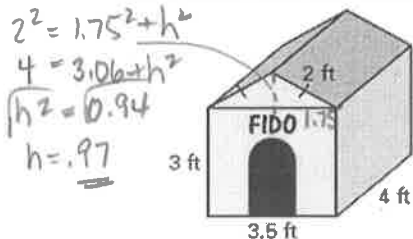


$$V = \frac{1}{2} \left(\frac{4}{3}(3.14)(4.5^3) \right) - \frac{1}{3}(3.14)(4.5^2)(4.5)$$

$$= 190.76 - 95.78$$

$$= 94.98 \text{ in}^3$$

40. Please find the volume of Fido's doghouse.



$$2^2 = 1.75^2 + h^2$$

$$4 = 3.06 + h^2$$

$$\sqrt{h^2} = \sqrt{0.94}$$

$$h = .97$$

$$V = Bh_{\square} + (Bh_{\Delta})$$

$$= 3.5(3)(4) + \frac{1}{2}(3.5)(.97)(4)$$

$$= 42 + 6.79$$

$$= 48.8 \text{ ft}^3$$

= 1 sphere

41. A pharmacist is filling medicine capsules. The capsules are cylinders with half spheres on each end. If the length of the cylinder is 12 mm and the radius is 2 mm, how many cubic mm of medication can one capsule hold (round answer to nearest tenth of a cubic mm)?



$$V = \frac{4}{3}(3.14)(2^3) + 3.14(2^2)(12)$$

$$= 33.49 + 150.72$$

$$= 184.21 \text{ mm}^3$$

42. A cone has a diameter of 10 inches and a height of 12 inches. The height of the cone was stretched to 15 inches. What must the radius be if the new cone still has the same volume?

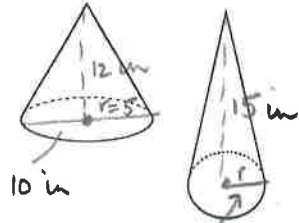
Volumes are equivalent

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

$$\frac{1}{3}(3.14)(5^2)(12) = \frac{1}{3}(3.14)(r^2)(15)$$

$$\frac{314}{15.7} = \frac{15.7 r^2}{15.7} \rightarrow r^2 = \sqrt{20.06}$$

$$r = \underline{4.48 \text{ in}}$$



ANSWERS:

- | | | |
|--|--|-----------------------------|
| 1.) 120 u ² | 2.) 120 ¹⁶⁰ u ² | 3.) 81 u ² |
| 4.) 88 u ² | 5.) 66 u ² | 6.) 48 u ² |
| 7.) 192 u ² | 8.) 75 u ² | 9.) 224 u ² |
| 10.) 426 u ² 378 | 11.) 273 u ² | 12.) 302.22 u ² |
| 13.) 160.92 u ² 270 | 14.) x=4 | 15.) x=2 |
| 16a.) 6.28 cm | 16b.) 47.1 in | 16c.) 7.33 ft |
| 17a.) 9.07 in ² | 17b.) 826.6 cm ² | 17c.) 427.72 m ² |
| 18a.) 301.44 ft ² | 18b.) 117.75 ft ² | |
| 19.) 241.51 u 24.51 | 20.) 57.6° | |
| 21.) B | | 35.) 456 ft ² |
| 22.) A | | 36.) 65.42 in ³ |
| 23.) C | | 37.) 195.3 in ³ |
| 24.) A | | 38.) 20 m ³ |
| 25.) C | | 39.) 95.4 in ³ |
| 26.) D | | 40.) 48.8 ft ³ |
| 27.) B | | 41.) 184.2 mm ³ |
| 28.) C | | 42.) 4.47 in |
| 29.) B | | |
| 30.) B | | |
| 31.) C | | |
| 32.) Pup Tent SA ≈ 247.4 ft ² | | |
| Tunnel Tent SA ≈ 214.7 ft ² | | |
| The tunnel tent requires less nylon | | |
| 33.) 8.9 gallons of paint | | |
| 34.) 204.9 in ² | | |