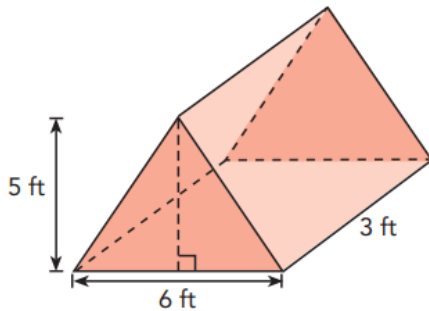


## Surface Area and Volume

1. The base of a closed right circular cylinder has a diameter of 5 cm. If the height of the cylinder is 8 cm, what is the surface area of the cylinder, to the nearest square centimeter?

A. 157  
B. 165 - correct  
C. 408  
D. 628

2. A camping tent is in the shape of a triangular prism as shown in the figure below. What is total surface area of the tent, including the floor? Round your answer to the nearest square foot.



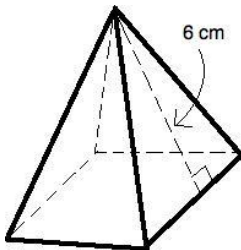
A. 78  
B. 83 - correct  
C. 95  
D. 108

3. A basketball has a diameter of 16 inches. Find the approximate surface area of the basketball. [Use 3.14 for  $\pi$ ]



A.  $100.5 \text{ in}^2$   
B.  $201.0 \text{ in}^2$   
C.  $401.9 \text{ in}^2$   
D.  $803.8 \text{ in}^2$  - correct

4. The regular pyramid below has a base area of  $16 \text{ cm}^2$ . What is the surface area of the pyramid?



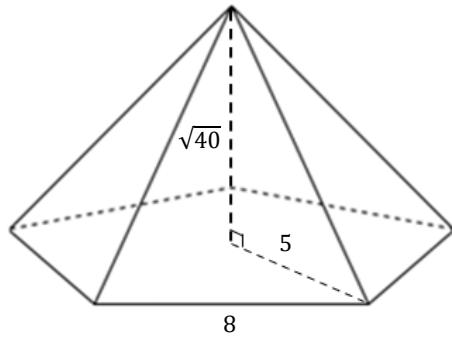
A.  $32 \text{ cm}^2$   
B.  $64 \text{ cm}^2$  - correct  
C.  $80 \text{ cm}^2$   
D.  $96 \text{ cm}^2$

5. Find the surface area of a cone that has a radius of 5 cm and a slant height of 13 cm. Round your answer to the nearest tenth of a square centimeter.

282.7

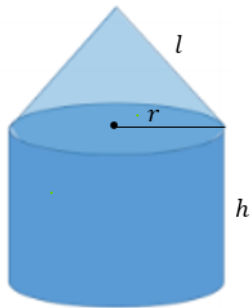
## Surface Area and Volume

6. Find the surface area in square units of the regular pentagonal pyramid shown below. Round your answer to the nearest square unit.



- A. 200 - correct
- B. 221
- C. 226
- D. 261

7. An engineer designs a small metallic part that will be used in the manufacturer of an aircraft. The part consists of a cone that sits on top of a cylinder as shown in the diagram below. Which expression could you use to determine the amount of paint needed to cover its surface, not including its base?



- A.  $3\pi r^2 + \pi r l + 2\pi r h$
- B.  $2\pi r^2 + \pi r l + 2\pi r h$
- C.  $\pi r^2(\pi r l + 2\pi h)$
- D.  $\pi r l + 2\pi r h$  - correct

8. The surface area of a sphere is 2304 square inches. The length of a radius of the sphere, in inches, is

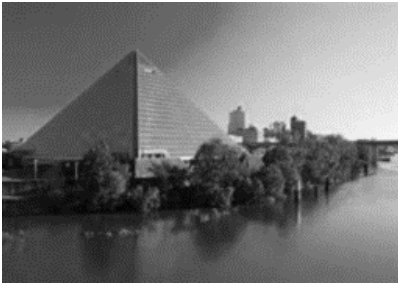
- A. 12
- B. 14 - correct
- C. 288
- D. 576

9. Calvin is filling the pool in his backyard with water. If the pool is in the shape of a cylinder with a diameter of 12 *ft* and a height of 5 *ft*, how much water is needed to fill  $\frac{3}{4}$  of the pool?

- A.  $135\pi \text{ ft.}^3$  - correct
- B.  $162\pi \text{ ft.}^3$
- C.  $180\pi \text{ ft.}^3$
- D.  $540\pi \text{ ft.}^3$

## Surface Area and Volume

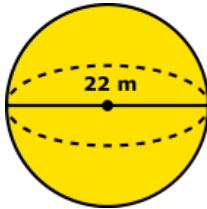
10. The Pyramid of Memphis, in Tennessee, stands 107 *yards* tall and has a square base whose side is 197 *yards* long.



What is the volume of the Pyramid of Memphis, to the nearest cubic yard?

- A. 751,818
- B. 1,384,188 - correct
- C. 2,076,212
- D. 4,152,563

11. Find the volume of a sphere with a diameter of 22 *m*. Round to the nearest tenth. [Use 3.14 for  $\pi$ ]



- A. 44,579.6  $m^3$
- B. 5,572.4  $m^3$  - correct
- C. 1,393.1  $m^3$
- D. 506.6  $m^3$

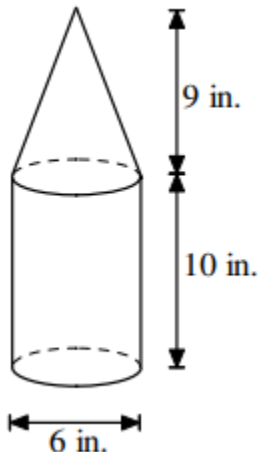
12. The ornament below is composed of two congruent square pyramids. Each square pyramid has base side lengths of 2 inches and a height of 2.5 inches.



What is the volume, in cubic inches, of the ornament?

- A.  $3\frac{1}{3}$
- B. 5
- C.  $6\frac{2}{3}$  - correct
- D. 10

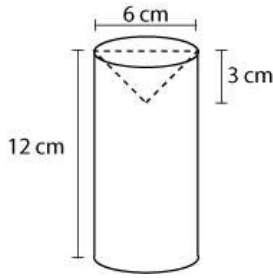
13. What is the volume of the figure below. Leave your answer in terms of  $\pi$ .



- A.  $86\pi$  cubic inches
- B.  $104\pi$  cubic inches
- C.  $117\pi$  cubic inches - correct
- D.  $171\pi$  cubic inches

## Surface Area and Volume

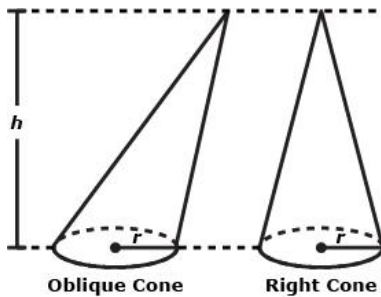
14. A drill press is used to remove a cone of steel from a solid cylinder, as shown below.



What is the volume of steel that remains after the cone is removed?

- A.  $72\pi \text{ cm}^3$
- B.  $99\pi \text{ cm}^3$  - correct
- C.  $117\pi \text{ cm}^3$
- D.  $396\pi \text{ cm}^3$

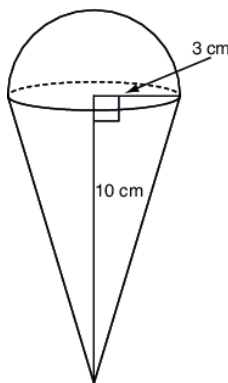
15. Shana wants to determine the formula for the volume of an oblique cone with height  $h$  and with a circular base of radius  $r$ . She draws a right circular cone with the same height and radius, as shown below. Shana knows that the areas of the cross section for the oblique cone and for the right cone are the same at any height.



Determine all the true statements regarding the volumes of the cones.

- A. The formula for the volume of the right cone is  $V = \pi r^2 h$ .
- B. The formula for the volume of the right cone is  $V = \frac{1}{3}\pi r^2 h$ . - correct
- C. The volume of the oblique cone is equal to the volume of the right cone. - correct
- D. The volume of the oblique cone is one-third of the volume of the right cone.
- E. The volume of the oblique cone is NOT equal to the volume of the right cone.

16. Jessica created a model of an ice cream cone by combining the shapes of a cone and a hemisphere. Based on the dimensions shown in the figure below, determine the volume of the model.



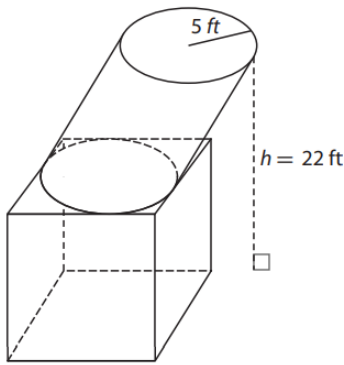
- A.  $48\pi \text{ cm}^3$  - correct
- B.  $66\pi \text{ cm}^3$
- C.  $108\pi \text{ cm}^3$
- D.  $126\pi \text{ cm}^3$

17. A sporting goods store sells a tent in the shape of a square pyramid. If the tent base has an area of  $36 \text{ ft}^2$  and the slant height of the tent is  $5 \text{ ft}$ , what is the volume of the tent?

- A.  $48 \text{ ft}^3$  - correct
- B.  $60 \text{ ft}^3$
- C.  $144 \text{ ft}^3$
- D.  $180 \text{ ft}^3$

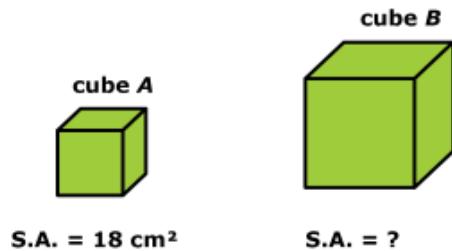
## Surface Area and Volume

18. Find the volume in cubic feet of the composite figure below. Round your answer to the nearest tenth.



1,942.5

19. Cube A has a surface area of  $18 \text{ cm}^2$ . If the edge lengths of cube B are three times as long as the edge lengths of cube A, what is the surface area of cube B?



- A.  $54 \text{ cm}^2$
- B.  $108 \text{ cm}^2$
- C.  $162 \text{ cm}^2$  - correct
- D.  $486 \text{ cm}^2$

20. If the radius and the height of a cone are doubled, which statements about the cone will be true?

- A. The new volume will be 8 times that of the old volume. - correct
- B. The new surface area will be 2 times that of the old surface area.
- C. The new volume will be 2 times that of the old volume.
- D. The new volume will be 4 times that of the old volume.
- E. The new surface area will be 4 times that of the old surface area. - correct
- F. The new surface area will be 8 times that of the old surface area.

21. The radius of a cone is increased from 2 centimeters to 5 centimeters while the height remains the same. What is the ratio of the volume of the smaller cone to the volume of the larger cone?

- A. 1:3
- B. 2:5
- C. 1:9
- D. 4:25 - correct

## Surface Area and Volume

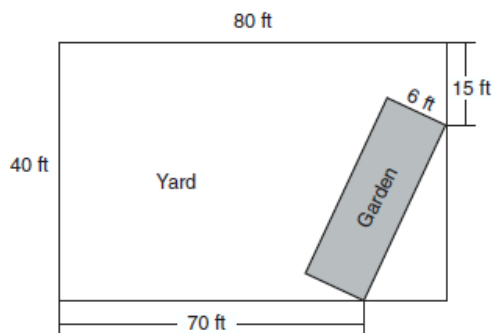
22. At her local market, Joanna purchases a regular-size can of tomato paste. The cylindrical can has a radius of 2 cm and a height of 5 cm. At the warehouse club, she sees a value-size can of tomato paste that contains 4 times as much tomato paste as the regular size. Which of these could be the dimensions of the cylindrical value-size can?
- A. radius: 4 cm, height: 10 cm
  - B. radius: 4 cm, height: 5 cm - correct
  - C. radius: 8 cm, height: 20 cm
  - D. radius: 16 cm, height: 5 cm
23. The entrance to the Louvre Museum in Paris is a square-based pyramid. The volume of the pyramid is  $9,039 \text{ m}^3$  with a height of 21.6 meters. What is the length of each side of the square base, to the nearest meter?
- A. 29
  - B. 35 - correct
  - C. 627
  - D. 1253
24. While playing at the beach, Dylan inflated a beach ball. If the inflated beach ball has a surface area of  $100\pi \text{ in.}^2$ , what is the approximate volume of air that was needed to inflate the ball?
- A.  $392.7 \text{ in.}^3$
  - B.  $523.6 \text{ in.}^3$  - correct
  - C.  $3,141.6 \text{ in.}^3$
  - D.  $4,188.8 \text{ in.}^3$
25. The volume of a triangular prism is  $70 \text{ in}^3$ . The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.
- A. 3.5
  - B. 5
  - C. 7 - correct
  - D. 17.5
26. A cylinder must have a volume of at least  $150 \text{ m}^3$  and a radius of 10 m. What is the minimum possible height of the cylinder?
- A. 0.2 m
  - B. 0.5 m - correct
  - C. 1.5 m
  - D. 2.4 m

## Surface Area and Volume

27. The city of Fargo in North Dakota and the city of Norwalk in California have the same population, both at 105,549. If Fargo has a population density of 2,069 people per square mile and Norwalk has a population density of 10,708 per square mile, which city has a larger area and by how much? Round your answer to the nearest square mile.

- A. Norwalk has the largest area by approximately 41 sq. miles.
- B. Fargo has the largest area by approximately 41 sq. miles. - correct
- C. Norwalk has the largest area by approximately 51 sq. miles.
- D. Fargo has the largest area by approximately 51 sq. miles.

28. A rectangular garden is going to be planted in a person's rectangular backyard, as shown in the accompanying diagram. Some dimensions of the backyard and the width of the garden are given.



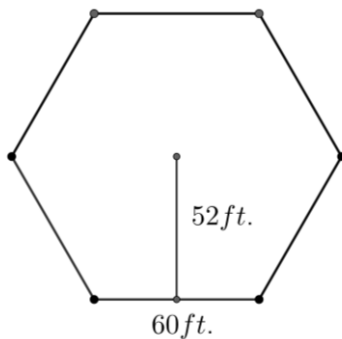
Part A: Find the area of the garden to the nearest square foot.

162

Part B: If the recommended planting density for a small garden is between 7 to 9 plants per  $10 \text{ ft}^2$ , what is the recommended maximum number of plants for this garden?

144

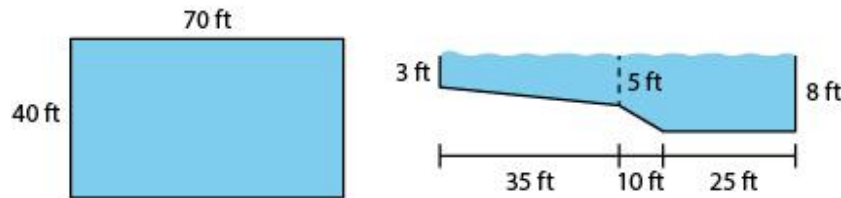
29. A farmer has a field in the shape of a regular hexagon with the dimensions shown. The farmer planted 3,650 corn seeds. What is the population density of the corn seeds? Round your answer to the nearest tenth.



- A. 0.2 corn seed per sq. ft.
- B. 0.4 corn seed per sq. ft. - correct
- C. 2.0 corn seed per sq. ft.
- D. 4.0 corn seed per sq. ft.

## Surface Area and Volume

30. A rectangular swimming pool has a shallow end that gently slopes from 3 feet deep to 5 feet deep and another end that is 8 feet deep. The diagrams below show the dimensions of the pool.



The swimming pool, which is completely full of water, is treated with chlorine to keep it clean. The concentration of chlorine in the pool water is 85 milligrams of chlorine per cubic foot. How many grams of chlorine are in the pool?

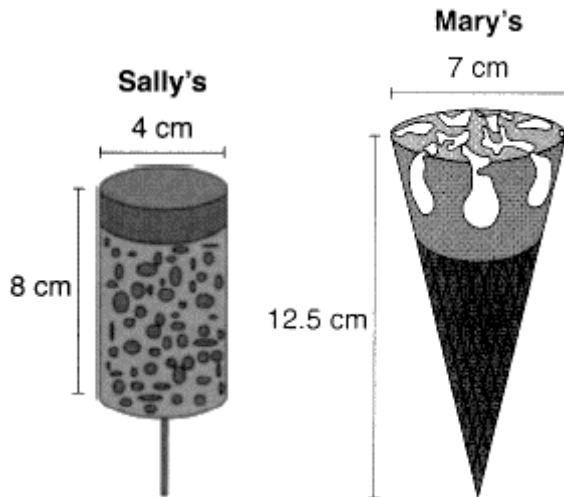
- A. 165 grams  
B. 191 grams  
C. 1,190 grams  
D. 1,377 grams - correct
31. A cylindrical pool has a diameter of 16 feet and height of 4 feet. The pool is filled to  $\frac{1}{2}$  foot below the top. How much water does the pool contain, to the nearest gallon? [ $1 \text{ ft}^3 = 7.48 \text{ gallons}$ ]
- A. 704  
B. 804  
C. 5264 - correct  
D. 6016
32. StoreTrash manufactures trash cans that are open at the top and do not have lids. The company's engineers are designing a trash can that has a total volume of  $7.85 \text{ ft}^3$ . They are deciding between a rectangular prism-shaped trash can with base dimensions of  $1.5 \times 2.0 \text{ ft}$  and a cylindrical trash can with a base area of  $3.14 \text{ ft}^2$ . The material used to manufacture the trash cans costs \$3.60 per square foot. Which trash can design will cost the company less to manufacture and by approximately how much?
- A. cylindrical trash can by \$2.47  
B. cylindrical trash can by \$8.89 - correct  
C. rectangular prism trash can by \$0.50  
D. rectangular prism trash can by \$3.96
33. A jewelry company makes copper heart pendants. Each heart uses  $0.75 \text{ in}^3$  of copper and there is 0.323 pound of copper per cubic inch. If copper costs \$3.68 per pound, what is the total cost for 24 copper hearts?

- A. \$5.81  
B. \$21.40 - correct  
C. \$66.24  
D. \$205.08

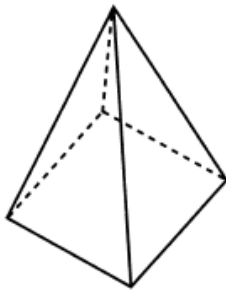


## Surface Area and Volume

34. Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone. Determine who was served more ice cream and by how much more.



- A. Mary got more ice cream by approximately  $100 \text{ cm}^3$ .
  - B. Sally got more ice cream by approximately  $100 \text{ cm}^3$ .
  - C. Mary got more ice cream by approximately  $60 \text{ cm}^3$ . - correct
  - D. Sally got more ice cream by approximately  $60 \text{ cm}^3$ .
35. The square pyramid below models a toy block made of maple wood.

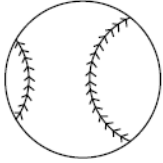


Each side of the base measures 4.5 cm and the height of the pyramid is 10 cm. If the density of maple is  $0.676 \text{ g/cm}^3$ , what is the mass of the block, to the nearest tenth of a gram?

- A. 45.6 - correct
  - B. 67.5
  - C. 136.9
  - D. 202.5
36. Julius is in charge of planting a peach orchard that covers 15 acres. He uses the same amount of ground space for each tree. Julius plants 25 trees in the section of the orchard called the South Hill region that measures 450 feet by 24 feet. Approximately how many trees does Julius plant in the orchard in all? [ $1 \text{ acre} = 43,560 \text{ sq. ft}$ ]
- A. 909
  - B. 1151
  - C. 1513 - correct
  - D. 1746

## Surface Area and Volume

37. A packing box for baseballs is the shape of a rectangular prism with dimensions of  $2\text{ ft} \times 1\text{ ft} \times 18\text{ in}$ . Each baseball has a diameter of  $2.94\text{ inches}$ .



Part A: Determine and state the maximum number of baseballs that can be packed in the box if they are stacked in layers and each layer contains an equal number of baseballs.

192

Part B: If the weight of a baseball is approximately 0.025 pound per cubic inch. Determine and state, to the nearest pound, the total weight of all the baseballs in the fully packed box.

64

38. A vase in the shape of a right circular cylinder has a diameter of 22 centimeters.

Part A: What is the area, in square centimeters, of the base of the vase? Round your answer to the nearest sq. cm.

380

Part B: The vase is partially filled with water to a depth of 10 centimeters. What is the volume, in cubic centimeters, of the water in the vase?

3,800

Part C: A solid sphere with a diameter of 12 centimeters is placed into the vase. What is the volume, in cubic centimeters, of the sphere? Round your answer to the nearest cubic centimeter.

905

Part D: The sphere sinks to the bottom of the vase. As a result, the water level rises, but the water does not overflow. What is the total number of centimeters the water level in the vase rises when the sphere sinks to the bottom? Round your answer to the nearest tenth.

2.4