9.2 Exercises

CONCEPT CHECK

1. Volume is measured in _____ dimensions while surface area is measured in _____ dimensions.

2. All points on the surface of a sphere are the same distance from a _____ point.

3. A square pyramid has four _____ sides.

4. True or False: A cube is a type of rectangular solid.

5. True or False: A cylinder can have ends that are different sizes and shapes.

PRACTICE

In each of the following scenarios, consider the space being described and determine whether you should calculate the volume or surface area.

6. The amount of coffee in a can

7. How much shaved ice is needed for a snow cone

8. How many gallons of paint needed for the siding on your house

9. The amount of sand in a sandbox

10. How much cedar is needed to line a hope chest

11. The amount of leather needed to cover a basketball

APPLICATIONS

12. If the volume of a right circular cone is 360 ft^3, find the volume of a right circular cylinder with the same radius and height.

13. If the volume of a right circular cylinder is 360 ft^3, find the volume of a right circular cone with the same radius and height.

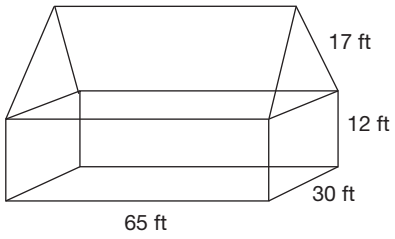
14. You want to make a fish tank in the shape of a rectangular solid that can hold 26,250 cubic centimeters of water. If the length is to be 50 cm and the height is to be 35 cm, then how wide is the tank? How many square centimeters of glass are needed to construct the tank?

15. The concrete foundation of a house requires 15 truckloads of concrete. The concrete was poured at a depth of 0.5 meters and covered an area of 540 square meters.

a. How many cubic meters of concrete were used?

b. If each truckload was the same size, how many cubic meters did each truck carry?

16. The surface of a house is covered with vinyl siding. The gable end (triangular portion) of the house and the roof will not need siding. Determine the amount of siding required.



17. Montgomery has a box that is 24 inches by 36 inches by 12 inches and is filled with sand. He wants to use this sand to fill as many 4-inch cubes as he can. How many cubes can he fill?

18. A company is shipping a piece of equipment that requires a cubic box with a volume of 216 cubic feet. How many square feet of wood are required to construct the box?

19. Isaac made a rectangular shaped raised flower bed that is 12-feet long, 4-feet wide and 1.5-feet high. He wants to line the inside of the bed with landscape fabric. How many square feet of fabric will he need?

20. Emeril baked a sheet cookie that is 15 inches by 24 inches. If he wants to serve one piece to each of his 40 guests, what size squares should he cut?

21. A company needs cubic boxes that will hold 729 cubic inches. How many square inches of cardboard will be required to construct each box?

22. The Earth has a diameter of about 7900 miles.

a. What is the approximate surface area of the Earth?

b. What is the approximate volume of the Earth?

c. If $\frac{2}{3}$ of the Earth's surface is covered with water, about how many square miles of the surface are covered by land?

23. The moon has a diameter of approximately 2160 miles.

a. What is the approximate surface area of the moon?

b. If one-third of the moon is covered in craters, about how many square miles of the moon's surface is crater free?

24. Lisa makes Christmas ornaments from Styrofoam balls with a 3-inch diameter.

a. Calculate the surface area of one of the balls rounded the area to the nearest hundredth.

b. What is the maximum number of balls Lisa can make from 1 square yard of fabric?

25. Patti is making 2 papier-mâché balls for a party. To make the balls, she will cover balloons that have a 12-inch diameter with the papier-mâché material.

a. Calculate the surface area of one balloon rounded to the nearest hundredth.

b. If each balloon must be covered five times to create a sturdy ball, how many pieces of 8.5 by 11 inch paper will be needed to cover the two balloons?

26. Helen is filling round balloons with helium for a wedding. Each balloon has a diameter of 12 inches. Her helium tank contains 14.9 cubic feet of helium.

a. How many cubic feet of helium does one balloon hold when filled to a diameter of 12 inches?

b. How many balloons can she fill with the amount of helium in the tank?

c. If Helen wants to use more balloons in the decorations but doesn't want to purchase more helium, she can fill each balloon to an 11-inch diameter instead of 12. How many balloons can she fill now?

d. By what percentage does the volume decrease when the diameter decreases from 12 inches to 11 inches?

27. A grain silo in the shape of a circular cylinder is 75 feet tall and has a diameter of 24 feet.

a. What is the volume of the silo?

b. If a bushel of grain is 1.25 cubic feet, then how many bushels of grain will the silo hold?

c. If a truck can unload 200 cubic feet of grain per minute into the silo, how long will it take to fill the entire silo?

28. The town of Batesburg has a cylindrical water tower that has a height of 15 meters and a diameter of 8 meters.

a. Find the volume of the water tower.

b. If 1 cubic meter is equal to 264.172 gallons, how many gallons of water will the water tower hold?

c. Suppose the water tower holds about a day's worth of water for the community when filled to full capacity. Approximately how many households are in Batesburg if the average household uses 400 gallons of water per day?

29. Maxine has two cylindrical vases. Vase A has a radius of 2.5 cm and a height of 25 cm, and vase B has a radius of 4 cm and a height of 10 cm.

a. Find the volume of each vase.

b. Which vase has a larger volume? What is the difference in volume between the two vases?

30. The manager of the Blizzard Snow Cone truck ordered a new style of paper cones. These new cones have a height of 12 cm and a radius of 8 cm. The dome of ice that goes on top of the cone will remain the same size, and the dome is made of 1072 cm^3 of ice.

a. Find the volume of the cone rounded to the nearest hundredth. (**Hint:** Do not include the volume of the dome.)

b. The shaved ice is kept in a cooler that is 80 cm by 40 cm by 70 cm. How many snow cones can be made? (**Hint:** Do not forget to include the dome.)

31. A shaved ice stand bought a new ice shaving machine and received a new inventory of paper cones.

a. Find the volume of a cone if the paper cup has a diameter of 9 cm and a height of 8 cm.

b. The new ice shaving machine can shave about 50 cm^3 per minute. About how many minutes will it take to shave enough ice to fill 12 snow cones if the domes of ice that go on top take an additional 190 cm^3.

32. A reception will be held in the lobby of a building that has an inverted square pyramid fountain with a height of 150 inches and side-length of 120 inches. Lani is making table decorations for the reception by filling small replicas of the fountain with glass beads.

a. Find the volume of the small vases if they are in a 1 : 20 ratio with the fountain.

b. If each bag of beads contains 30 cubic inches of beads and there are 8 replicas, how many bags of beads will Lani need?

33. Bo built a sandcastle in the shape of a square pyramid. The side length of the pyramid was 8 feet and the height was 4 feet.

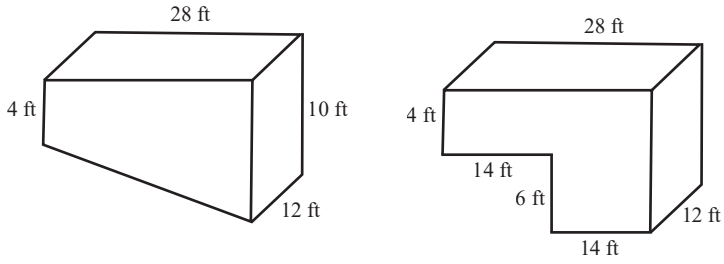
a. How many cubic feet of sand did it take to build the castle?

b. If Bo decides to build a small replica that has a ratio of 1 : 3, how much sand would be needed for the replica?

34. Selene's teacher made a square pyramid and gave the class an assignment to make replica pyramids out of clay with a ratio of 1 : 6. If the side length of the pyramid made by the teacher is 24 inches and the height is 30 inches, find the volume of the replica that Selene needs to make.

35. The Great Pyramid of Giza is the largest structure ever built by man. It is a square pyramid with a side length of approximately 230.36 meters and a height of approximately 146.59 meters. A gift shop sells replicas that has a ratio of 1: 200. Determine the volume of the replica.

36. Which swimming pool holds more water?



37. Michaela is making a cylindrical candle. She has 2 blocks of candle wax that will melt to give her a total of 400 cm3 of wax. She doesn't want the candle to be more than 20 cm tall. Find a set of dimensions that will meet the restrictions and will also use all of the candle wax.

38. Delilah is making a cylindrical candle. She has 3 blocks of candle wax that will melt to give her a total of 80 $in.^3$ of wax. She doesn't want the radius of the candle to be smaller than 1 inch. Find a set of dimensions that will meet the restrictions and will also use all of the candle wax.

39. David is building a cylindrical rainwater harvesting storage tank in his backyard, and he wants it to hold 1000 gallons or about 134 cubic feet of water. His HOA will not allow any free-standing structures taller than 8 feet. Find a set of dimensions that will meet these restrictions.

40. Phillipe wishes to have a grain silo in the shape of a right circular cylinder that can store 200,000 cubic feet of grain. If he doesn't want the silo to be any taller than 50 feet, determine a set of dimensions that will meet his needs.

41. Refer to Example 9.2.12 of the section to solve the following problems.

a. Find the surface area of the record-breaking cup, given that the surface area of a frustum can be calculated using the formula $SA = \pi(R_1 + R_2)\sqrt{(R_1 - R_2) + h^2} + \pi R_2^2 + \pi R_1^2$.

b. Paper is not a viable option for the cup because it is not strong enough, so the owner has opted to use steel. If steel costs $7.25 per square meter, what is the cost of material to make the world record cup?