

TEST NAME: **G-GMD.3**
TEST ID: **464136**
GRADE: **09**
SUBJECT: **Mathematics**
TEST CATEGORY: **My Classroom**

Student: _____

Class: _____

Date: _____

1. The length of the base of a square pyramid is 6 inches. The slant height of the pyramid is 5 inches. What is the **approximate** volume of the pyramid?

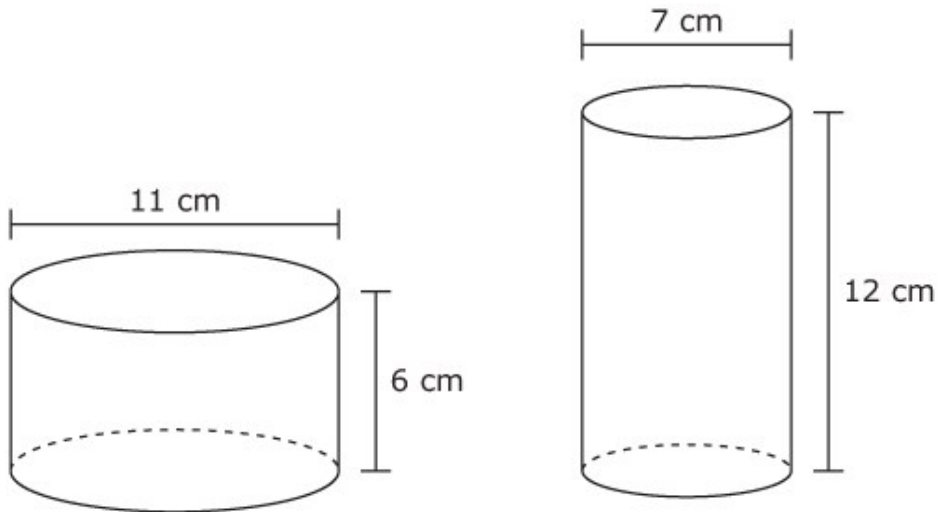
(Note: volume of pyramid = $\frac{1}{3}Bh$)

- A. 20 cubic inches
 - B. 33 cubic inches
 - C. 48 cubic inches
 - D. 60 cubic inches
2. What is the volume of a cone that has a radius of 9 cm and a **slant height** of 15 cm?
- A. $324\pi \text{ cm}^3$
 - B. $405\pi \text{ cm}^3$
 - C. $972\pi \text{ cm}^3$
 - D. $1,215\pi \text{ cm}^3$
3. The volume, V , of a sphere can be found using the equation $V = \frac{4}{3}\pi r^3$, given the radius, r , of the sphere. What is the **approximate** radius of a sphere with a volume of 113 cubic centimeters?
- A. 3 centimeters
 - B. 9 centimeters
 - C. 15 centimeters
 - D. 27 centimeters

4. 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
 - C. 627
 - D. 1,253
5. The area of the base of a cylinder is equal to the area of the base of a cone. What is the relation between their heights if their volumes are also equal?
- A. The height of the cone is one-third the height of the cylinder.
 - B. The height of the cone is three-fourths the height of the cylinder.
 - C. The height of the cone is equal to the height of the cylinder.
 - D. The height of the cone is three times the height of the cylinder.
6. A cylindrical soup can is 10 cm tall and has a diameter of 6.36 cm. What is the **approximate** volume of the can?
- A. $1,270.8 \text{ cm}^3$
 - B. 317.7 cm^3
 - C. 199.8 cm^3
 - D. 99.9 cm^3
7. A cylindrical water tank has a diameter of 10 inches and a height of 6 inches. Dan filled the tank such that its water surface is 2 inches from the top. What is the approximate volume of the water in the tank?
- A. 157 cubic inches
 - B. 170 cubic inches
 - C. 314 cubic inches
 - D. 471 cubic inches

8. A can has a base with an area of 5 in.^2 and a height of 6 in. What is the total volume of six of these cans?
- A. 30 in.^3
 - B. 94 in.^3
 - C. 180 in.^3
 - D. 471 in.^3
9. A pyramid with a square base has sides measuring 4 yards. The height of the pyramid measures 6 feet. What is the volume of this pyramid? (Use $V = \frac{1}{3}Bh$, where B represents the area of the base, and h represents the height of the pyramid.)
- A. $2\frac{2}{3}$ cubic yards
 - B. 8 cubic yards
 - C. $10\frac{2}{3}$ cubic yards
 - D. 32 cubic yards
10. The volume, V , of a pyramid can be found using the formula $V = \frac{1}{3}Bh$, where B is the area of the base, and h is the height. What is the volume of a pyramid with a square base, a slant height of 10 cm, and a height of 8 cm?
- A. 96 cm^3
 - B. 267 cm^3
 - C. 384 cm^3
 - D. $1,152 \text{ cm}^3$

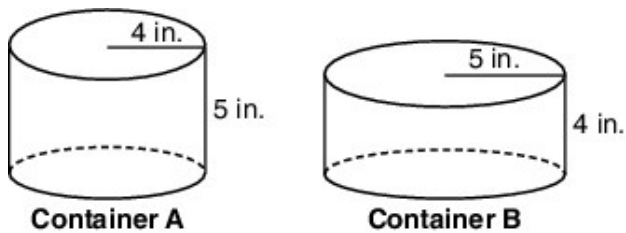
11. The volume of a cylinder is 352 cm^3 . The height measures 7 cm. What is the **approximate** diameter of the cylinder?
- A. 4 cm
 - B. 6 cm
 - C. 8 cm
 - D. 16 cm
12. A company sells colored sand in two cylindrical packages, as shown below.



The package on the left is the more popular shape. The company plans to discontinue the other package and replace it with a new cylindrical package of the same volume. If the new package will have the same diameter as the shorter package, which length is **closest** to the height of the new package?

- A. 4.1 cm
- B. 4.9 cm
- C. 7.6 cm
- D. 8.0 cm

13. A spherical storage tank has a volume, V , of 17,157 cubic feet. What is the **approximate** diameter of this tank? (Use $V = \frac{4}{3}\pi r^3$, where V is volume and r is radius.)
- A. 8 feet
 B. 16 feet
 C. 32 feet
 D. 64 feet
14. A spherically-shaped balloon has a diameter of 11 inches. What is the **approximate** volume of this balloon? (Use $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius.)
- A. 127 cubic inches
 B. 697 cubic inches
 C. 2,788 cubic inches
 D. 5,575 cubic inches
15. A popcorn manufacturing company packages its popcorn in two types of cylindrical containers, as shown below.



If each piece of popcorn takes up about one-half of a cubic inch (in.), approximately how many more pieces of popcorn can container B hold than container A?

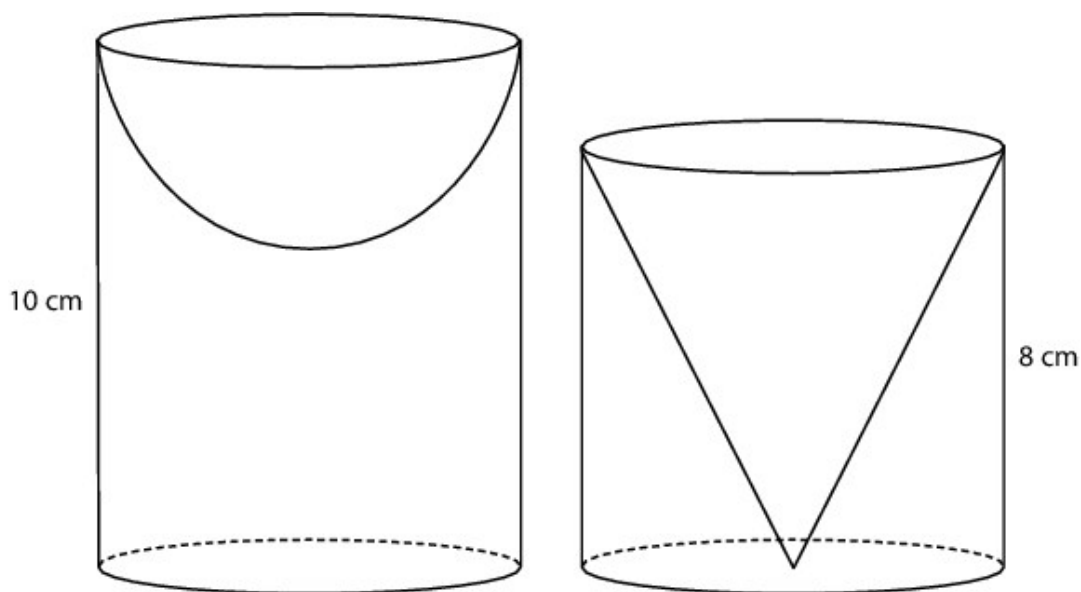
- A. 31
 B. 63
 C. 126
 D. 251

16. A balloon in the shape of a sphere has a radius of 6 inches. What is the **approximate** volume of the balloon? (Use $V = \frac{4}{3}\pi r^3$, where V is volume and r is radius.)
- A. 151 in.³
B. 452 in.³
C. 905 in.³
D. 2,714 in.³
17. A cone has a diameter of 2 inches and a height of 5 inches. What is the volume of the cone?

(Note: volume of cone = $\frac{1}{3}Bh$)

- A. $\frac{20}{3}\pi$ cubic inches
B. $\frac{10}{3}\pi$ cubic inches
C. $\frac{5}{3}\pi$ cubic inches
D. $\frac{1}{3}\pi$ cubic inches

18. The Creative Cup Company has designed two new glass drinking cups. Design #1 is a hemisphere hollowed out of a cylinder, and design #2 is a cone hollowed out of a cylinder, as shown below.



Part A. If design #1 has a diameter of 8 cm and a height of 10 cm, determine how much glass is needed to create the cup. Show your work and round your answer to the nearest tenth of a centimeter.

Part B. If design #2 has a radius of 4 cm and a height of 8 cm and the height of the cone is the same as the height of the cylinder, how much glass is needed to create the cup? Show your work and round your answer to the nearest tenth of a centimeter.

Part C. A customer is deciding between these two designs and wants to purchase the cup that can hold the **most** liquid. The customer decides to purchase the cup based on design #1 because it is taller than the cup based on design #2. Did the customer **correctly** choose the cup that can hold the most liquid? Explain your answer.

Part D. If a cone and a hemisphere have the same radius and the same volume, what is the height of the cone in terms of the radius? Use volume formulas to determine your answer algebraically. Show your work.

Use words, numbers, and/or pictures to show your work.

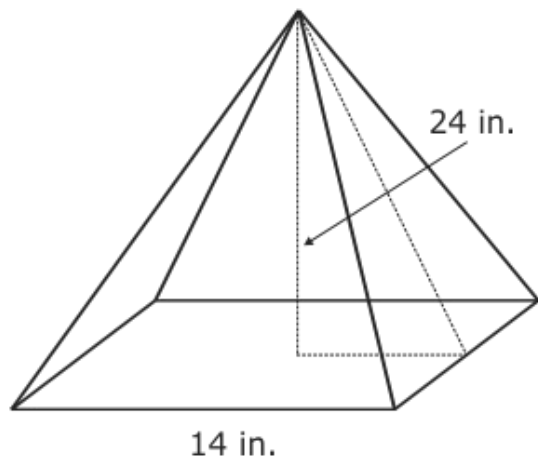
19. A food manufacturing company produces and packages cylindrical cans of soup. Each can has a height of 9 cm and a radius of 2 cm. These cans are packed in rectangular boxes that have an interior height of 18 cm, an interior width of 24 cm, and an interior length of 32 cm. If the cans are packed in rows so that there is no space between them and so that the maximum number of cans are placed in each box, what is the volume **of soup** that the cans in the box hold?
- A. $384\pi \text{ cm}^3$
 - B. $2,304\pi \text{ cm}^3$
 - C. $3,456\pi \text{ cm}^3$
 - D. $13,824\pi \text{ cm}^3$
20. A sphere has a volume, V , of 20 cm^3 . What is the **approximate** radius, r , of the sphere? ($V = \frac{4}{3}\pi r^3$)
- A. 1.1 cm
 - B. 1.7 cm
 - C. 2.2 cm
 - D. 3.4 cm
21. The volume, V , of a sphere is 36π cubic inches. What is the radius, r , of this sphere? ($V = \frac{4}{3}\pi r^3$)
- A. 3 inches
 - B. 4 inches
 - C. 6 inches
 - D. 27 inches

22. A can of paint, shaped like a cylinder, has a volume of 308 inches³. The height of the can measures 8 inches. What is the **approximate** measure of the radius of the can of paint?
- A. 3.5 inches
 - B. 6.0 inches
 - C. 7.0 inches
 - D. 12.25 inches
23. While playing at the beach, Dylan inflated a beach ball. If the inflated beach ball has a surface area of 100π in.², what is the approximate volume of air that was needed to inflate the ball?
- A. 392.7 in.³
 - B. 523.6 in.³
 - C. 3,141.6 in.³
 - D. 4,188.8 in.³
24. The diameter of a sphere A is $4\frac{1}{3}$ times the diameter of sphere B . Which of these statements is **true**?
- A. The volume of A is about 4.3 times the volume of B .
 - B. The volume of A is about 10.2 times the volume of B .
 - C. The volume of A is about 18.7 times the volume of B .
 - D. The volume of A is about 81.4 times the volume of B .
25. A cone has a diameter that measures 10 cm and is 6 cm tall. What is the **approximate** volume, V , of this cone? (Use $V = \frac{1}{3}\pi r^2 h$, where r is radius and h is height.)
- A. 157.1 cm³
 - B. 188.5 cm³
 - C. 471.2 cm³
 - D. 628.3 cm³

26. The base of a square pyramid has a side length of 10 inches. The height of the prism is 12 inches. What is the volume of the pyramid? (Use $V = \frac{1}{3}Bh$, where B is the area of the base, and h is the height.)
- A. 480 cubic inches
 - B. 400 cubic inches
 - C. 120 cubic inches
 - D. 40 cubic inches
27. Jessica was building a cone for her rocket in science class. The volume of the cone was 42 cubic inches. The radius of the cone was 2 inches. **About** what height was the cone? (Use $V = \frac{1}{3}\pi r^2 h$, where r is radius and h is height.)
- A. 40 inches
 - B. 20 inches
 - C. 10 inches
 - D. 4 inches
28. A box, in the shape of a square pyramid, has a base side of 9 in. and a height of 15 in. What is the **approximate** volume of the box when it is 75% full? (Use $V = \frac{1}{3}Bh$, where B is the area of the base, and h is the height.)
- A. 34 in.³
 - B. 68 in.³
 - C. 304 in.³
 - D. 405 in.³
29. The volume of a cylinder is 254 cm³. If the height measures 9 cm, what is the **approximate** diameter of the cylinder?
- A. 3 cm
 - B. 5 cm
 - C. 6 cm
 - D. 9 cm

30. A cylinder has a radius of 5 cm and a volume of 471 cubic cm. What is the **approximate** height of the cylinder?
- A. 6 cm
 - B. 15 cm
 - C. 19 cm
 - D. 30 cm
31. A basketball has a diameter of approximately 9.4 inches. What is the **approximate** volume of the basketball? (Use $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius.)
- A. 370 cubic inches
 - B. 435 cubic inches
 - C. 3,479 cubic inches
 - D. 7,631 cubic inches

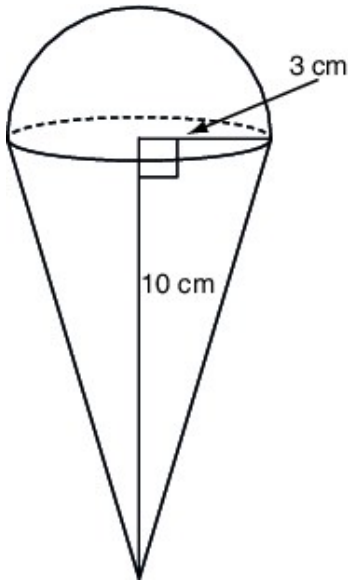
32. A pyramid-shaped container with a square base is going to be filled with sand.



What is the volume of sand that will fit in this container? (Use $V = \frac{1}{3}Bh$, where B is the area of base and h is the height.)

- A. 672 in.³
- B. 700 in.³
- C. 1,008 in.³
- D. 1,568 in.³

33. 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. $48\pi \text{ cm}^3$
- B. $66\pi \text{ cm}^3$
- C. $108\pi \text{ cm}^3$
- D. $126\pi \text{ cm}^3$
34. Jacob compares a cone, a cylinder, and a sphere and lists some observations.
- I. The volumes of the three objects are equal.
- II. The radius of both the sphere and the base of the cylinder is 9 in.
- III. The height of the cylinder is equal to the height of the cone.

What is the approximate area of the base of the cone?

- A. 255 sq in.
- B. 509 sq in.
- C. 764 sq in.
- D. 1,018 sq in.

35. A town is storing salt for the winter in a cylindrical building.

- The building has a radius of 5 ft and is 30 ft tall.
- The building is filled with $1,500 \text{ ft}^3$ of salt.

What is the **approximate** height that the salt reaches in the building?

- A. 0.5 ft
- B. 5 ft
- C. 19 ft
- D. 22 ft

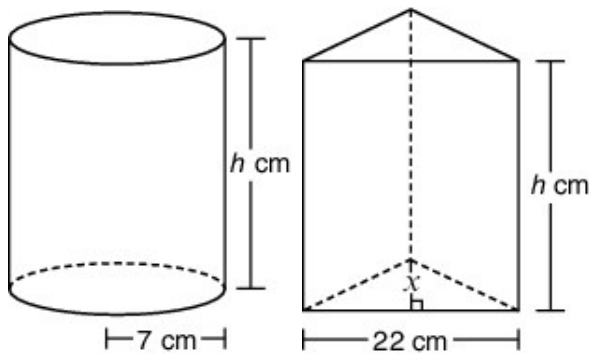
36. A toy, in the shape of a sphere, has a radius of 5 inches. The toy is two-thirds full of water. **Approximately** how many cubic inches of water are in the toy? (Use $V = \frac{4}{3}\pi r^3$, where V is the volume, and r is the radius.)

- A. 524 cubic inches
- B. 349 cubic inches
- C. 314 cubic inches
- D. 209 cubic inches

37. A ball made out of a special material is inflated such that its diameter changes from 14 inches to 18 inches. What is the approximate change in the volume of the ball?

- A. 402.1 in.^3
- B. 1616.9 in.^3
- C. 3053.6 in.^3
- D. 12935.0 in.^3

38. Two vases are shown below. One vase is a cylinder and the other is a triangular prism. Both vases have the same height and volume. The vases will be displayed on the same table.



- Explain whether one of the vases will take up less space on the surface of the table where they are displayed.
- **To the nearest hundredth of a centimeter (cm)**, find the height of the triangle, x , in the triangular prism.

Use words, numbers, and/or pictures to show your work.

39. A spherical ball has a diameter of 28 inches when fully inflated. The ball currently has a diameter of 20 inches. **Approximately** how many more cubic inches of air need to be added for the ball to be fully inflated?

(Note: volume of sphere = $\frac{4}{3}\pi r^3$)

- A. 58,442 cubic inches
 - B. 7,305 cubic inches
 - C. 2,144 cubic inches
 - D. 268 cubic inches
40. The volume of an ice cream cone is 500 cm^3 . The height of the cone is 16 cm. What is the **approximate** diameter of the base of the cone? (Note: Use Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the height.)
- A. 6 cm
 - B. 11 cm
 - C. 15 cm
 - D. 30 cm

41. The volume of a cylindrical can is 553 cm^3 . The height of the can measures 11 cm. What is the **approximate** diameter of the can?
- A. 4 cm
 - B. 8 cm
 - C. 16 cm
 - D. 32 cm
42. The volume of a sphere is 523 cubic cm. What is the **approximate** measure of the radius? (Use $V = \frac{4}{3}\pi r^3$, where V is volume and r is radius.)
- A. 5.0 cm
 - B. 6.1 cm
 - C. 14.8 cm
 - D. 15.0 cm
43. A water container in the shape of a cylinder is 12 feet tall and has a diameter of 10 feet. **Approximately** how much water is in this container if it is $\frac{3}{4}$ full?
- A. 283 feet³
 - B. 707 feet³
 - C. 943 feet³
 - D. 2,828 feet³

44. During a class experiment, the following data were collected on cylinders.

Radius (cm)	Circumference (cm)
2.5	15.7
3.0	18.8
5.0	31.4
7.0	44.0

What is the relationship between the circumference and the radius of these cylinders?

- A. The radius is approximately 3 times the circumference.
 - B. The radius is approximately 3 times the circumference doubled.
 - C. The circumference is approximately 3 times the radius.
 - D. The circumference is approximately 3 times the radius doubled.
45. A sporting goods store sells a tent in the shape of a square pyramid. If the tent base has an area of 36 ft^2 and the **slant height** of the tent is 5 ft, what is the volume of the tent?
- A. 48 ft^3
 - B. 60 ft^3
 - C. 144 ft^3
 - D. 180 ft^3
46. Alan has a cylindrical bottle that is 6 inches tall and has a 2-inch radius. How much taller must the bottle be in order to hold **about** 175 cubic inches of water?
- A. 22 inches
 - B. 14 inches
 - C. 8 inches
 - D. 2 inches

47. What is the approximate volume of a cylinder with a height of 12 feet and a diameter of 16 feet?
- A. 1005.31 cubic feet
 - B. 2412.74 cubic feet
 - C. 3619.11 cubic feet
 - D. 9650.97 cubic feet
48. The length of the base of a rectangular pyramid measures 18 in. and the width measures 10 in. The height of the pyramid measures 1.5 ft. What is the volume of this pyramid? (Use $V = \frac{1}{3}Bh$, where B is the area of base and h is the height.)
- A. 90 in.³
 - B. 270 in.³
 - C. 1,080 in.³
 - D. 3,240 in.³
49. A container is in the shape of a square pyramid. The length of the side of the square measures 6 inches. The height of the container is 9 inches. How much water will the container hold? (Use $V = \frac{1}{3}Bh$, where B is the area of the base and h is the height.)
- A. 18 cubic inches
 - B. 21 cubic inches
 - C. 108 cubic inches
 - D. 162 cubic inches
50. The dwarf planet Pluto has a density similar to that of concrete: 125 pounds per cubic foot. Paul constructs a model of Pluto made out of concrete, with a diameter of 4 feet. What is the weight of the model, in pounds?
- A. 698
 - B. 2,792
 - C. 4,189
 - D. 33,510

51. A soft drink company wants to increase the volume of the cylindrical can they sell soft drinks in by 25%. The company wants to keep the 5-inch height of the can the same. The radius of the can is currently 2.5 inches. **Approximately** how much should the radius of the can be increased?
- A. 0.245 inches
 - B. 0.250 inches
 - C. 0.278 inches
 - D. 0.295 inches