G-GMD.4 [697539]

 Student

 Class

 Date

- 1. 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
- **2.** How much water will fit into this cup?





D. 452.2 in.³

3. 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
- **4.** 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

- 5. 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
- 6. Kevin designed the container below to hold a solid cylindrical tube with gel to surround and insulate the



tube. The container is a rectangular prism, and the tube has a diameter of 0.75 inch and a length of 3.5 inches, as shown.



Note: The art is not drawn to scale.

• Calculate the volume of gel the container will hold when the tube is in the container. Show all of your work.

- 7. 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
- **8.** Two architectural models are pyramids with bases of equal area. The smaller model has a height of 10 centimeters, and the larger model has a height of 30 centimeters. How many times greater than the smaller model is the larger model's volume?



A. 3

B. 9

- **C.** 20
- **D.** 27
- **9.** 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.



Α. 48π cm³

B. 66π cm³



- **C.** $108\pi \text{ cm}^3$
- **D.** 126π cm³
- **10.** The cylindrical can shown below has a volume of approximately 117.75 cubic inches.



Which is closest to the circumference of the top of the can?

- **A.** 7.85 inches
- **B.** 15.70 inches
- **C.** 18.84 inches
- **D.** 19.63 inches
- **11.** The volume of the given cylinder is 282.74 cubic units.





Which is closest to the radius, r, of the base in units? (Use $\pi \approx 3.14$)

A. 1.69

B. 3.00

C. 6.00

D. 9.42

12. A right circular cylinder has radius 3 and volume 72π . What is the height of the cylinder?

A. √8

B. 8

C. 12

D. 24

13. 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
- 14. A sporting goods store sells a tent in the shape of a square pyramid. If the tent base has an area of 36 and the slant height of the tent is 5 ft, what is the volume of the tent?
 - **A.** 48 ft³
 - **B.** 60 ft³
 - **C.** 144 ft³
 - **D.** 180 ft³
- **15.** 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 ft³ 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
- **16.** James has a cylinder and a cone with the same base area and height. The cylinder has a radius of 3 inches, a height of 5 inches, and its volume is 45π in³.





James used the cone to fill the cylinder with rice and found that it took 3 cones full of rice to fill the cylinder. Which formula can be used to find the volume of the cone?

- A. $V = 3\pi r^2 h$
- **B.** $V = \pi r^2 h$
- C. $V = \pi r^2$
- **D.** $V = \frac{1}{3}\pi r^2 h$
- **17.** What is the volume, in cubic yards, of a pyramid that has a height of 10 yards and a square base that measures 3 yards on each side?

A. 15





18. Which expression represents the volume of the sphere in cubic inches?



19. A storage shed is shown in the drawing with dimensions given in feet (ft).





What is the volume of the storage shed?

- **A.** 190 cubic feet
- **B.** 210 cubic feet
- C. 240 cubic feet
- **D.** 360 cubic feet
- 20. Tony uses paper cones like the one shown below to serve snow cones. The circumference of the top of the cone is 11 inches, and the height is 4 inches.



Which measurement is closest to the volume of the cone?





B. $14\frac{2}{3}$ cubic inches

C. 22 cubic inches

D. $51\frac{1}{3}$ cubic inches

21. 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.
- **22.** What is the volume of this square pyramid if the altitude is 9.5 inches?





- **A.** 114 cubic inches
- **B.** 150 cubic inches
- **C.** 171 cubic inches
- **D.** 342 cubic inches
- **23.** A truck hauled 136 cubic feet of sand to a construction site. The sand is dumped into a cone-shaped pile 6 feet in height. What is the approximate diameter of the pile of sand, in feet?
 - **A.** 4.7
 - **B.** 9.3
 - **C.** 45.3
 - **D.** 68.0
- 24. 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
- **25.** The length of one side of the base of the square pyramid measures 60 feet. The height of the pyramid is 120 feet as shown below.



What is the volume of the pyramid?

- **A.** 144,000 cubic feet
- **B.** 216,000 cubic feet
- **C.** 432,000 cubic feet



- **D.** 864,000 cubic feet
- **26.** The rectangular pyramid below has a height of 6 inches.



Note: The figure is not drawn to scale.

What is the volume of the pyramid?

- **A.** 18 cubic inches
- **B.** 120 cubic inches
- **C.** 40 cubic inches
- **D.** 360 cubic inches
- **27.** 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
- 28. 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
- **29.** A cylindrical water tank has a diameter of 60 feet and a water level of 10 feet, as shown below.





If the water level increases by 2 inches, how many more cubic feet of water will be in the tank, to the nearest cubic foot?

- **A.** 189 cubic feet
- **B.** 471 cubic feet
- **C.** 565 cubic feet
- **D.** 1,915 cubic feet
- **30.** The figure below shows the dimensions of a cylindrical soup can, in centimeters (cm).



The manufacturer has decided to redesign the can. The new can will be 0.5 centimeter taller and 0.5 centimeter wider. By how much will the volume of the can increase in the redesign?

A. 6.125π cubic centimeters



- **B.** 24.250π cubic centimeters
- **C.** 35.625π cubic centimeters
- **D.** 43.625π cubic centimeters
- **31.** Cylinder 1 is congruent to cylinder 2. The dimensions of the cylinders are given in units.



What is the volume of cylinder 2?

- **A.** 24π cubic units
- **B.** 48π cubic units
- **C.** 66π cubic units
- **D.** 72π cubic units
- **32.** The Ocean Salt Company is investigating the option of changing their container from a cylinder shape to a right rectangular prism with the length and width shown below. The cylindrical container has a height of 14 centimeters (cm) and a diameter of 8.5 centimeters.





If the company wants the new container to have the same volume as the cylindrical container, how tall does the new container need to be, to the nearest hundredth centimeter?

A. 6.23 cm

B. 8.12 cm

C. 12.46 cm

D. 13.23 cm

33. Ashley has a cylinder filled with sand and an empty cone. Both containers have the same radius and height as shown below.





It took Ashley three cones filled with sand to empty the cylinder. If the cylinder has an approximate volume of $441\pi \text{ cm}^3$, which formula can be used to find the volume of the cone?

- A. $V = \frac{1}{3}\pi r^2 h$
B. $V = \pi r^2 h$
C. $V = \pi r^2$
- **D.** $V = 3\pi r^2 h$
- **34.** A cylinder is completely filled with water. The radius of the cylinder is 5 inches and its height is 10 inches. The cylinder loses 1.2 cubic inches of water per minute through a small leak. If no water is added, which of the following is closest to the number of minutes it will take to completely empty the cylinder?
 - A. 654 minutes
 - **B.** 785 minutes
 - **C.** 942 minutes
 - **D.** 1308 minutes
- **35.** Two spherical domes have volumes of 2,200 cubic meters and 140,800 cubic meters. How many times greater than the smaller dome is the larger dome's diameter?



A. 64

- **B.** 8
- **C.** 4
- **D.** 2
- **36.** 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
- **37.** If the height of the cylinder below is 4.5 centimeters and the volume is 40.5 π cubic centimeters, what is the length of the diameter of the base?





- **A.** 1.5 cm
- **B.** 3 cm
- **C.** 4.5 cm
- **D.** 6 cm
- **38.** If the volume of a sphere is $24\pi_{\text{-what}}$ is the radius?
 - **A**. √18
 - **B**. √32
 - C. ∛18
 - D. ∛32
- **39.** A square pyramid has a base of 10 inches by 10 inches and a height of 10 inches.



10 in. Which of the following is closest to the volume of the pyramid?

- **A.** 333.3 cubic inches
- **B.** 500 cubic inches
- **C.** 1000 cubic inches
- **D.** 3000 cubic inches
- **40.** 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.



- **41**. 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
- **42**. The volume of a cylinder is 352 cm³. 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

43. 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
- **44**. 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
- **45.** Martina makes scented candles that fill cylindrical jars like the one shown below. She plans on making larger candles that require jars exactly 4 times the volume of the jar shown.



Which change to the jar dimensions shown would result in the larger jar Martina needs?

- **A.** multiplying the radius by 2
- **B.** multiplying the radius by 4
- **C.** multiplying the height by 2
- **D.** multiplying the radius and height by 2
- **46.** A right square pyramid has a base with a perimeter of 36 inches. The height of the pyramid is 8 inches, as shown below.





- **A.** 96 cubic inches
- **B.** 216 cubic inches
- **C.** 288 cubic inches
- **D.** 648 cubic inches
- **47.** If the circumference of a cylinder is known, which other information must be known to find the volume of the cylinder?
 - Α. π
 - **B.** radius
 - C. height
 - **D.** diameter
- 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.** The base of a right cone and the base of a right cylinder have equal areas. The height of the cylinder is 4 times the height of the cone. Which statement correctly describes the comparison between the volume of the cylinder and the volume of the cone?
 - A. $\frac{1}{12}$ The volume of the cylinder is 12 times the volume of the cone.
 - **B.** $\frac{4}{1000}$ The volume of the cylinder is $\frac{4}{300}$ times the volume of the cone.
 - **C.** The volume of the cylinder is 4 times the volume of the cone.
 - **D.** The volume of the cylinder is 12 times the volume of the cone.
- 50. 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
- **51.** A company makes square-pyramid-shaped tents with a height of 6 feet and a base with a side length of 8 feet, as shown below.



The company plans to make a new, larger tent by increasing the side length of the base by 2 feet. By how many cubic feet would this change increase the volume of the tent?

- **A.** 12 cubic feet
- **B.** 72 cubic feet
- **C.** 200 cubic feet
- **D.** 216 cubic feet
- **52.** Terrence made a sphere out of modeling clay. The sphere had a radius of 2 inches. Approximately how much modeling clay did Terrence use, in cubic inches?



A. 4.2

B. 25.1

- **C.** 33.5
- **D.** 50.3

53. What is the volume of this can of tomato juice?



- A. 64π cubic in
- B. 128π cubic in.
- C. 256π cubic in.
- D. 804π cubic in.
- **54.** 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

- **55.** It takes Lisa 50 seconds to completely fill a cylindrical bucket with water from a water hose at a certain rate. Lisa wants to fill a second cylindrical bucket at the same rate.
 - The radius of the second bucket is 1.5 times the radius of the original bucket.
 - The height of the second bucket is 1.2 times the height of the original bucket.

How many seconds will it take Lisa to completely fill the second bucket?

A. 90

- **B.** 108
- **C.** 135
- **D.** 162
- **56.** What is the volume of a cone that has a radius of 9 cm and a **slant height** of 15 cm?

Α. 324π cm³

B. 405π cm³



- C. 972π cm³
- **D.** 1,215π cm³
- **57.** 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.

58. A hemisphere on top of a cylinder is shown. The height from the bottom of the cylinder to the top of the hemisphere is *h*. The hemisphere and the cylinder have the same radius, *r*.





Which expression represents the volume, in cubic units, of this three-dimensional object?

- A. $\frac{2}{3}\pi r^{3} + \pi r^{2}h$ B. $\frac{4}{3}\pi r^{3} + \pi r^{2}h$ C. $\frac{2}{3}\pi r^{3} + \pi r^{2}(h-r)$
- **D.** $\frac{4}{3}\pi r^3 + \pi r^2(h-r)$
- **59.** A sphere has a volume, *V*, of 20 cm³. 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
- **60**. 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
- **61.** While playing at the beach, Dylan inflated a beach ball. If the inflated 100 π in.², beach ball has a surface area of 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

62. 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

63. A sphere with a radius of 2 inches is increased so that the surface area is 9 times as large. What is the ratio of the new sphere's volume to the original sphere's volume?

A. 3:1

B. 9:1

C. 18:1

D. 27:1

64. A tower is topped by a right circular cone with a diameter of 24 feet and a height of 36 feet. The space inside the cone is used for housing electronic equipment.



- **A.** 904 cubic feet
- **B.** 5426 cubic feet
- **C.** 16,278 cubic feet
- **D.** 21,704 cubic feet
- **65.** 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.



66. The volume of an ice cream cone is 500 cm³. 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
- **67**. 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

68. Sam wants to compare the volumes of the cone in Figure 1 and the square pyramid in Figure 3 below. The heights of the cone and the pyramid are equal. The radius of the base of the cone and the length of the base of the pyramid are given in centimeters (cm). When the cone is placed inside the pyramid, the base of the cone touches each edge of the square base of the pyramid at one point, as shown in Figure 2.



The volume of the cone is 1884 cubic centimeters. What is the difference in the volume of the pyramid and the volume of the cone, in cubic centimeters? (Use $\pi = 3.14$)

- **A.** 400
- **B.** 516
- **C.** 7200

69. A cylindrical container of garlic powder has a height of 9 centimeters and 1.2 times the radius of another cylindrical container of the same height. If the volume of the smaller container is 36π cm³, what is the volume of the larger container?

A. 43.2π cm³

B. 51.94π cm³





D. 7536

C. 97.2π cm³

- **D.** 124.416π cm³
- **70.** Which equation represents the volume, in cubic meters, of a pyramid with a height of 4 meters and a rectangular base 5 meters wide by 6 meters long?

A. $V = 5 \times 6 \times 4$ B. $V = \frac{1}{3} \times 5 \times 6 \times 4$ C. $V = \frac{1}{2} \times 5 \times 6 \times 4$

- $\mathsf{D}. \ V = 4 \times 5 + 4 \times 6 + 5 \times 6$
- **71.** 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?

Α. 384π cm³

B. 2,304π cm³

C. 3,456π cm³

D. 13,824 π cm³

- 72. 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
- **73.** Which formula can be used to determine the volume of this 3-dimensional figure?





74. A cone has a radius of 5 feet and a height of 18 feet, as shown below.





If the radius of the cone is tripled but the volume remains unchanged, what will be the new height of the cone?

A. 2 feet

B. 3 feet

C. 6 feet

D. 8 feet

- **75.** A cylinder with a radius of 3 cm and a height of 16 cm is increased in size by doubling the radius. What is the difference between the volume of the original cylinder and volume of the larger cylinder?
 - A. 9π cm³
 B. 144π cm³
 C. 432π cm³
 - D. $576\pi \text{ cm}^3$



76. The slant height of a cone forms a constant 45° angle with its axis. A plane parallel to the base is 1 centimeter (cm) below the apex as shown.



Which shape and measurement describes the intersection of the plane and the cone?

- **A.** a circle with diameter 2 cm
- **B.** a circle with diameter $\sqrt{2}_{cm}$
- **C.** an ellipse with minimum diameter $\sqrt{2}$ cm and maximum diameter 2 cm
- **D.** an ellipse with minimum diameter 2 cm and maximum diameter $2\sqrt{2}_{cm}$
- **77.** A right square pyramid is shown below.





Which set of points determines the position of a plane that would bisect the pyramid?

A. *A*, *B* and *E*

- **B.** B, D and F
- **C.** C, E and F
- **D.** *D*, *B* and *A*
- **78.** A plane passes through the apex (top point) of a cone and then through its base. What geometric figure will be formed from this intersection?

A. square

B. triangle

- C. parabola
- **D.** straight line
- **79.** Which of the following is the best description for the resulting three-dimensional figure if a right triangle is rotated about the line containing its hypotenuse?



- **A.** a cone with slant height the same length as the longest leg
- **B.** a pyramid with triangular base
- **C.** two cones sharing the same circular base with apexes opposite each other
- **D.** a cone with slant height the same length as the shortest leg
- **80.** In three-dimensional space, Circle *P*, with a radius of 3 inches, is perpendicular to \overline{PR} . The length of \overline{PR} is 6 inches.



Which solid is formed by translating Circle *P* until it intersects with Point *R*?

- **A.** full sphere
- **B.** half sphere
- **C.** right circular cone
- **D.** right circular cylinder
- 81. What geometric figures result where a plane and a sphere intersect?
 - **A.** a circle or a parabola
 - **B.** a circle or a single point



- **C.** a circle or a straight line
- **D.** a single point or a straight line
- **82.** What shape is formed if $\triangle ABC$ shown below is rotated in a three-dimensional plane around the *x*-axis?



- A. a cone with vertex A
- **B.** a cone with vertex *B*
- C. a triangular pyramid with vertex A
- **D.** a triangular pyramid with vertex B
- **83.** Paul bought a piece of cheese that was in the shape of a cylinder, as shown below.



He unwrapped the cheese and cut a thin slice off of the end. What would be the shape of the cheese slice?

A. circle

B. triangle

- **C.** rectangle
- **D.** square
- **84.** From a piece of paper, Sam cuts a rectangle with a length that is 2 inches (in.) longer than the width. He tapes a straw to the long side of the rectangle. Holding the straw horizontally at one end, he twirls it, causing the rectangle to create the image of a solid figure. Which statement best describes the solid figure?
 - A. $(w^2 + 4w + 4)$ in.³, where w represents the width of the rectangle.
 - **B.** A rectangular prism with a volume of $(w^3 + 4w^2 + 4w)$ in.³, where *w* represents the width of the rectangle.
 - **C.** A cylinder with a volume of $\pi(w^3 + 2w^2)$ in.³, where *w* represents the width of the rectangle.

D. $\frac{\pi (w^3 + 2w^2)}{3}$ in.³,



represents the width of the rectangle.

85. Kara works at a plant nursery and collects soil in different pots for her plants. The different types of pots used are shown below.



Part A. Compare the shape of the surface of the soil in pot A and pot B when they are exactly half-filled and when they are completely filled. Explain how the shape of the surface of the soil level changes as the soil level increases in pot A and pot B.

Part B. Suppose pot B and pot C are half-filled with water and then tilted at a slight angle. What is the shape of the water surface in each tilted pot?

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

86. A sphere is cut by a horizontal and a vertical plane, each passing through the center of the sphere.





Which phrase best describes the intersection of the sphere and the two planes?

A. a circle

- **B.** a diameter of the sphere
- **C.** a point inside the sphere
- **D.** a line tangent to the sphere
- 87. Point A lies on the surface of the right circular cone shown below. Point B is in the interior of the cone.



The intersection of the cone and the plane that includes \overline{AB} generates which figure?

- **A.** double line
- **B.** single line
- C. hyperbola
- **D.** parabola
- **88.** A plane intersects both bases of a cylinder, passing through the center of each base of the cylinder. What geometric figure will be formed from this intersection?



A. circle

B. square

C. parabola

D. rectangle

89. In the figure below, points A, B, and C are midpoints of the edges of a cube.



If the cube is intersected by a plane at points *A*, *B*, and *C*, which of the following best describes the intersection?

A. square

B. parallelogram

- **C.** equilateral triangle
- **D.** scalene triangle

90. A regular hexagonal pyramid is cut horizontally by a plane.





Which is the best description of the smaller pyramid on the top of the surface of the plane?

- A. a similar triangular pyramid
- **B.** a smaller triangular pyramid
- **C.** a similar hexagonal pyramid
- **D.** a congruent hexagonal pyramid
- **91.** Which of the following statements is true about any sphere?
 - **A.** It has only two dimensions.
 - **B.** Its cross section is in the shape of a circle.
 - **C.** Its surface area is measured in cubic units.
 - **D.** It has a radius that is always a perfect square.
- **92.** A rectangle has vertices at (0, 0), (5, 0), (5, 6), and (0, 6).





If the rectangle is revolved about the *y*-axis, what 3-dimensional solid is formed?

A. a cylinder with a diameter of 10 units and a height of 6 units

- **B.** a cylinder with a diameter of 12 units and a height of 5 units
- **C.** a rectangular solid with dimensions 10, 10, and 6 units
- **D.** a rectangular solid with dimensions 12, 12, and 5 units
- **93.** When triangle *ABC* is revolved about \overline{AB} , one cone is formed. Which of the following must be true?
 - A. AC = BC
 - **B.** AB = AC or AB = BC
 - **C.** $m \angle A = 90^\circ$ or $m \angle B = 90^\circ$
 - **D.** $m \angle A + m \angle = 90^{\circ}$



94. In the diagram below, a right circular cylinder with a radius of 3 inches is intersected vertically by a plane passing through Points *A* and *B*, the centers of the circular bases.



Figure not drawn to scale What is the perimeter of the figure formed by the intersection of the plane and the cylinder?

A. 17 inches

B. 20 inches

- **C.** 26 inches
- **D.** 40 inches

95. A plane intersects a cylinder without intersecting either of its bases. The plane is not parallel to the bases.





What geometric figure will be formed from this intersection?

- A. a circle
- **B.** a square
- **C.** an ellipse
- **D.** a line segment
- **96.** A regular pentagonal prism is intersected by a plane. The plane is not parallel to the bases and does not intersect the bases. Which figure is formed from this intersection?

A. equilateral triangle

- **B.** hexagon
- **C.** regular pentagon
- **D.** irregular pentagon
- **97.** What is the intersection of a plane and a sphere through its center?
 - **A.** circle
 - **B.** semicircle



C. ellipse

D. sphere

98. A plane slices through the axis of a right circular cone with a height of 4 feet and a radius of 3 feet, as shown below.



Note: Figure not drawn to scale What is the perimeter of the intersection of the plane and the cone?

A. 13 feet

B. 14 feet

- **C.** 16 feet
- **D.** 20 feet

99. A square has vertices at(0, -5), (3, -5), (0, -8), and (3, -8).

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If the square is revolved about the *y*-axis, what 3-dimensional solid is formed?

- **A.** a cube with edge lengths of 3 units
- **B.** a cube with edge lengths of 6 units
- **C.** a cylinder with a diameter and height of 3 units
- **D.** a cylinder with a diameter of 6 units and height of 3 units
- **100.** In three dimensional space, Square *KLMN* is perpendicular to \overline{QR} and intersects it at Point *Q*. An angled front view is shown below.





What solid figure is formed when Square KLMN is translated until it intersects Point R?

- A. cube
- **B.** square pyramid
- **C.** triangular prism
- **D.** rectangular prism
- **101.** Which of the following figures is generated when a plane intersects a double cone parallel to the axis of the double cone?
 - **A.** circle
 - **B.** ellipse
 - **C.** parabola
 - **D.** hyperbola

102. The graph below shows a semicircle with a radius of 2 units.



About what line should the semicircle be revolved in order to create a sphere?

- **A.** the line y = 0
- **B.** the line x = 0
- **C.** the line x = 2
- **D.** the line y = 2

103. Points A and C lie on the surface of this right cone. Point B is in the interior of the cone.



Which statement is true?

- **A.** The intersection of the cone and a plane including Points *B* and *C* creates a hyperbola.
- **B.** The intersection of the cone and a plane including Points *A* and *C* creates a parabola.
- **C.** The intersection of the cone and a plane including Points *A* and *C* creates an ellipse.
- **D.** The intersection of the cone and a plane including Points *B* and *C* creates a circle.
- **104.** Jason has a cube-shaped piece of cheese that measures 3 inches on each side. He slices the cheese in half diagonally as shown below.



What is the shape of this cross section?

- **A.** quadrilateral, but not square or rectangle
- **B.** rectangle, but not square
- **C.** rhombus
- **D.** triangle
- **105.** Points *A* and *C* lie on the surface of the cone. Point *B* lies in the interior of the cone.





Which statement is true?

- **A.** The intersection of the cone and a plane including *A* and *B* generates a circle.
- **B.** The intersection of the cone and a plane including *B* and *C* generates an ellipse.
- **C.** The intersection of the cone and a plane including *B* and *C* generates a parabola.
- **D.** The intersection of the cone and a plane including *A* and *C* generates a hyperbola.
- **106.** A sphere with a 10-inch radius intersects a plane that is 8 inches from the sphere's center as shown.



What is the circumference of the circle formed where the plane intersects the sphere, in inches?

B. 12π



Α. 4π

C. 20π

D. 36π

107. An isosceles right triangle is rotated around its hypotenuse to obtain a three-dimensional solid. The solid is then intersected by a plane parallel to the hypotenuse that intersects the solid through its vertex. How can the shape of the resulting cross section **best** be classified?

A. circle

- B. square
- C. rhombus
- D. rectangle





A. six cubes



- **B.** four cubes
- **C.** six rectangular prisms
- **D.** four rectangular prisms
- **109.** A deli had a piece of lunchmeat in the shape of a cylinder as shown.



The clerk in the deli cut the lunchmeat horizontally along the dotted line. What was the shape of the lunchmeat where he made his cut?

- A. circle
- **B.** oval
- **C.** rectangle
- **D.** square
- **110.** Which statement **best** describes how to slice a cone so that the resulting cross section is an ellipse?
 - A. A plane slicing the cone parallel to its base
 - **B.** A plane slicing the cone diagonally without intersecting the base



- **C.** A plane slicing the cone perpendicular to its base and passing through the vertex
- **D.** A plane slicing the cone perpendicular to its base, not passing through the vertex
- **111.** A rectangular piece of cheese is 8 centimeters wide, 15 centimeters long, and 6 centimeters tall. The piece is cut perpendicular to and diagonally across the bases.



What is the area, in square centimeters, of the cross section formed by the cut?

A. 90

B. 102

- **C.** 138
- **D.** 150







What is the shape of the planar cross section formed by the intersection of the plane and prism?

- A. trapezoid
- **B.** rectangle
- C. hexagon
- **D.** triangle
- **113.** A rectangle will be rotated about Line *L* in the figure below.



L

What best describes the three-dimensional object formed by rotating the rectangle about Line *L*?

- **A.** solid cylinder
- **B.** solid rectangular prism
- **C.** rectangular prism with a square hole down its length
- **D.** cylinder with a cylindrical hole down its length
- **114.** A right circular cylinder is intersected by a plane at the oblique angle shown.



What geometric shape is formed by the planar cross section?



- **A.** circle
- **B.** ellipse
- C. parabola
- **D.** rectangle

115. A cone of finite height is intercepted by a plane as shown below.



Which shape represents the cross-section?









116. Which of the following drawings best represents a cross section of a sphere?







117. Gina made a gelatin dessert in a cylindrical mold. She took it out of the mold, placed it on a plate, and sliced it down the middle, as shown below.



What shape did Gina expose on each piece of the dessert where her cross-sectional cut was made?

A. circle

B. oval

- C. rectangle
- **D.** trapezoid



118. The figure below shows a sphere and a plane.



When a plane intersects a sphere, which phrase best describes the possible intersections that result?

- **A.** a point or a circle
- **B.** a circle or an ellipse
- **C.** a rectangle or a point
- **D.** a parallelogram or a point
- **119.** A deli clerk has lunchmeat formed in the shape of a cylinder with a radius of 2 inches and a height of 4 inches. He divides the lunchmeat into two equal sections by making a vertical cut as shown below.





<u>Note:</u> This figure is not drawn to scale. What is the shape of the cross section formed by the vertical cut?

A. circle

- **B.** ellipse
- **C.** square
- **D.** rectangle, but not a square
- **120.** A triangle has vertices at (0, 0), (0, 9), and (4, 0).




If the triangle is revolved about the *x*-axis, what 3-dimensional solid is formed?

- A. a pyramid with a square base of 4 units by 4 units and a height of 9 units
- **B.** a pyramid with a square base of 9 units by 9 units and a height of 4 units
- **C.** a cone with a diameter of 8 units and a height of 9 units
- **D.** a cone with a diameter of 18 units and a height of 4 units
- **121.** What will result in the largest area of intersection when a plane and a sphere intersect?





- **A.** The intersection includes the midpoint of a radius of the sphere.
- **B.** The intersection includes the center of the intersecting plane.
- **C.** The intersection does not include the center of the sphere.
- **D.** The intersection includes the diameter of the sphere.
- **122.** A triangle has vertices at (0, 0), (2, 1), (1, 3). About which line could the triangle be revolved, in order to form one cone?
 - **A.** The *x*-axis
 - **B.** The *y*-axis
 - **C**. The line x = 2y
 - **D**. The line y = 3x
- **123.** A cylinder is intersected by a plane that is not parallel to the bases and does not intersect the bases. What figure is formed from this intersection?
 - **A.** circle
 - **B.** ellipse
 - C. parabola
 - **D.** sphere
- 124. Four shapes are listed below.

I. Triangle II. Parallelogram III. Pentagon IV. Hexagon

Which of these are possible cross sections of a cube?

A. I and II

- B. I, II, and III
- C. I, II, and IV
- D. I, II, III, and IV
- **125.** In three-dimensional space, ABC is perpendicular to \overline{JK} and intersects it at Point K. An angled front view of this arrangement is shown below.



JK = 6 units BC = 4 units What solid figure is formed when[▲] ABC is translated until it intersects Point J?

- **A.** a square pyramid with a base length of 4 units
- **B.** a square pyramid with a base length of 6 units



- **C.** a triangular prism with a length of 4 units
- **D.** a triangular prism with a length of 6 units
- **126.** If a plane intersects a sphere through the sphere's center, which of the following is formed?
 - **A.** small circle
 - **B.** central circle
 - **C.** great circle
 - **D.** semicircle
- **127.** Which of the following figures could be produced by translating a plane figure back and forth in a direction perpendicular to the plane containing the figure?
 - A. cone
 - **B.** prism
 - **C.** pyramid
 - **D.** sphere
- **128.** A plane is parallel to the axis of a double cone. The plane does not pass through the double cone's apex. Which most accurately describes the intersection of the double cone and the plane?

A. hyperbola

B. parabola



- **C.** ellipse
- **D.** circle
- **129.** If a cylinder is cut in half across the middle (Figure 1), the two new faces that are revealed are both circles. If a cylinder is cut in half through the top, as shown in Figure 2, what is the shape of the two new faces?



D.



- **130.** Which phrase describes a possible intersection of a plane with a double cone?
 - **A.** two lines
 - **B.** two points
 - **C.** two circles
 - **D.** two ellipses
- **131.** Plane P intersects a double cone in a circle. Which statement must be true about Plane P?
 - **A.** Plane P is parallel to the axis and contains the apex.
 - **B.** Plane P is perpendicular to the axis and contains the apex.
 - **C.** Plane P is parallel to the axis but does not contain the apex.
 - **D.** Plane P is perpendicular to the axis but does not contain the apex.
- **132.** \overline{AB} is a diameter of a sphere. What is the intersection if the sphere is intersected by a plane through \overline{AB} ?
 - **A.** diametric circle
 - **B.** semicircle
 - **C.** hemisphere
 - **D.** great circle



- **133.** A plane intersects a cylinder parallel to the base of the cylinder. What geometric figure will be formed from this intersection?
 - A. circle
 - **B.** ellipse
 - C. parabola
 - **D.** straight line
- **134.** A plane intersects a double cone through the apex of the double cone and the axis. Which of the following is generated by the intersection?
 - **A.** ellipse
 - **B.** hyperbola
 - **C.** single point
 - **D.** intersecting line segments
- 135. Which of these is NOT a possible cross section of a cylinder?
 - A. Circle
 - B. Ellipse
 - C. Rectangle



D. Trapezoid

