Key

Geometry
UNIT 4 REVIEW

1. What is the name of the cross section formed when a plane intersects a sphere so that the plane passes through the center of the sphere? Use a complete sentence to answer the question.

The cross section is called a great circle.

2. Suppose a student stacks 1000 congruent squares one on top of the other, and the teacher stacks 1000 similar squares, with each square a little smaller than the one below it.

   a. What is the name of the solid formed by the stack of congruent squares?

   square prism

   b. Relate the dimensions of one of the congruent squares to the dimensions of this solid.

   The side of the square base is equal to the side of the original square.

   c. What is the name of the solid formed by the stack of similar squares?

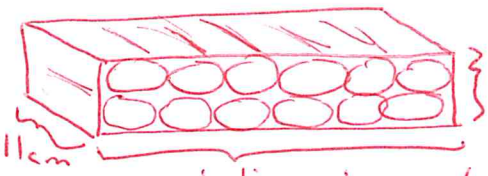
   Square pyramid

   d. Relate the height of the stack of similar squares to a dimension of this solid.

   The height of the stack of squares is equal to the height of the pyramid.

3. A can of juice has a height of 11 centimeters and a diameter of 5 centimeters. A fridge pack of juice consists of 12 cans stacked in a box in two rows of six. The cans touch the box on all sides. Determine the volume of the empty space in the box.

$r = 2.5\text{cm} \left(= \frac{1}{2}d\right)$



2 diameters = 10 cm

6 diameters = 6(5) = 30cm

Volume of box = $(10\text{cm})(30\text{cm})(11\text{cm}) = 3300\text{cm}^3$

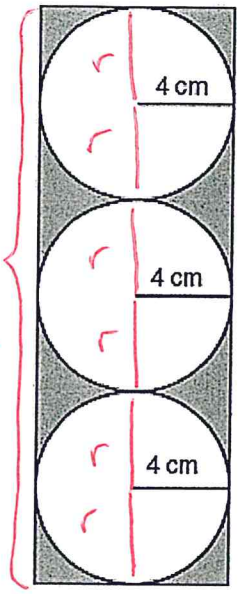
Vol of (1) can = $Bh = \pi r^2 h = \pi (2.5\text{cm})^2 (11\text{cm}) = 216.0\ \text{cm}^3$

Vol of (12) cans = $(216.0)(12) = 2592\ \text{cm}^3$

Empty space = 3300 − 2592

408 cm^3

4. Three tennis balls are stacked vertically to the top of a cylindrical container. The radius of each ball and the radius of the container is 4 centimeters.



a. Determine the volume of each tennis ball. Show all your work.

$V = \frac{4}{3}\pi r^3 = \frac{4\pi r^3}{3} = \frac{4\pi(4)^3}{3}$

$= 268.1\ cm^3$

b. Determine the volume of the cylindrical container. Show all your work.

$V = Bh = \pi r^2 h = \pi(4)^2(24)$

$= 1206.4\ cm^3$

c. Is the volume of one tennis ball less than, greater than, or equal to the amount of empty space in the container? Explain your reasoning.

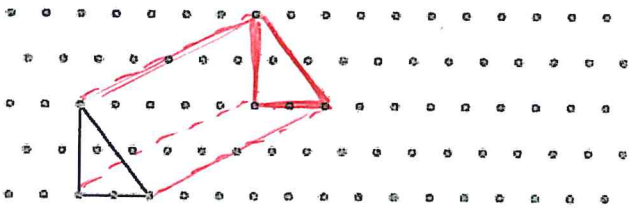
Vol of (3) balls $= (268.1\ cm^3)(3) = 804.3\ cm^3$

Volume of cylinder − Vol of 3 balls = empty space

$1206.4\ cm^3 - 804.3\ cm^3 = 402.1\ cm^3$ of empty space

(*) One tennis ball is less than the amount of empty space in the container.

5. a. Translate the triangle in a diagonal direction to create a second triangle.



b. Use dotted line segments to connect each pair of corresponding vertices in the triangles.

c. What is the shape of each lateral face of the solid figure formed by this translation?

They are rectangles.

d. What is the name of the solid formed by this translation?

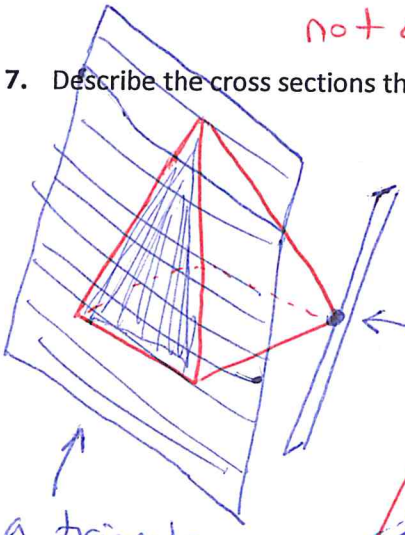
triangular prism

6. Decide if the object shown could have been created by translating, rotating, or stacking. Explain.

a disk → translating would make a cylinder, not a sphere

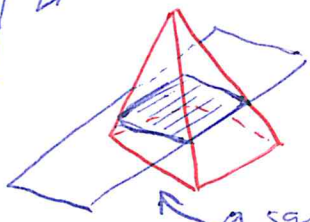
a disk → similar disks

7. Describe the cross sections that are formed when a plane intersects a square pyramid.

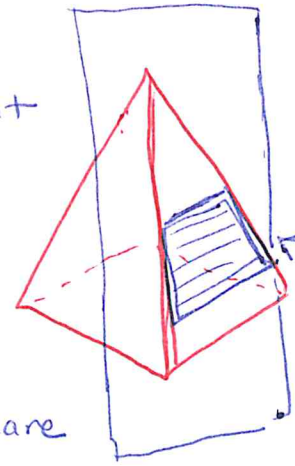


a point

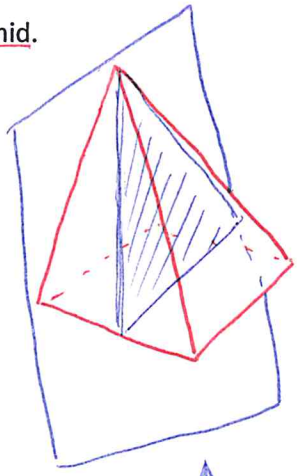
a triangle



a square

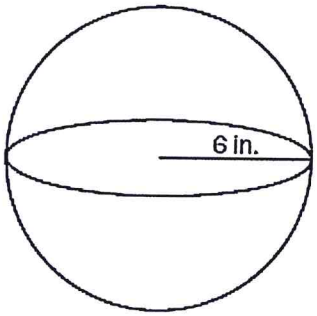


a trapezoid



a triangle

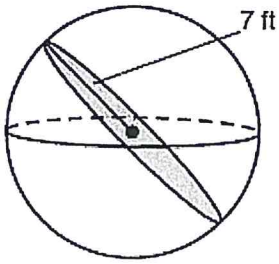
8. What is the volume of the sphere?



$V = \frac{4}{3}\pi r^3 = \frac{4\pi r^3}{3} = \frac{4\pi(6m)^3}{3}$

$= 904.8\ in^3$

____ 9. The shaded circle is a great circle. What is the diameter of the sphere?



$d = 2r$

a. 5 feet
b. 7 feet
c. 10 feet
d. 14 feet

10. Name each set of actions from the following list that could result in forming the same solid, and name the solid that is formed.

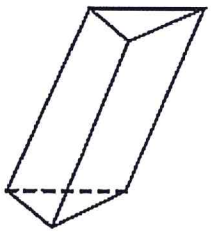
- translating a square = Square prism
- translating a circle = cylinder
- rotating a rectangle = cylinder
- rotating a triangle = cone
- stacking congruent circles = cylinder
- stacking similar circles = cone
- stacking congruent squares = square prism

(1.) translating a square or stacking congruent squares creates a (square prism)

(2.) translating a circle, rotating a rectangle or stacking congruent circles will create a (cylinder)

(3.) a (cone) is produced by rotating a triangle or stacking similar circles

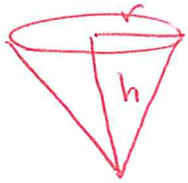
D **11.** Which term best describes the figure shown?



a. triangular pyramid
b. triangular prism
c. ~~square pyramid~~
d. oblique triangular prism

A **12.** The volume of a cone is 218 cubic centimeters and the height of the cone is 13 centimeters. What is the radius of the cone to the nearest whole number?

a. 4 centimeters
b. 5 centimeters
c. 8 centimeters
d. 16 centimeters



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

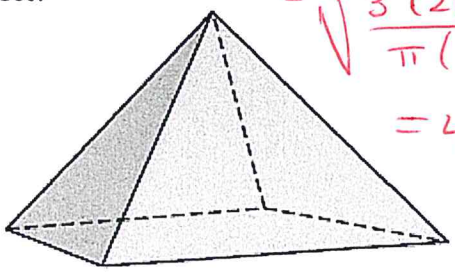
$$3V = \pi r^2 h$$

$$\frac{3V}{\pi h} = r^2 \quad \therefore \quad r = \sqrt{\frac{3V}{\pi h}}$$

$$= \sqrt{\frac{3(218)}{\pi(13)}}$$

$$= 4$$

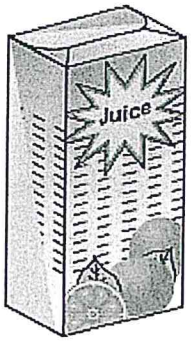
D **13.** What could have been used to create the following object?



a. ~~translating a triangle~~
b. ~~rotating a rectangle~~
c. ~~translating a rectangle~~
d. stacking similar squares

B

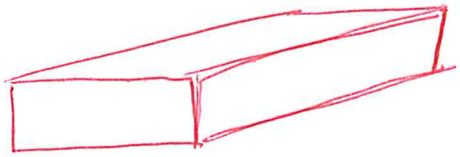
14. Which action could have been used to create the following object?



a. rotating a rectangle
b. translating a rectangle
c. stacking similar rectangles that are not congruent
d. translating a triangle

D

15. A student translated rectangle diagonally in space to form a solid. What are the shapes of the lateral side of the solid?



a. pyramids
b. triangles
c. prisms
d. parallelograms

A

16. A stack of 1000 congruent circles forms which of these figures?

a. cylinder
b. sphere
c. cone
d. cube

D

17. Which two actions could create the same solid?

a. translating a triangle and stacking similar squares = triangular prism + square pyr.
b. stacking congruent circles and rotating a circle = cyclinder + sphere
c. translating a triangle and rotating a rectangle = triangular prism + cone
d. rotating a triangle and stacking similar circles = cone + cone

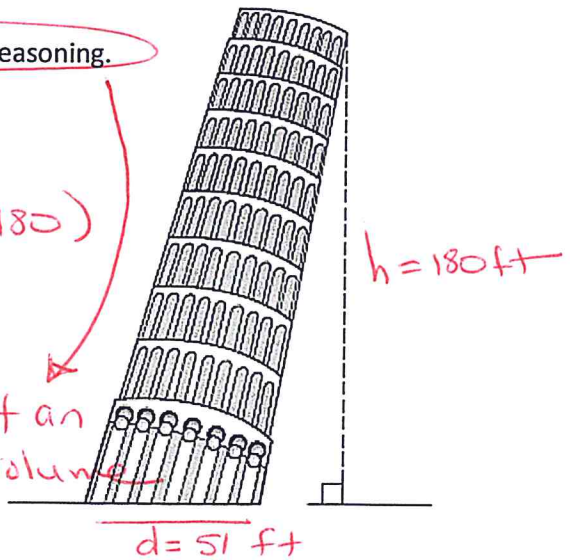
18. The Leaning Tower of Pisa in Italy is about 180 feet tall from the top of the tower vertically to the ground. It has a diameter of approximately 51 feet.

Determine the approximate volume of the tower. Explain your reasoning.

$r = \frac{1}{2}d = \frac{51}{2} = 25.5$ ft

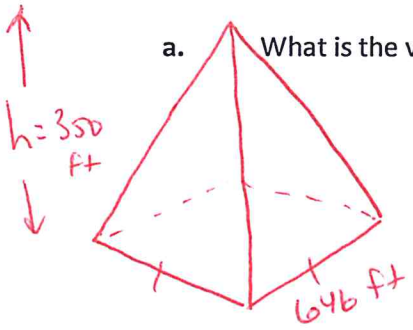
$V = Bh = \pi r^2 h = \pi(25.5)^2(180)$

$V = 367{,}707.7$ ft^3



Cavalieri's principle states that an oblique prism has the same volume as a right prism.

19. The Luxor Hotel in Las Vegas is a replica of the Pyramid of Khafre at Giza, one of the seven wonders of the world. The Luxor's base is a square with a side length of 646 feet, and it is 350 feet tall.



a. What is the volume of the Luxor Hotel?

$$V = \frac{1}{3}Bh = \frac{Bh}{3} = \frac{s^2h}{3} = \frac{(646)^2(350)}{3}$$

$$= \boxed{48,686,866.7\ ft^3}$$

b. The Pyramid of Khafre has a volume of 2,226,450 cubic meters. Its base is a square with a side length of 215 meters. What is the height of the Pyramid of Khafre?

$$V = \frac{Bh}{3}$$

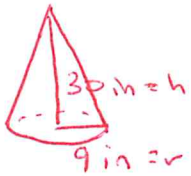
$$3V = Bh$$

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

$$h = \frac{3V}{s^2} = \frac{3(2,226,450\ m^3)}{(215\ m)^2}$$

$$\boxed{h = 144.5\ m \text{ tall}}$$

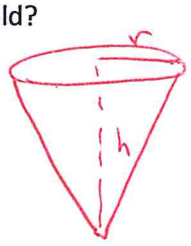
20. A traffic cone has a radius of 9 inches and a height of 30 inches. What is the volume of this traffic cone?



$$V = \frac{Bh}{3} = \frac{\pi r^2 h}{3} = \frac{\pi (9)^2 30}{3}$$

$$= \boxed{2544.7\ in^3}$$

21. A funnel that is used to change the oil in a car is in the shape of a cone. The base of the funnel has a circumference of 60 centimeters. The height of the funnel is 25 centimeters. How much oil will this funnel hold?



$$C = 2\pi r$$

$$\frac{C}{2\pi} = r = \frac{(60\ cm)}{2\pi}$$

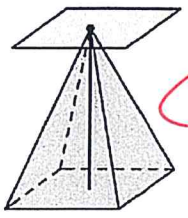
$$r = 9.55\ cm$$

$$V = \frac{\pi r^2 h}{3} = \frac{\pi (9.55)^2 25}{3}$$

$$V = \boxed{2387.7\ cm^3}$$

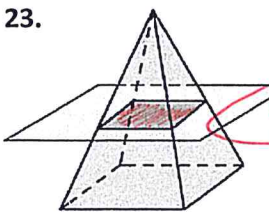
Describe the shape of each cross section.

22.



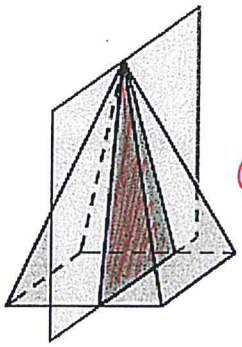
a point

23.



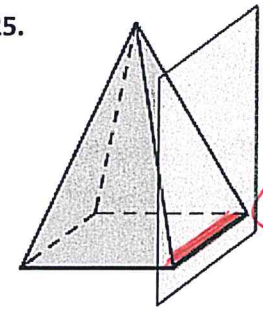
a square

24.



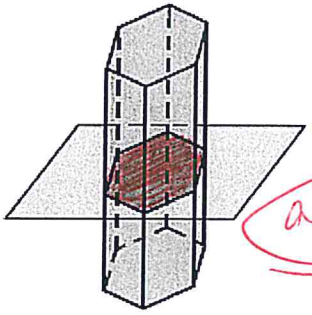
a triangle

25.



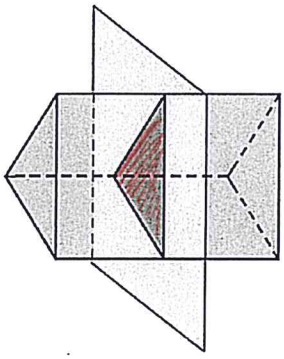
a line

26.



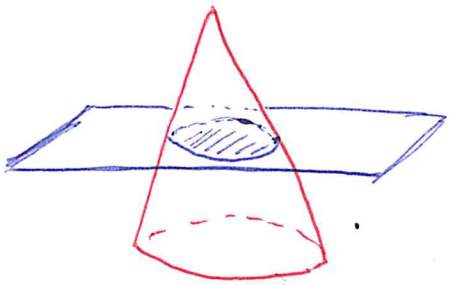
a hexagon

27.

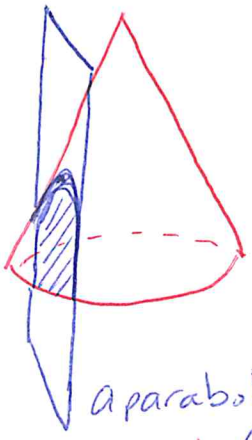


a triangle

28. Sketch two cross sections of a cone—one cross section that is parallel to the base and another cross section that is perpendicular to the base.

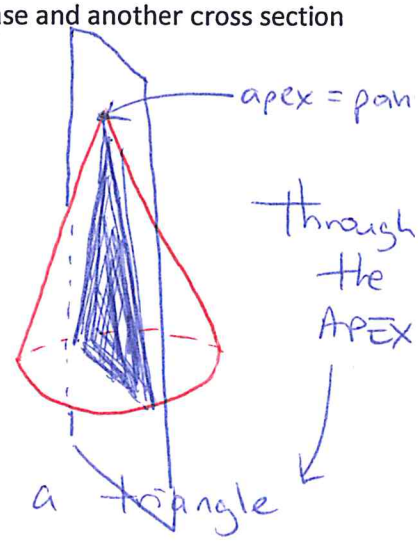


a circle



a parabola

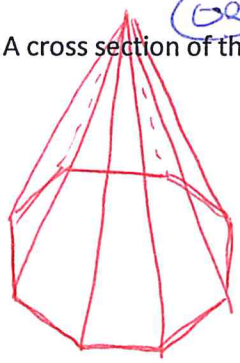
(OR)



a triangle

29. A solid's cross section parallel to the base is an octagon. A cross section of the solid perpendicular to the base is a triangle. Identify the solid.

Octagonal pyramid



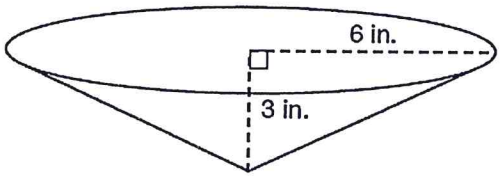
Match each definition to its corresponding term.

D **30.** oblique triangular prism
B **31.** oblique rectangular prism
C **32.** oblique cylinder
A **33.** isometric paper
F **34.** right triangular prism
G **35.** right rectangular prism
E **36.** right cylinder

a. dotted paper used to show three-dimensional diagrams
b. a prism with rectangles as bases whose lateral faces are not perpendicular to those bases
c. a 3-dimensional object with two parallel, congruent, circular bases, and a lateral face not perpendicular to those bases
d. a prism with triangles as bases whose lateral faces are not perpendicular to those bases
e. a 3-dimensional object with two parallel, congruent, circular bases, and a lateral face perpendicular to those bases
f. a prism with triangles as bases whose lateral faces are perpendicular to those bases
g. a prism with rectangles as bases whose lateral faces are perpendicular to those bases

Calculate the volume of each cone.

37.



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

$= \frac{\pi (6\text{ in})^2 (3\text{ in})}{3}$

$= 36\pi$

$= 113.1\ \text{in}^3$

Calculate the volume of the square pyramid.

38.

$V = \frac{1}{3}Bh$

$= \frac{Bh}{3} = \frac{l \cdot w \cdot h}{3}$

$= \frac{(100)(100)(125)}{3}$

$= 416{,}666.7\ \text{yd}^3$