

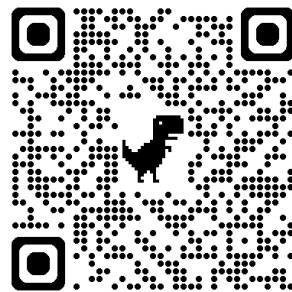
Name:

Common Core Geometry

Unit 7

Area and Volume

Mr. Schlansky



Volume Formulas

$V = lwh$ for rectangular/square base

Rectangular prism: $V = lwh$

Triangular prism: $V = \frac{1}{2}lwh$

Pyramid: $V = \frac{1}{3}lwh$

$V = \pi r^2 h$ for circular base

Cylinder: $V = \pi r^2 h$

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

Sphere: $V = \frac{4}{3}\pi r^3$

Lesson 1: I can find area on the grid by subtracting the areas of the outside triangles

($A = \frac{1}{2}bh$) from the rectangle ($A = bh$)

Area with Coordinate Geometry

Box Method

- 1) Build a rectangle around the shape
- 2) Find the area of the rectangle ($A = lw$)
- 3) Find the area of the triangles outside of the shape ($A = \frac{1}{2}lw$)

*There will be 3 triangles for area of a triangle and 4 triangles for area of quadrilateral.

- 4) Subtract the triangle areas from the rectangle area

Lesson 2: I can find the area of a non-right triangle using $A = \frac{1}{2}ab \sin C$

Area of a Triangle: $A = \frac{1}{2}ab \sin C$

a, b are sides and C is the INCLUDED angle

You may need to add and subtract from 180 in order to find the third angle of the triangle.

Lesson 3: I can calculate volume using the their formulas

Substitute into the appropriate formula

The radius is half of the diameter.

Rounded: Type π in to the calculator

In terms of π (π in the answers): Don't type π in.

If you are finding the value of half of a shape, put $\frac{1}{2}$ in front of the formula

-**A square pyramid has a square base!** The length and width are the same.

-**If given slant height for pyramid/cone, use Pythagorean Theorem** to find the height.

Cut the diameter/length in half for the small leg. The slant height is the hypotenuse.

- Triangular prism: length and width are the length and width of the rectangle.

Lesson 4: I can find a missing piece of information given the volume by using the formulas and doing algebra.

If given volume, substitute values into the appropriate formula and use algebra to find the missing variable or **USE THE EQUATION SOLVER TO SOLVE THE EQUATION!!!!**

Lesson 5: I can calculate compound volume by adding the individual volumes together.

Compound volume: If a shape is made up of multiple shapes, find the volume of each shape and add them together.

Lesson 6: I can find a 2 dimensional cross section of a 3 dimensional object by understanding that parallel to the base is horizontal and perpendicular to the base is vertical.

Cross Sections (2 dimensional slice of a 3 dimensional object):

Prism/Cylinder:

The cross section parallel to the base is the base

The cross section perpendicular to the base is a rectangle

Pyramid/Cone:

The cross section parallel to the base is the base

The cross section perpendicular to the base is a triangle

Rectangular Prism: Rectangle, triangle

Cylinder: Circle, ellipse, rectangle

Cone: Circle, ellipse, triangle, parabola

Pyramid: Rectangle, triangle

Sphere: Circle

Lesson 7: I can find the volume of a hollow object by subtracting the inside shape from the outside shape using a cross section.

Hollow shapes:

-Draw a cross section to help you. Subtract the thickness from both sides of the cross section to find the inside dimensions. The heights will be the same.

-Once you find the inside dimensions, calculate the volume of the outside shape, the volume of the inside shape, and subtract them.

Lesson 8: I can find population density using $density = \frac{mass}{volume}$.

$$Density = \frac{mass}{volume}$$

1) Calculate volume

$$2) Density = \frac{mass}{volume}$$

Lesson 9: I can perform dimensional analysis by starting with the volume and matching up the units.

Dimensional Analysis:

Start with whatever piece of information they give you. Keep on converting, canceling out the given units until you end up with the desired unit. If there is a quantity, multiply by the quantity at the end. If there is a percent, convert to a decimal and multiply by that decimal at the end. Example, a volume of 12 cubic inches has a density of $7.6 \text{ g} / \text{in}^3$, which costs \$1.25 per kilogram, and 50 are needed that are each filled up to 85%:

$$12 \text{ in}^3 \cdot \frac{7.6 \text{ g}}{1 \text{ in}^3} \cdot \frac{1 \text{ kg}}{1000 \text{ g}} \cdot \frac{\$1.25}{1 \text{ kg}} \cdot 50 \cdot .85$$

***If given kilo, cross out 1 kilogram/kiloliter/kilometer and replace with 1000 grams/liters/meters.**

Lesson 10: I can find cost/mass by calculating the volume and using dimensional analysis.

Modeling Volume

1) Check units. Convert if necessary. To convert units: Multiply to get units to cancel

out. Example: $3 \text{ in} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}}$

2) FIND VOLUME

3) Begin dimensional analysis.

Example, a volume of 12 cubic inches has a density of $7.6 \text{ g} / \text{in}^3$, which costs \$1.25 per kilogram, and 50 are needed that are each filled up to 85%:

$$12 \text{ in}^3 \cdot \frac{7.6 \text{ g}}{1 \text{ in}^3} \cdot \frac{1 \text{ kg}}{1000 \text{ g}} \cdot \frac{\$1.25}{1 \text{ kg}} \cdot 50 \cdot .85$$

Lesson 11: I can find volume by converting units and using the appropriate formulas

The units must match the cubic units BEFORE calculating volume

Feet to inches: Multiply by 12

Inches to feet: Divide by 12

Lesson 12: I can find cost/mass by converting units first, calculating the volume and using dimensional analysis.

Same notes as lessons 10 and 11.

Lesson 13: I can complete Shelf/Box Questions by drawing a two dimensional diagram.

-Draw a two dimensional diagram of the shelf/bottom of the box

-Find how many of each object will fit in each dimension by dividing the dimension by the diameter/width of the object and sketch that into the diagram

*For boxes, add in the third dimension

-Multiply the amount in each dimension by each other to come up with the total number.

Lesson 14: I can rotate an object in 3 dimensions by reflecting it in 2 dimensions and connect the image and the original with curves.

3 dimensional rotations ALMOST ALWAYS form a cylinder or cone

Reflect the shape in 2 dimensions and connect the images with curves

If asked for volume, substitute into the appropriate volume formulas

Lesson 15: I can prepare for my area and volume test by practicing!

Name _____
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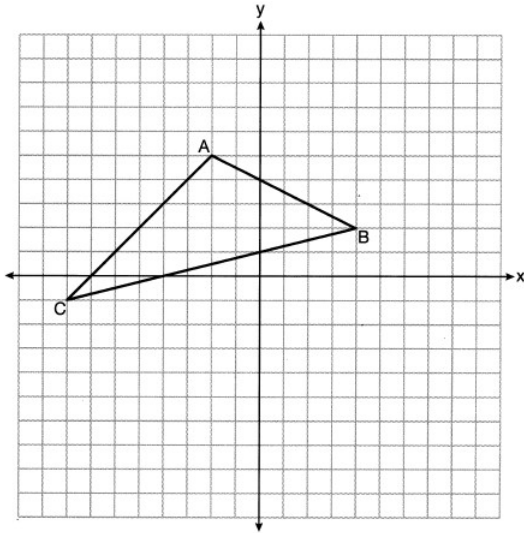
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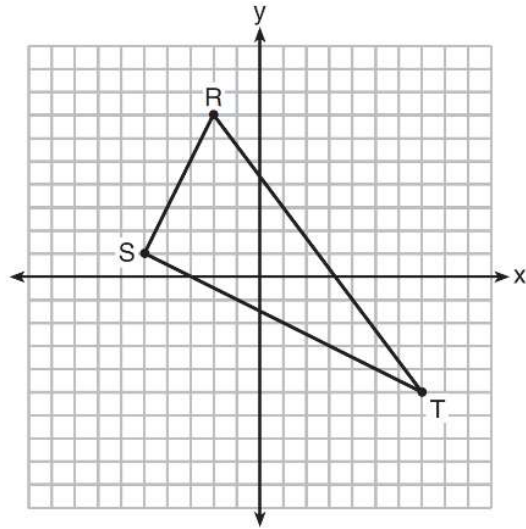
Finding Area on the Coordinate Grid

Find the area of the following shapes

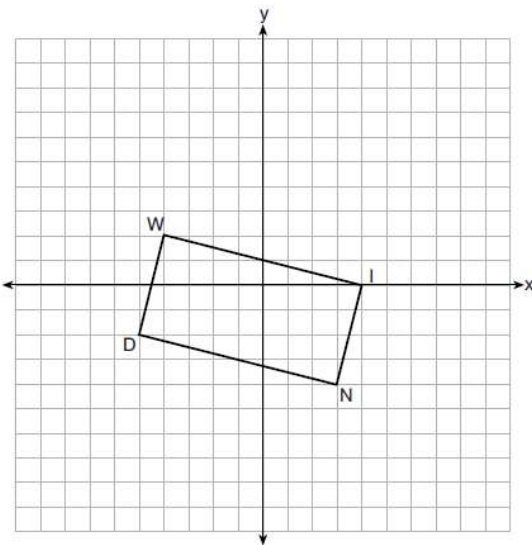
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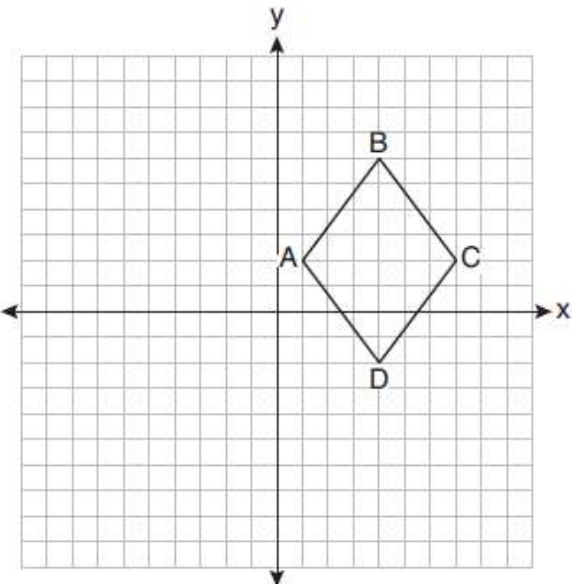
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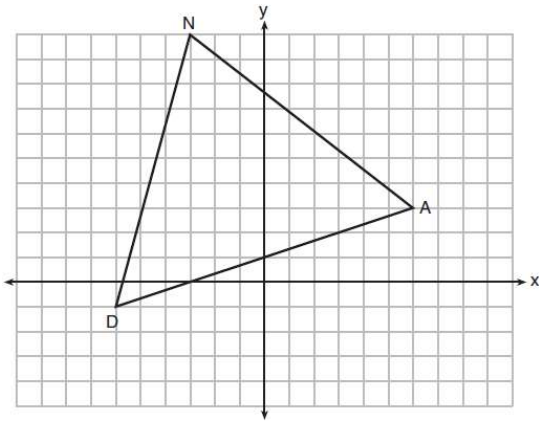
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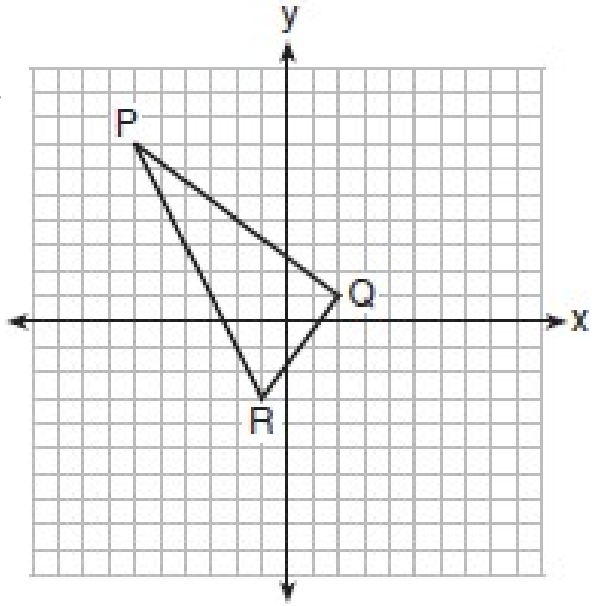
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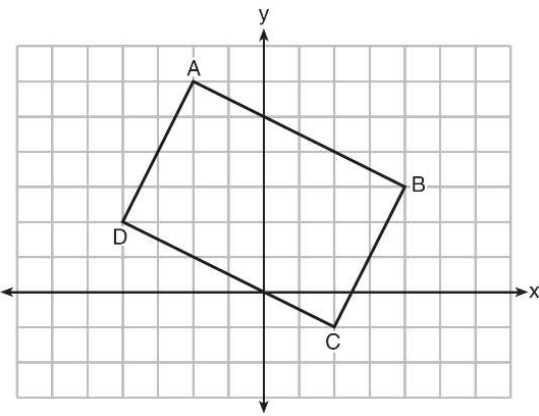
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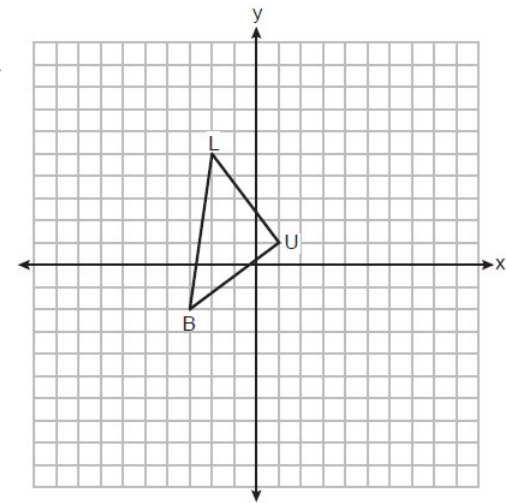
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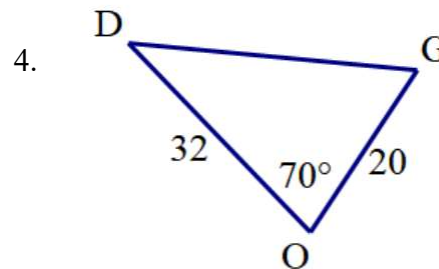
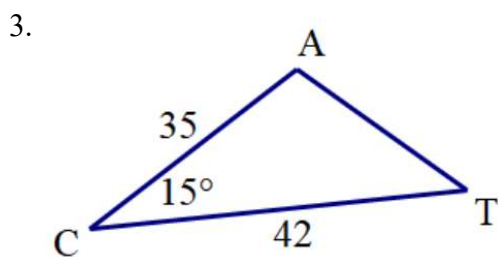
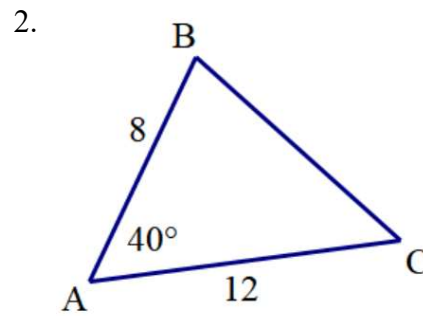
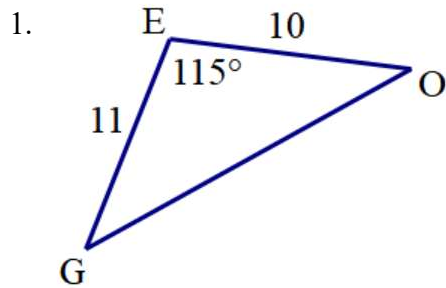
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Date _____
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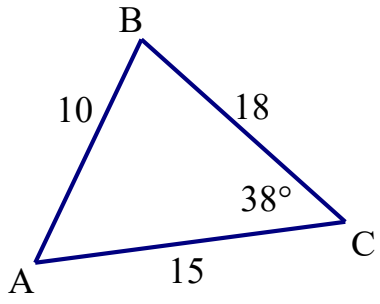


Area of a Triangle

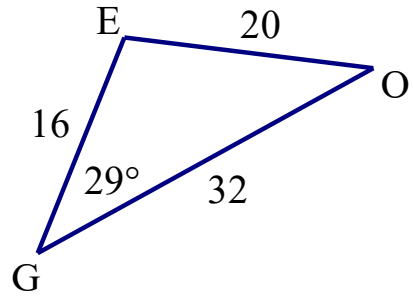
Find the area of the following triangles to the nearest tenth of a square unit



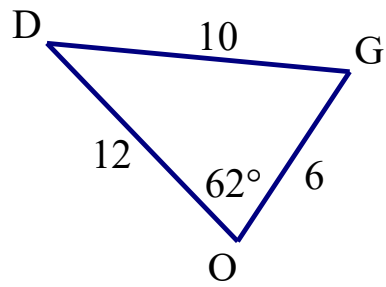
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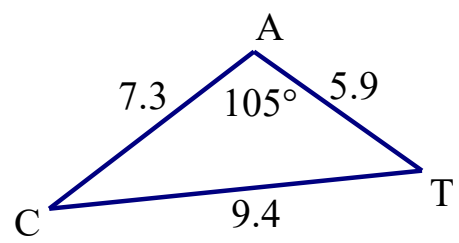
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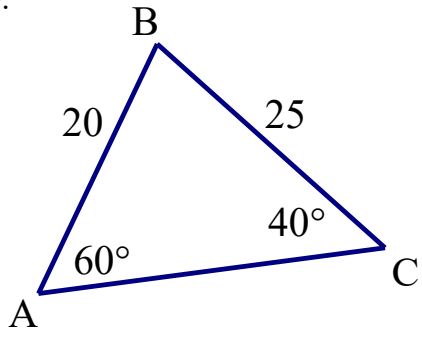
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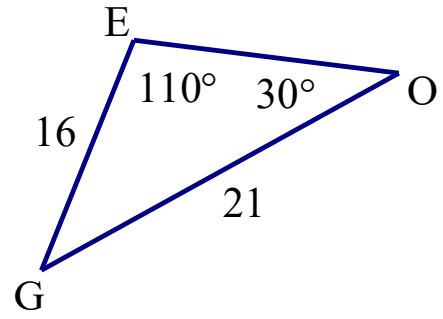
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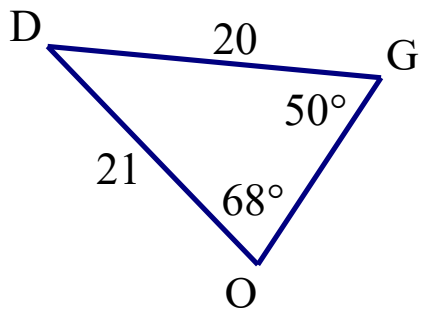
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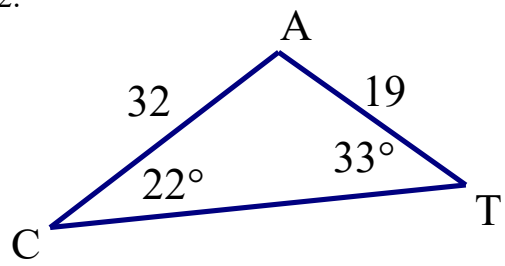
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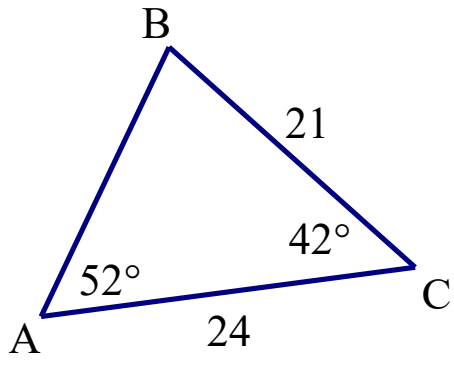
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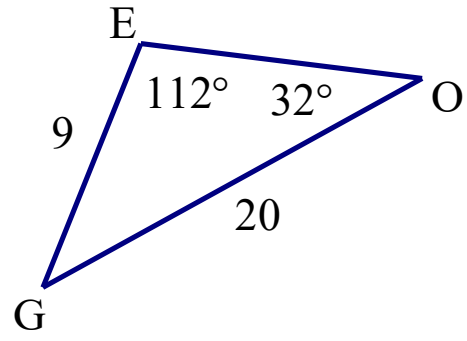
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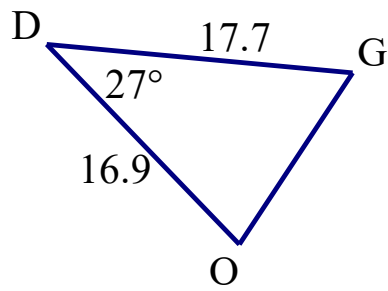
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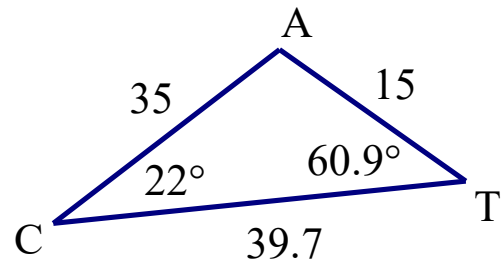
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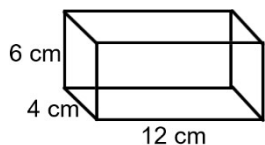


Name _____
Mr. Schlansky

Date _____
Geometry

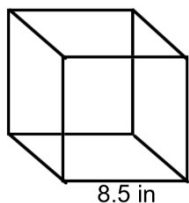
Calculating Volume

1. Find the volume of the rectangular prism given below



2. Find the volume of a rectangular prism that has dimensions 10 feet by 14 feet by 8 feet.

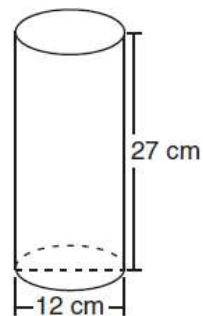
3. Find the volume of the cube shown below.



4. Lenny made a cube in technology class. Each edge measured 1.5 cm. What is the volume of the cube in cubic centimeters?

5. Which expression represents the volume, in cubic centimeters, of the cylinder represented in the diagram below?

- 1) 162π 3) 972π
2) 324π 4) $3,888\pi$



6. What is the volume, in cubic centimeters, of a cylinder that has a height of 15 cm and a diameter of 12 cm?

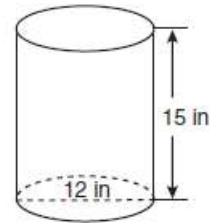
- 1) 180π
- 2) 540π
- 3) 675π
- 4) $2,160\pi$

7. A cylinder is 8 cm tall and has a base with a radius of 3 cm. What is the total volume of the cylinder to the nearest tenth of a centimeter?

8. A cylindrical container has a diameter of 12 inches and a height of 15 inches, as illustrated in the diagram below.

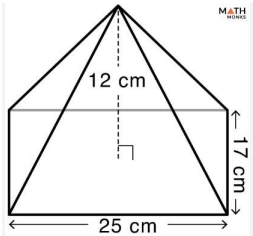
What is the volume of this container?

- 1) 6,785.8
- 2) 4,241.2
- 3) 2,160.0
- 4) 1,696.5

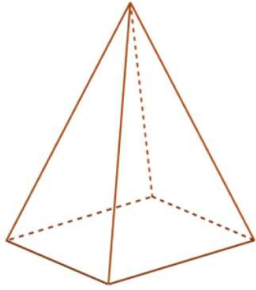


(Not drawn to scale)

9. Find the volume of the pyramid below



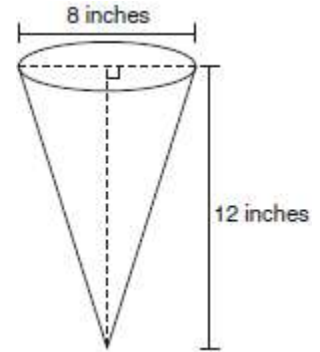
10. The pyramid below has a base with a length of 4 cm, width of 2.5 cm, and an altitude of 9 cm. Find the volume of the pyramid.



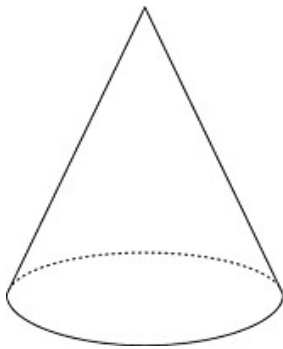
11. In the diagram below, a right circular cone has a diameter of 8 inches and a height of 12 inches.

What is the volume of the cone to the *nearest cubic inch*?

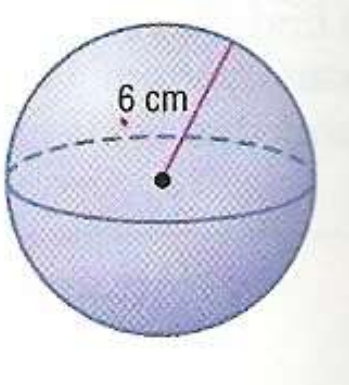
- 1) 201 3) 603
- 2) 481 4) 804



12. A cone has a base with a radius of 2 and an altitude of 7. Find its volume in terms of π .



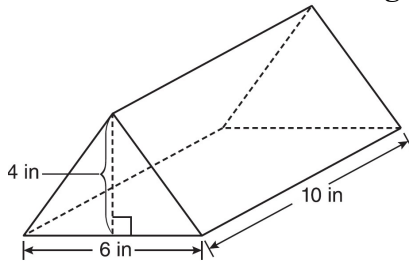
13. Find the volume of the sphere shown below in terms of π .



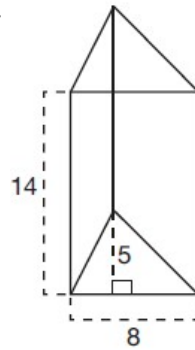
14. Find the volume of a sphere with a diameter of 10 inches rounded to the *nearest hundredth* of a cubic inch.

Find the volume of the following triangular prisms

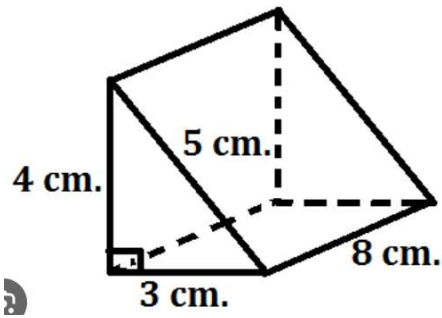
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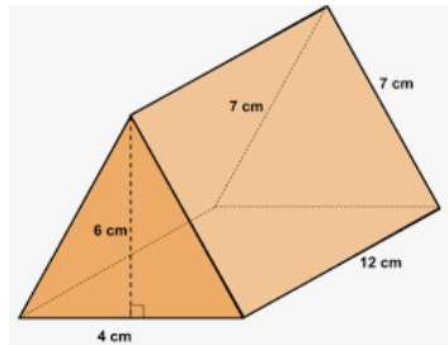
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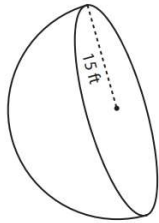
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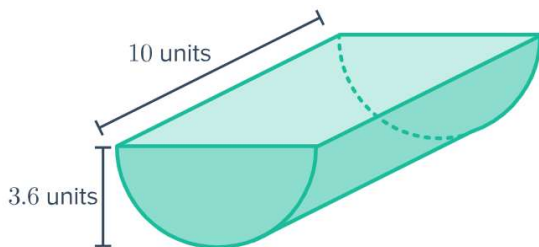
19. Find the volume of the shape below in terms of π .



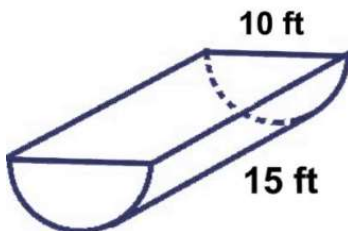
20. Find the volume of the object below if the diameter is 18.2 meters. Round your answer to the *nearest cubic meter*.



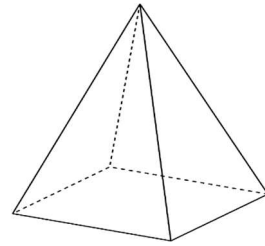
21. Find the volume of the object below to the *nearest cubic unit*.



22. Find the volume of the object below in terms of π .

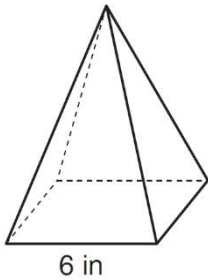


23. A regular pyramid has a square base with an edge length of 14 cm and an altitude of 24 cm. Find its volume.

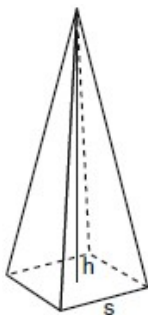


24. Find the volume of a square pyramid with a base with edge length 4 inches and a height of 18 inches.

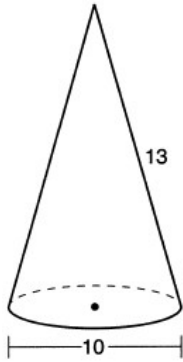
25. As shown in the diagram below, a regular pyramid has a square base whose side measures 6 inches. If the altitude of the pyramid measures 12 inches, find its volume.



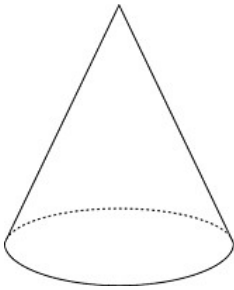
26. A side, s , of the base of the pyramid is 12 meters, and the height, h , is 42 meters. What is the volume of the pyramid in cubic meters?



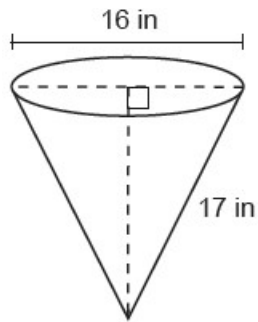
27. Determine and state the volume of the cone, in terms of π .



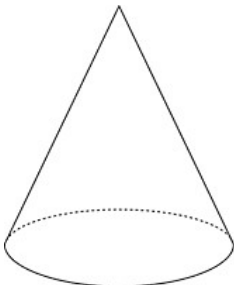
28. A cone has a base with a diameter of 4 and a slant height of 7. Find its volume rounded to the *nearest tenth*.



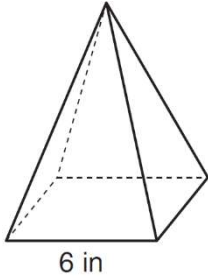
29. In the diagram below, a cone has a diameter of 16 inches and a slant height of 17 inches. What is the volume of the cone, in terms of π , in cubic inches?



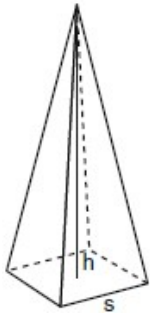
30. In the diagram below, a right circular cone has a diameter of 8 and a slant height of 7. Find the volume of the cone rounded to the *nearest tenth*.



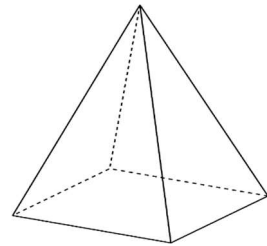
31. As shown in the diagram below, a regular pyramid has a square base whose side measures 6 inches. If the slant height measures 9 inches, find its volume to the nearest cubic inch.



32. A side, s , of the base of the pyramid is 12 meters, and the slant height 50 meters. What is the volume of the pyramid to the nearest cubic meter?



33. A regular pyramid has a square base with an edge length of 14 cm and a slant height of 24 cm. Find its volume to the nearest cubic centimeter.



34. Find the volume of a square pyramid with a base with edge length 4 inches and a slant height of 14 inches.

Name _____
Mr. Schlansky

Date _____
Geometry



Volume with Algebra

1. A brick in the shape of a rectangular prism has a base that measures 3 inches by 5 inches. If the volume of the brick is 90 cubic inches, what is the height of the brick?

- 1) 15
- 2) 6
- 3) 8
- 4) 11

2. A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches. What is the radius of the cylinder to the *nearest tenth of an inch*?

- 1) 6.3
- 2) 11.2
- 3) 19.8
- 4) 39.8

3. The base of a pyramid is a rectangle with a width of 6 cm and a length of 8 cm. Find, in centimeters, the height of the pyramid if the volume is 288 cm^3 .

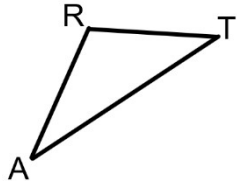
- 1) 6
- 2) 8
- 3) 18
- 4) 24

4. Find the radius of a sphere with a volume of 576π cubic inches. Find the answer to the nearest tenth of an inch.

- 1) 4.9
- 2) 15.1
- 3) 9.2
- 4) 7.6

5. The area of $\triangle ART$ is 48 square inches. If $\overline{AR} = 12$ and $\angle TAR = 26^\circ$, find \overline{AT} to the nearest tenth of an inch.

- 1) 17.4
- 2) 18.2
- 3) 21.7
- 4) 24.9



6. The volume of a cylinder is $12,566.4 \text{ cm}^3$. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.

- 1) 12.3
- 2) 22.4
- 3) 7.9
- 4) 501.8

7. The Parkside Packing Company needs a rectangular shipping box. The box must have a length of 11 inches and a width of 8 inches. Find, to the *nearest tenth of an inch*, the height of the box such that the volume is 800 cubic inches.

- 1) 9.1
- 2) 14.7
- 3) 42.1
- 4) 7.9

8. If the volume of a sphere is 36π , what is the radius of the sphere?

- 1) 3
- 2) 6
- 3) 12
- 4) 24

9. The volume of a sphere is approximately 44.6022 cubic centimeters. What is the radius of the sphere, to the *nearest tenth of a centimeter*?

- 1) 2.2
- 2) 3.3
- 3) 4.4
- 4) 4.7

10. An ice cream waffle cone can be modeled by a right circular cone with a base diameter of 6.6 centimeters and a volume of 54.45π cubic centimeters. What is the number of centimeters in the height of the waffle cone?

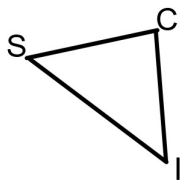
- 1) $3\frac{3}{4}$
- 2) 5
- 3) 15
- 4) $24\frac{3}{4}$

10. The Great Pyramid of Giza was constructed as a regular pyramid with a square base. It was built with an approximate volume of 2,592,276 cubic meters and a height of 146.5 meters. What was the length of one side of its base, to the *nearest meter*?

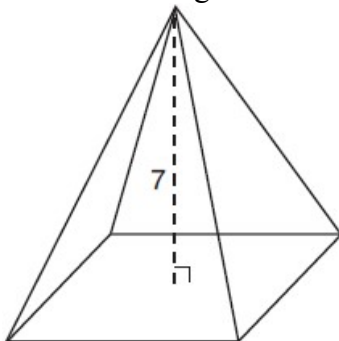
- 1) 73
- 2) 77
- 3) 133
- 4) 230

11. Find the length of the radius of a cylinder to the *nearest tenth* if it has a volume of 60 cm^3 and a height of 10 cm .

12. The area of $\triangle SCI$ is 124 square centimeters. If $\overline{SC} = 25$ and $\angle CSI = 51$, find \overline{SI} to the nearest tenth of a centimeter.



13. The pyramid shown below has a square base, a height of 7, and a volume of 84. What is the length of the side of the base?





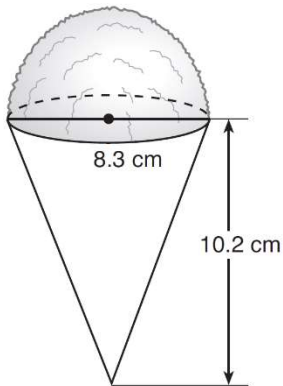
Name _____
Mr. Schlansky

Date _____
Geometry

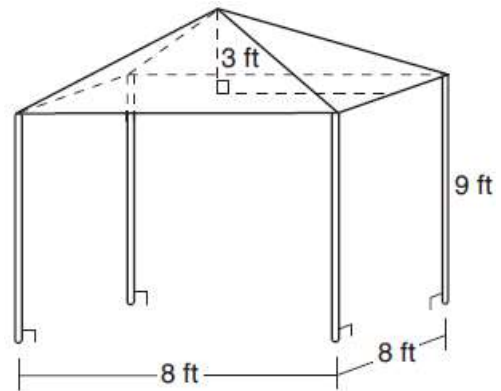
Compound Volume

Find the compound volume of the following shapes rounded to the *nearest tenth of a unit*.

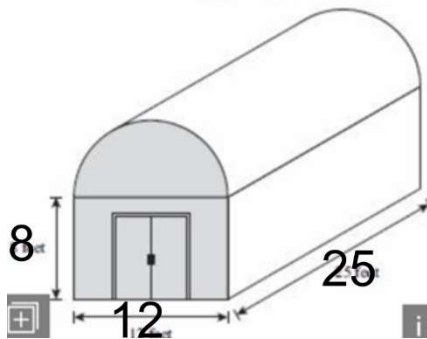
1.



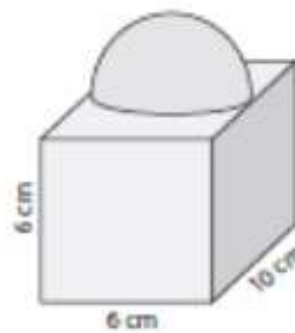
2.



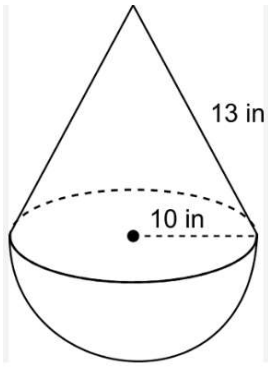
3.



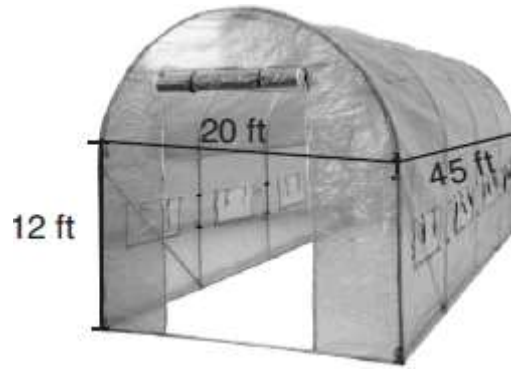
4.



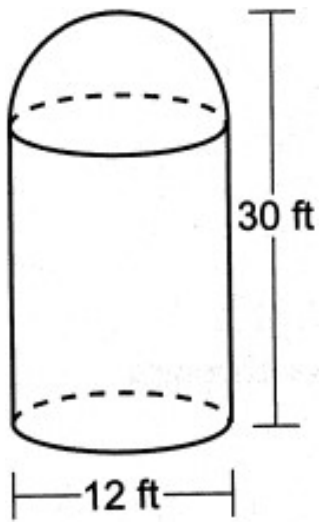
5.



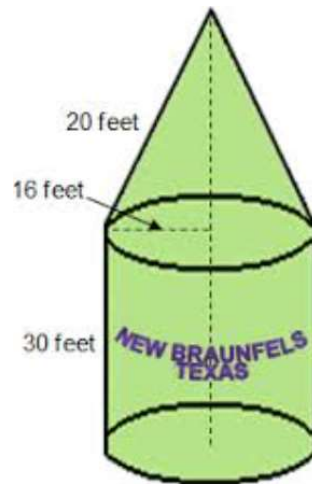
6.



7.



8.



Name _____
Mr. Schlansky

Date _____
Geometry

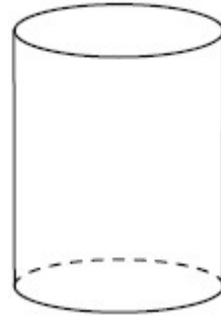


Cross Sections

1. A plane intersects a cylinder perpendicular to its bases.

This cross section can be described as a

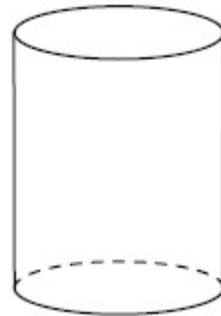
- 1) rectangle
- 2) parabola
- 3) triangle
- 4) circle



2. A plane intersects a cylinder parallel to its bases.

This cross section can be described as a

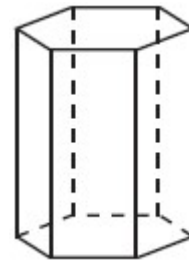
- 1) rectangle
- 2) parabola
- 3) triangle
- 4) circle



3. A right hexagonal prism is shown below. A two-dimensional cross section that is perpendicular to the base is taken from the prism.

Which figure describes the two-dimensional cross section?

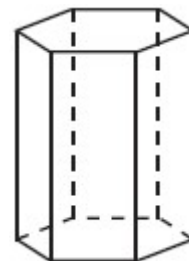
- 1) triangle
- 2) rectangle
- 3) pentagon
- 4) hexagon



4. A right hexagonal prism is shown below. A two-dimensional cross section that is parallel to the base is taken from the prism.

Which figure describes the two-dimensional cross section?

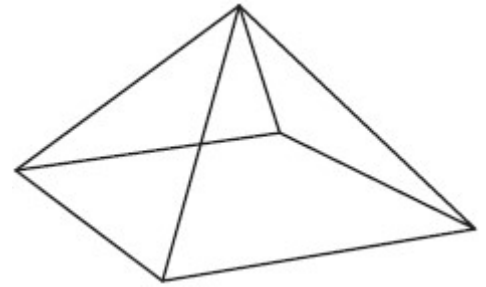
- 1) triangle
- 2) rectangle
- 3) pentagon
- 4) hexagon



5. A square pyramid is intersected by a plane passing through the vertex and parallel to the base.

Which two-dimensional shape describes this cross section?

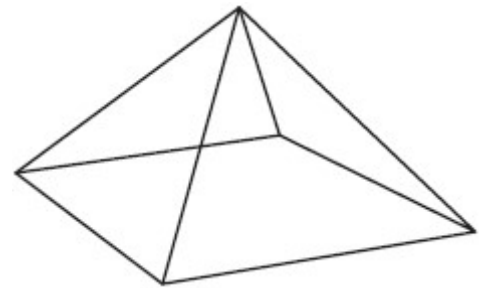
- 1) square
- 2) triangle
- 3) pentagon
- 4) rectangle



6. A square pyramid is intersected by a plane passing through the vertex and perpendicular to the base.

Which two-dimensional shape describes this cross section?

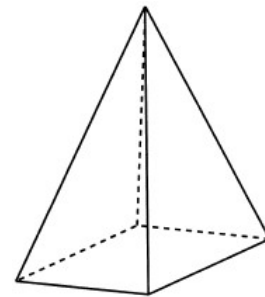
- 1) square
- 2) triangle
- 3) pentagon
- 4) rectangle



7. In the diagram below, a plane intersects a square pyramid parallel to its base.

Which two-dimensional shape describes this cross section?

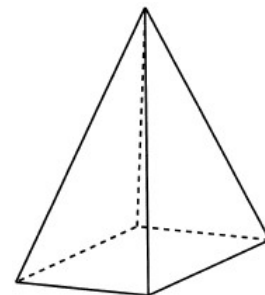
- 1) circle
- 2) square
- 3) triangle
- 4) pentagon



8. In the diagram below, a plane intersects a square pyramid perpendicular to its base.

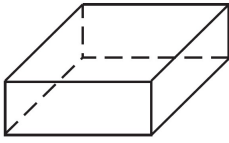
Which two-dimensional shape describes this cross section?

- 1) circle
- 2) square
- 3) triangle
- 4) pentagon

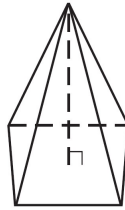


9. Which figure can have the same cross section as a sphere?

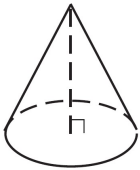
1)



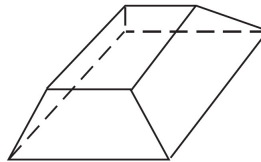
3)



2)



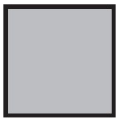
4)



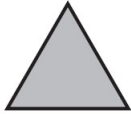
10. William is drawing pictures of cross sections of the right circular cone below.

Which drawing can *not* be a cross section of a cone?

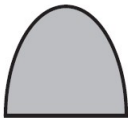
1)



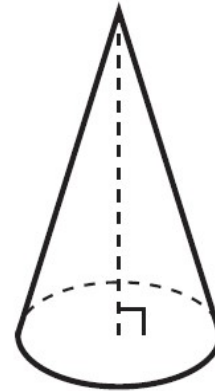
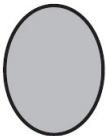
2)



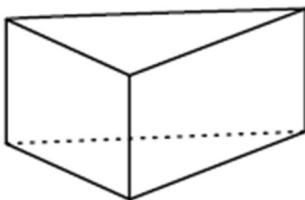
3)



4)



11. The right prism with a triangular base shown below is cut by a plane perpendicular to its bases.



The two-dimensional shape of the cross section is always a

1) triangle

3) pentagon

2) rhombus

4) rectangle

12. A plane intersects a hexagonal prism. The plane is perpendicular to the base of the prism. Which two-dimensional figure is the cross section of the plane intersecting the prism?

- 1) triangle
- 2) trapezoid
- 3) hexagon
- 4) rectangle

13. A right cylinder is cut perpendicular to its base. The shape of the cross section is a

- 1) circle
- 2) cylinder
- 3) rectangle
- 4) triangular prism

14. The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a

- 1) circle
- 2) square
- 3) triangle
- 4) rectangle

15. A two-dimensional cross section is taken of a three-dimensional object. If this cross section is a triangle, what can *not* be the three-dimensional object?

- 1) cone
- 2) cylinder
- 3) pyramid
- 4) rectangular prism

16. A plane intersects a sphere. Which two-dimensional shape is formed by this cross section?

- 1) rectangle
- 2) triangle
- 3) square
- 4) circle

17. Which is *not* a possible two-dimensional cross section of a three-dimensional cylinder?

- 1) circle
- 2) rectangle
- 3) ellipse
- 4) triangle

18. Which figure(s) below can have a triangle as a two-dimensional cross section?

- I. cone
 - II. cylinder
 - III. cube
 - IV. square pyramid
- 1) I, only 2) IV, only 3) I, II, and IV, only 4) I, III, and IV, only

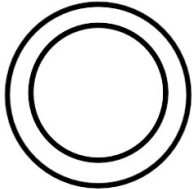
Name _____
Mr. Schlansky

Date _____
Geometry

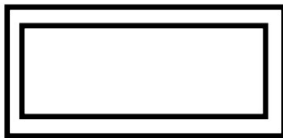


Hollow Volume

1. A hollow cylinder has a height of 10 inches, an outer diameter of 5 inches, and a thickness of 1 inch. Find the volume to the hollow cylinder to the nearest cubic inch.



2. A hollow rectangular prism has a length of 12 cm, a width of 4 cm, a height of 16 cm, and a thickness of 0.5 cm. Find the volume of the hollow rectangular prism to the nearest cubic centimeter.

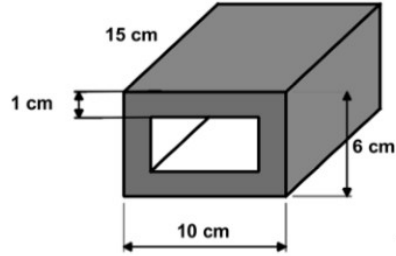


3. A hollow sphere has an outer diameter of 10 feet, and a thickness of 1.5 feet. Find the volume of the hollow sphere to the nearest tenth of a cubic foot.

4. A hollow rectangular prism has a length of 8 meters, a width of 6 meters, a height of 4 meters, and a thickness of 1 meter.. Find the volume of the hollow rectangular prism to the nearest cubic meter.

5. A box tube is to be constructed out of 1 cm thick metal that has a width of 10 cm, a height of 6 cm, and a depth of 15 cm. Which of the following represents the volume of the metal used?

- (1) 420 cm^3 (3) 640 cm^3
(2) 540 cm^3 (4) 760 cm^3



6. The paper towel roll shown below has a diameter of 8 inches and the paper has a thickness of 3 inches. If the height of the paper towel roll is 12 inches, what is the volume of the paper towels? Round your answer to the nearest tenth of a cubic inch.



7. A hollow metal pipe is in the shape of a rectangular prism that has a height of 12 cm. The length is 5 cm and the width is 2 cm. If the thickness is 0.5 cm all the way around, what is the volume of the metal?



Name _____
Mr. Schlansky

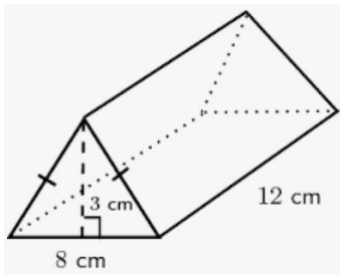
Date _____
Geometry



Density

1. A brick that weighs 1824 grams has dimensions that measure 4 cm by 3 cm by 8 cm. To the nearest tenth, what is the density of the brick?

2. Clay in the shape of a triangular prism shown below has a mass of 1260 grams. What is its density?



3. A cylindrical candleholder has a diameter of 4.5 cm and a height of 20 cm. If the candleholder has a mass of 2900 g, rounded to the nearest whole number, what is its density?

4. A square pyramid with a base with an edge of 6 inches and a height of 12 inches has a mass of 684 grams. Find the density to the nearest tenth.

5. What is the density of a solid sphere of clay that has a diameter of 3.2 inches and has a mass of 552 grams? Round your answer to the nearest tenth.

6. A wooden cube has an edge length of 6 centimeters and a mass of 137.8 grams. Determine the density of the cube, to the *nearest thousandth*. State which type of wood the cube is made of, using the density table below.

Type of Wood	Density (g/cm ³)
Pine	0.373
Hemlock	0.431
Elm	0.554
Birch	0.601
Ash	0.638
Maple	0.676
Oak	0.711

Name _____
Mr. Schlansky

Date _____
Geometry



Dimensional Analysis

1. A block of wood has a volume of 200 cm^3 . The cost of the wood is \$.10 per gram and the density of the wood is 2.1 g/cm^3 . What would be the cost of producing 15 of these blocks of wood.
2. A cylindrical test tube has a volume of 45 in^3 . The liquid inside has weighs 4 ounces per cubic inch and the cost of the liquid is \$.12 per ounce. How much will it cost to fill the test tube to 80% of its capacity?
3. The volume of a pool is 25,000 gallons. The cost of the water to fill the pool is \$120 per 8000 gallons. How much will it cost to fill the pool up 90%?
4. An object made of steel has a volume of 24.1 cm^3 . The steel costs \$1.25 for 500 grams and has a density of 3.1 g/cm^3 . How much will it cost to make 25 of these objects?
5. A stone brick has a volume of 150 in^3 . The stone weighs 5 grams per cubic inch and it costs \$4.52 for 500 grams of stone. How much will it cost to purchase enough stone to make 12 bricks?

6. A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for \$0.29 per kilogram, and has a density of 7.95 g/cm^3 . If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

7. A water tower has a volume of 1000 liters and the cost of the water is \$250 per cubic kiloliter. How much will it cost to fill the water tower up to 60% of its capacity?

8. A wax candle has a volume of 885 cubic centimeters. The wax costs \$1.24 per kilogram and has a density of 1.9 g/cm^3 . How much will it cost to make 80 candles?

9. An object has a volume of 12 cubic inches and the material it is made from has a density of 7.6 g/in^3 . If the cost of the material is \$1.25 per kilogram, how much will it cost to make 50 of these objects?

10. An object has a volume of 1200 cubic feet. The material it is made of weighs 3.2 pounds per cubic foot and it costs \$2.50 per ounce. If a company has to pay 75% of the cost, how much will the company have to pay for 15 of these objects?

Name _____
Mr. Schlansky

Date _____
Geometry



Modeling Volume

1. Cylindrical bricks are needed to fill a hole in a homeowner's backyard. Each brick is to have a diameter of 4 cm and a height of 2 cm. The weight of the concrete that the brick is going to be made from is 2.1 ounces per cubic centimeter. If the concrete costs \$.14 per ounce, how much would it cost to purchase four bricks? Round your answer to the *nearest cent*.

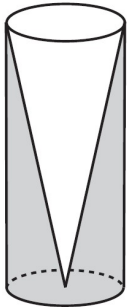
2. A town in upstate New York keeps sand in a silo that is in the shape of a cone. They use this sand to help de-ice the roads after a snowstorm. The silo has a diameter of 18.6 meters and a height of 30 meters. The weight of the sand is 1.2 ounces per cubic meter. If the sand costs \$.12 per ounce, how much will it cost the town to fill 80% of the silo?

3. A hollow cylindrical casing is to be put around a garbage can in a busy street in Manhattan. The diameter is 25 inches. The height of the case will be 40 inches and the casing will be 1 inch thick. The density of the metal is .841 grams per cubic inch. What will be the mass of the casing to the *nearest gram*?

4. A pyramid with a square base is made of solid glass. The pyramid has a base with a side length of 5.7 cm and a height of 7 cm. The density of the glass is 2.4 grams per cubic centimeter. If the cost of the glass is \$1.25 per gram, what is the cost in producing 12 glass pyramids?

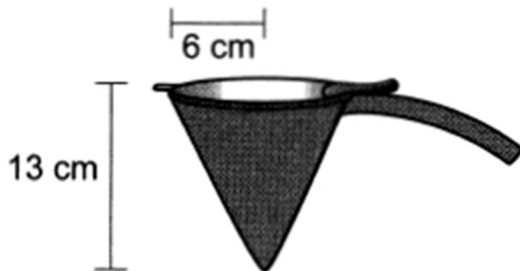
5. Walter wants to make 100 candles in the shape of a cone for his new candle business. The mold shown below will be used to make the candles. Each mold will have a height of 8 inches and a diameter of 3 inches.

Walter goes to a hobby store to buy the wax for his candles. The wax costs \$0.10 per ounce. If the weight of the wax is 0.52 ounce per cubic inch, how much will it cost Walter to buy the wax for 100 candles?



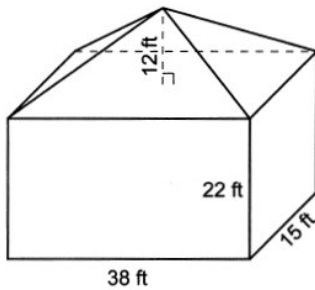
6. The funnel shown below can be used to decorate cookies with melted chocolate. The funnel can be modeled by a cone whose radius is 6 cm and height is 13 cm.

The baker uses 2 cubic centimeters of chocolate to decorate each cookie. When the funnel is completely filled, what is the maximum number of cookies that can be decorated with the melted chocolate?

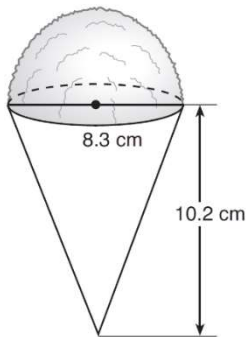


7. Trees that are cut down and stripped of their branches for timber are approximately cylindrical. A timber company specializes in a certain type of tree that has a typical diameter of 0.2 meters and a typical height of about 10 meters. The density of the wood is 9800 grams per cubic meter, and the wood can be sold by mass at a rate of \$4.75 per kilogram. What will be the cost for selling 20 trees?

8. A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet. An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

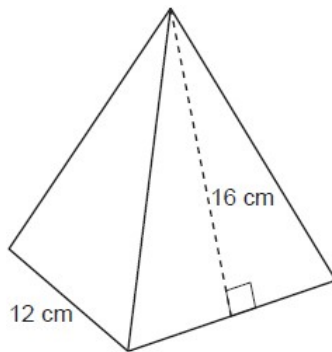


9. A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters. The desired density of the shaved ice is 0.697 g/cm^3 , and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.



10. A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere. The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3 , determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

11. A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters. Determine and state the volume of the candle, to the *nearest cubic centimeter*. The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.



Name _____
Mr. Schlansky

Date _____
Geometry



Volume with Conversions

Convert the following units and round to the nearest tenth if necessary

1. 24 inches to feet

2. 54 inches to feet

2. 3 inches to feet

4. 4 inches to feet

5. 2 feet to inches

6. 5 feet to inches

7. 3.5 feet to inches

8. 9.25 feet to inches

9. What is the volume, to the *nearest cubic foot*, of a rectangular prism that is 2.4 feet high, 3.2 feet wide, and 9 inches high?

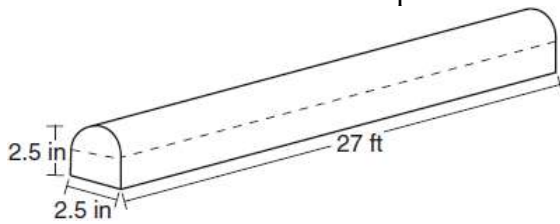
10. A cylinder has a diameter of 20 inches and a height of 2 feet. Find the volume rounded to the nearest cubic inch.

11. A regular pyramid has a square base. A side of the base measures 0.75 feet and the height of the pyramid is 15 inches. What is the volume of the pyramid in cubic inches?

12. Find the volume of a cone whose diameter is 15 inches and height of 2 feet rounded to the nearest cubic foot.

13. A child's tent can be modeled as a pyramid with a square base whose sides measure 60 inches and whose height measures 84 inches. What is the volume of the tent, to the nearest cubic foot?

14. Find the volume of the shape below to the nearest cubic inch.



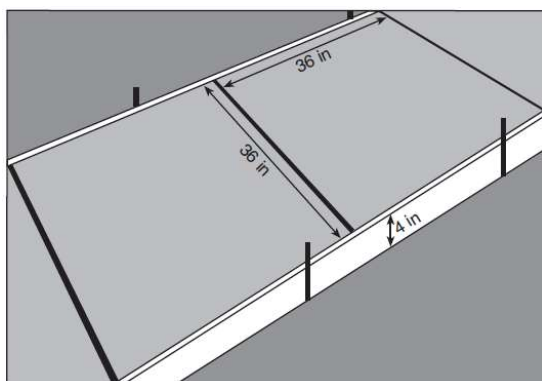


Name _____
Mr. Schlansky

Date _____
Geometry

Modeling Volume with Conversions

1. Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for \$3.25 per cubic foot. How much money will it cost Ian to replace the two concrete sections?



2. A rectangular tabletop will be made of maple wood that weighs 43 pounds per cubic foot. The tabletop will have a length of eight feet, a width of three feet, and a thickness of one inch. If the maple costs \$12.59 per pound, how much will it cost to make 5 tabletops?

3. Ali made six solid spherical decorations out of modeling clay. Each decoration has a radius of 2.5 inches. The weight of clay is 68 pounds per cubic foot. Determine and state, to the *nearest pound*, the total weight of the six decorations.

4. A sandbox in the shape of a rectangular prism has a length of 43 inches and a width of 30 inches. Jack uses bags of sand to fill the sandbox to a depth of 9 inches. Each bag of sand has a volume of 0.5 cubic foot. What is the minimum number of bags of sand that must be purchased to fill the sandbox?

5. A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings. If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

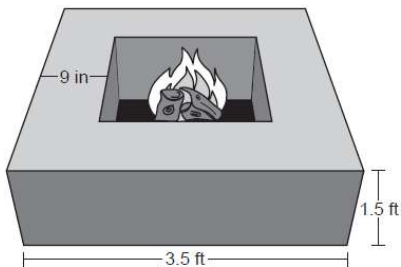


6. A gardener wants to buy enough mulch to cover a rectangular garden that is 3 feet by 10 feet. One bag contains 2 cubic feet of mulch and costs \$3.66. How much will the minimum number of bags cost to cover the garden with mulch 3 inches deep?

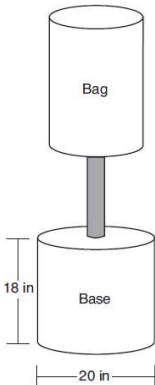
7. A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height.

Determine and state the volume of the water in the pool, to the *nearest cubic foot*. One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

8. Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick. If a bag of concrete mix will fill 0.6 ft^3 , determine and state the minimum number of bags needed to build the fire pit.



9. Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot. To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.





Name _____
Mr. Schlansky

Date _____
Geometry

Shelf/Box Questions (Bonus Lesson)

1. Boxes of baseball cards are being put on a display shelf. Each box is a cube with edge length of 6 inches. The display shelf is 26 inches by 14 inches. The boxes must completely fit on the shelf and cannot be stacked on top of each other. What is the maximum number of boxes that can fit on the shelf?

2. Cylindrical soup cans with a base diameter of 2.5 inches and a height of 4 inches are to be put on a display shelf. The display shelf measures 21 inches by 45 inches. The cans must completely fit on the shelf and cannot be stacked on top of each other. What is the maximum number of cans that can fit on the shelf?

3. Lacrosse balls have a diameter of 6.47 centimeters and are to be put on a shelf that measures 120 centimeters by 60 centimeters. The balls must completely fit on the shelf and cannot be stacked on top of each other. What is the maximum number of balls that can fit on the shelf?

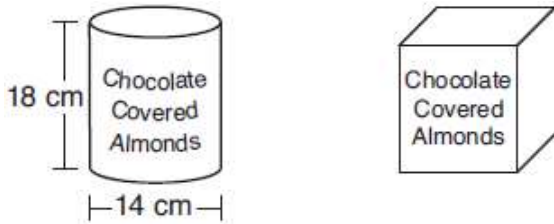
4. Funko Pops come in cubic packages with edge length of 4 inches. They are to be packed into a shipping box that is a rectangular prism that measures 35 inches by 25 inches by 11 inches. What are the maximum number of Funko Pops that can fit into the shipping box?

5. Baseballs that have a diameter of 2.8 inches are to be packed into a rectangular shipping box that has dimensions 24 inches by 12 inches by 6 inches. What is the maximum number of baseballs that can fit into the shipping box?

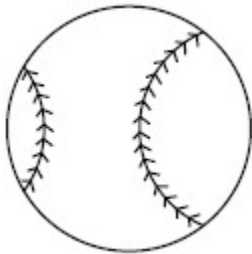
6. Ice cream cones are to be packed into a shipping box that has a base that measures 20 inches by 12 inches and has a height of 10 inches. The cones have a diameter of 1.2 inches and a height of 3.2 inches. How many cones can be packed into the box?

7. A manufacturer is designing a new container for their chocolate-covered almonds. Their original container was a cylinder with a height of 18 cm and a diameter of 14 cm. The new container can be modeled by a rectangular prism with a square base and will contain the same amount of chocolate-covered almonds.

If the new container's height is 16 cm, determine and state, to the *nearest tenth of a centimeter*, the side length of the new container if both containers contain the same amount of almonds. A store owner who sells the chocolate-covered almonds displays them on a shelf whose dimensions are 80 cm long and 60 cm wide. The shelf can only hold one layer of new containers when each new container sits on its square base. Determine and state the maximum number of new containers the store owner can fit on the shelf.



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



Name _____
Mr. Schlansky

Date _____
Geometry



Three Dimensional Rotations

1. Which object is formed when right triangle RST shown below is rotated around leg \overline{RS} ?

- 1) a pyramid with a square base
- 2) an isosceles triangle
- 3) a right triangle
- 4) a cone

2. If the rectangle below is continuously rotated about side w , which solid figure is formed?

- 1) pyramid
- 2) rectangular prism
- 3) cone
- 4) cylinder



3. If you rotated the shaded figure below about line m , which solid would result from the revolution?

- (1) cylinder (2) cone (3) cube (4) sphere



4. If you rotated the triangular region of the figure below about line m , what solid would result from the revolution?

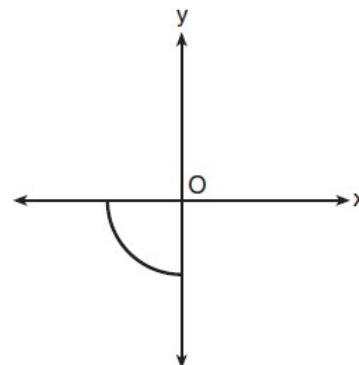
- (1) cylinder (2) cone (3) cube (4) sphere



5. Circle O is centered at the origin. In the diagram below, a quarter of circle O is graphed.

Which three-dimensional figure is generated when the quarter circle is continuously rotated about the y -axis?

- 1) cone
- 2) sphere
- 3) cylinder
- 4) hemisphere

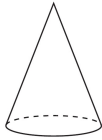


6. If an equilateral triangle is continuously rotated around one of its medians, which 3-dimensional object is generated?

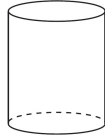
- 1) cone
- 2) pyramid
- 3) prism
- 4) sphere

7. A student has a rectangular postcard that he folds in half lengthwise. Next, he rotates it continuously about the folded edge. Which three-dimensional object below is generated by this rotation?

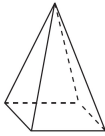
1)



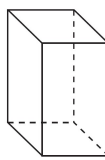
3)



2)



4)



8. An isosceles right triangle whose legs measure 6 is continuously rotated about one of its legs to form a three-dimensional object. The three-dimensional object is a

- 1) cylinder with a diameter of 6
- 2) cylinder with a diameter of 12
- 3) cone with a diameter of 6
- 4) cone with a diameter of 12

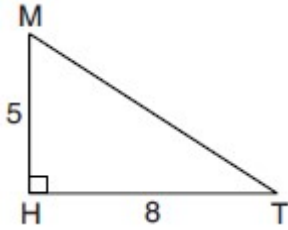
9. Which three-dimensional figure will result when a rectangle 6 inches long and 5 inches wide is continuously rotated about the longer side?

- 1) a rectangular prism with a length of 6 inches, width of 6 inches, and height of 5 inches
- 2) a rectangular prism with a length of 6 inches, width of 5 inches, and height of 5 inches
- 3) a cylinder with a radius of 5 inches and a height of 6 inches
- 4) a cylinder with a radius of 6 inches and a height of 5 inches

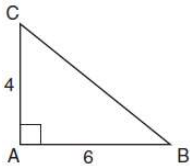
10. Square *MATH* has a side length of 7 inches. Which three-dimensional object will be formed by continuously rotating square *MATH* around side \overline{AT} ?

- 1) a right cone with a base diameter of 7 inches
- 2) a right cylinder with a diameter of 7 inches
- 3) a right cone with a base radius of 7 inches
- 4) a right cylinder with a radius of 7 inches

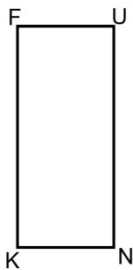
11. In right triangle MTH shown below, $m\angle H = 90^\circ$, $HT = 8$, and $HM = 5$. Determine and state, to the *nearest tenth*, the volume of the three-dimensional solid formed by rotating $\triangle MTH$ continuously around \overline{MH} .



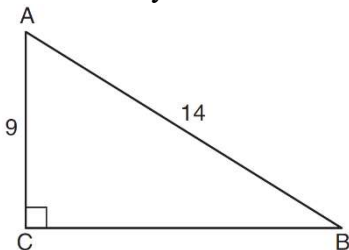
12. In the diagram below, right triangle ABC has legs whose lengths are 4 and 6. What is the volume, in terms of π , of the three-dimensional object formed by continuously rotating the right triangle around \overline{AB} ?



13. In the rectangle below, $\overline{UN} = 8\text{ in}$ and $\overline{KN} = 3\text{ in}$. Find the volume of the three-dimensional object created by rotating rectangle $FUNK$ continuously about side \overline{FK} in terms of π .



14. In the diagram of right triangle ABC shown below, $AB = 14$ and $AC = 9$. What is the volume of the three-dimensional object formed when the triangle is continuously rotated about side \overline{BC} to the nearest tenth.



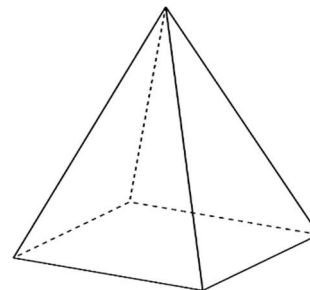


Name _____
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Volume and 3 Dimensional Objects Review Sheet

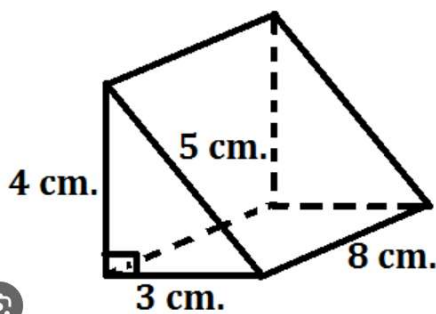
1. A regular pyramid has a square base with an edge length of 14 and an altitude of 24.
Find its volume.



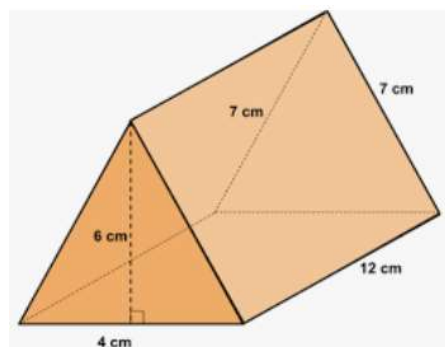
2. Find the volume of a cone with a slant height of 12 in and a diameter of 8 in rounded to the nearest hundredth.

Find the volume of the shapes below:

3.

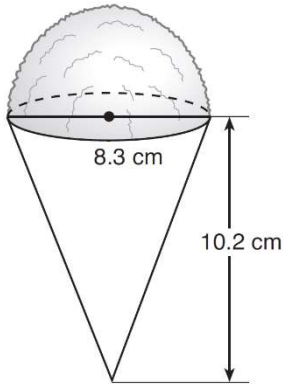


4.

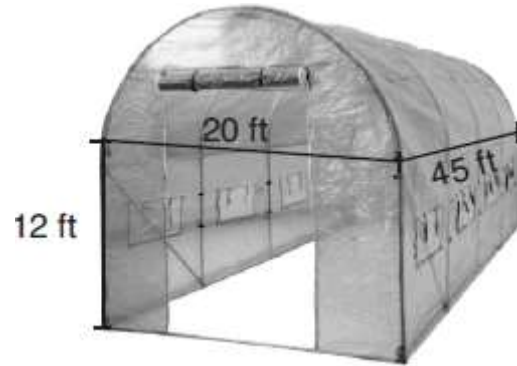


Find the volume of the following objects rounded to the *nearest tenth*:

5.



6.



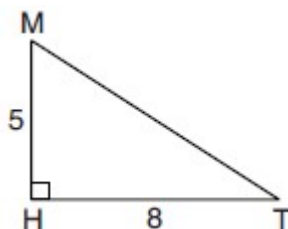
7. A plane intersects a hexagonal prism. The plane is perpendicular to the base of the prism. Which two-dimensional figure is the cross section of the plane intersecting the prism?

- 1) triangle
- 2) trapezoid
- 3) hexagon
- 4) rectangle

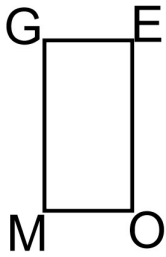
8. The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a

- 1) circle
- 2) square
- 3) triangle
- 4) rectangle

9. In right triangle MTH shown below, $m\angle H = 90^\circ$, $HT = 8$, and $HM = 5$. Determine and state, to the *nearest tenth*, the volume of the three-dimensional solid formed by rotating $\triangle MTH$ continuously around \overline{MH} .



10. In rectangle GEOM, $GE = 4$ and $EO = 10$. Find the volume of the three-dimensional object create by continuously rotating rectangle GEOM about EO in terms of π .



11. The base of a pyramid is a rectangle with a width of 6 cm and a length of 8 cm. Find, in centimeters, the height of the pyramid if the volume is 288 cm^3 .

- 1) 6
- 2) 8
- 3) 14
- 4) 24

12. Find the radius of a sphere with a volume of 576π cubic inches. Find the answer to the nearest tenth of an inch.

- 1) 4.9
- 2) 15.1
- 3) 9.2
- 4) 7.6

13. A brick that weighs 1824 grams has dimensions that measure 4 cm by 3 cm by 8 cm. To the nearest tenth, what is the density of the brick?

14. A metal sphere that has a mass of 8024 grams has a diameter of 10 cm. To the nearest tenth, what is the density of the sphere?

15. Cylindrical bricks are needed to fill a hole in a homeowner's backyard. Each brick is to have a diameter of 4 cm and a height of 2 cm. The weight of the concrete that the brick is going to be made from is 2.1 ounces per cubic centimeter. If the concrete costs \$.14 per ounce, how much would it cost to purchase four bricks? Round your answer to the *nearest cent*.

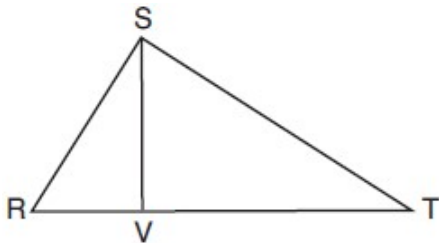
16. Walter wants to make candles in the shape of a cone for his new candle business. Each candle will have a height of 8 inches and a diameter of 3 inches. Walter goes to a hobby store to buy the wax for his candles. The wax costs \$0.10 per ounce. If the weight of the wax is 0.52 ounce per cubic inch, how much will it cost Walter to buy the wax for 100 candles?

17. A sandbox in the shape of a rectangular prism has a length of 43 inches and a width of 30 inches. Jack uses bags of sand to fill the sandbox to a depth of 9 inches. Each bag of sand has a volume of 0.5 cubic foot. What is the minimum number of bags of sand that must be purchased to fill the sandbox?

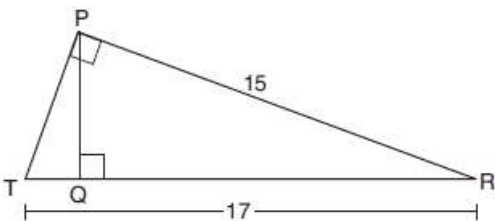
18. A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings. If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.



19. In right triangle RST below, altitude \overline{SV} is drawn to hypotenuse \overline{RT} . If $RV = 4.1$ and $TV = 10.2$, what is the length of \overline{ST} , to the *nearest tenth*?

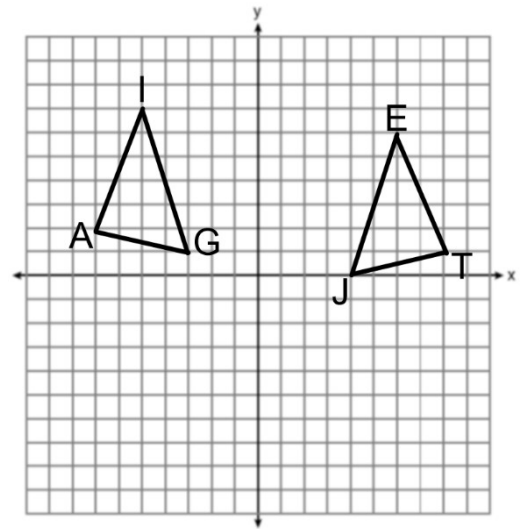


20. In right triangle PRT , $m\angle P = 90^\circ$, altitude \overline{PQ} is drawn to hypotenuse \overline{RT} , $RT = 17$, and $PR = 15$. Determine and state, to the *nearest tenth*, the length of \overline{RQ} .

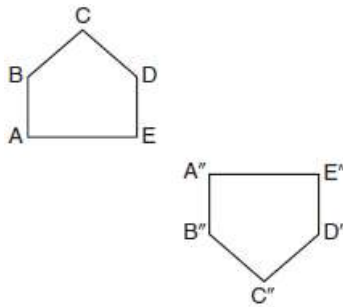


21. Which of the following sequences of rigid motions would map $\triangle GIA$ onto $\triangle JET$?

- 1) point reflection through $(0.5, 0.5)$ followed by a translation 11 right and 1 down
- 2) reflection over the y -axis followed by a translation right 1 and down 1
- 3) rotation of 90 degrees clockwise centered at the origin followed by a translation right 1 and up 1
- 4) reflection over $x=1$ followed by a reflection over the x -axis



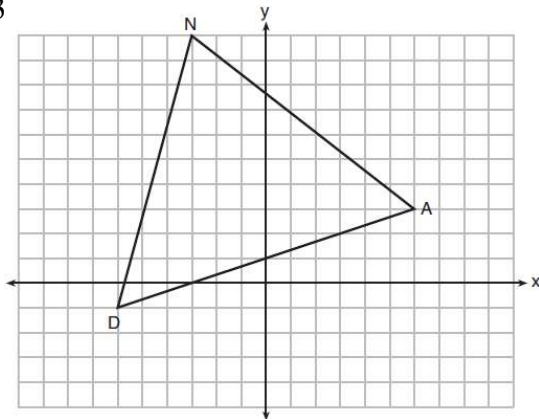
22. Identify which sequence of transformations could map pentagon $ABCDE$ onto pentagon $A''B''C''D''E''$, as shown below.



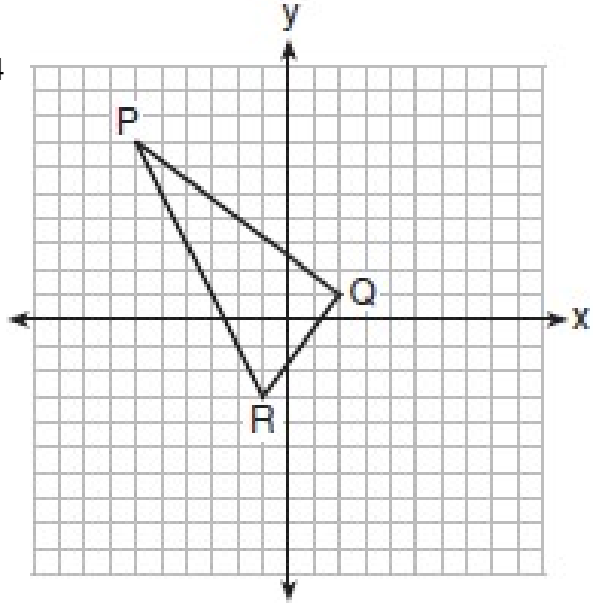
- 1) dilation followed by a rotation
- 2) translation followed by a rotation
- 3) line reflection followed by a translation
- 4) line reflection followed by a line reflection

Find the area of the following triangles:

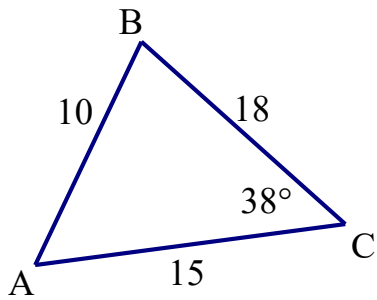
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25.



26.

