

Geometry

Unit 3-10 Measurement

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**Common Core High School Math Reference Sheet
(Algebra I, Geometry, Algebra II)**

CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilograms	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

FORMULAS

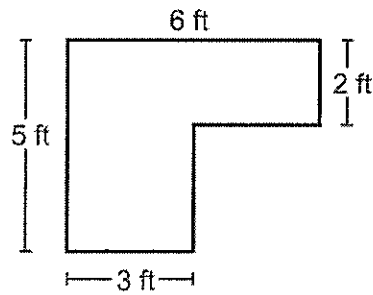
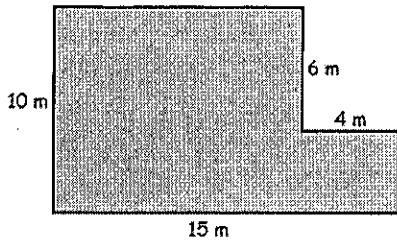
Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n-1)d$
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	1 radian = $\frac{180}{\pi}$ degrees
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	1 degree = $\frac{\pi}{180}$ radians
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t-t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

Unit 10: Measurement

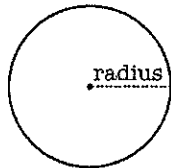
Lesson 1: Perimeter and Area

Example 1

Find the perimeter of the shapes below:



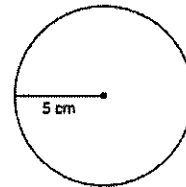
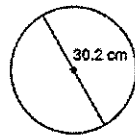
Circle



$$\text{Circumference} = 2\pi r$$

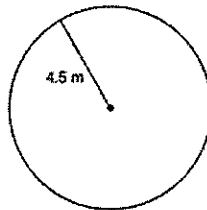
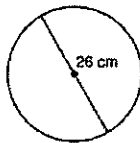
Example 2

Find each circumference in terms of π

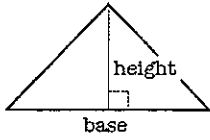


Example 3

Find each circumference to nearest tenth.

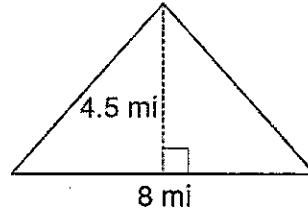


Triangle

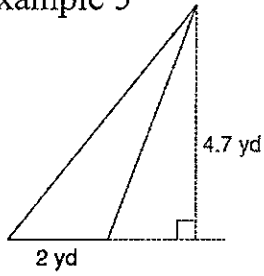


Area = $\frac{1}{2} bh$

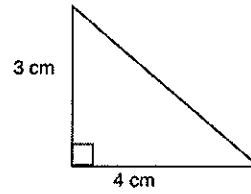
Example 4



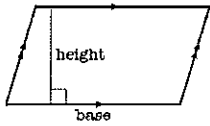
Example 5



Example 6

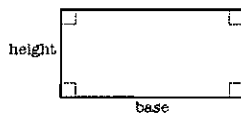


Parallelogram



Area = bh

Rectangle



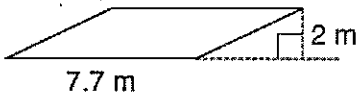
Area = bh

Square

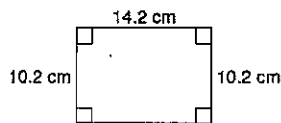


Area = s²

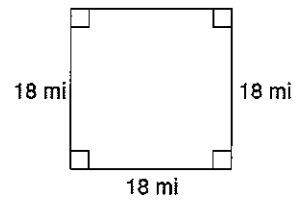
Example 7



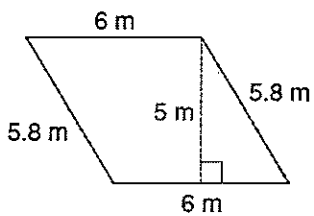
Example 9



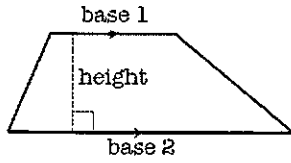
Example 10



Example 8

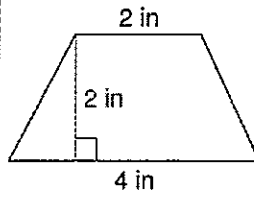


Trapezoid

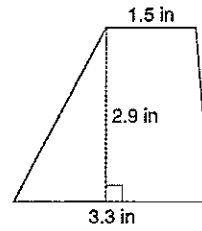


$$\text{Area} = \frac{1}{2}(b_1 + b_2)h$$

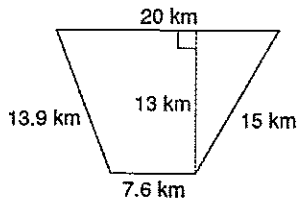
Example 11



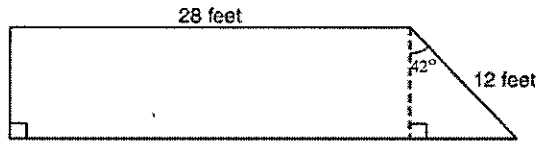
Example 12



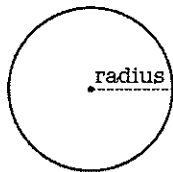
Example 13



Example 14 (nearest tenth)



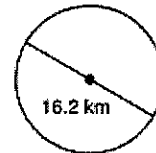
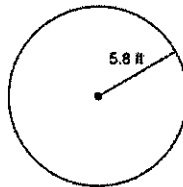
Circle



$$\text{Area} = \pi r^2$$

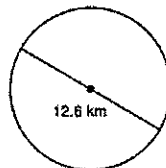
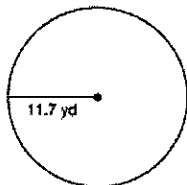
Example 15

Find each area in terms of π



Example 16

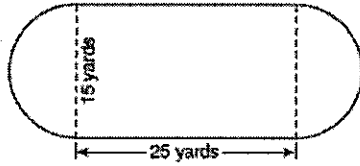
Find each area to the nearest hundredth



Composite Perimeter and Area

Example 17

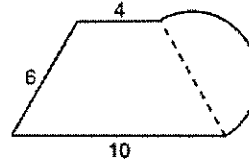
A playground in a local community consists of a rectangle and two semicircles, as shown in the diagram below.



Which expression represents the amount of fencing, in yards, that would be needed to completely enclose the playground? (in terms of π)

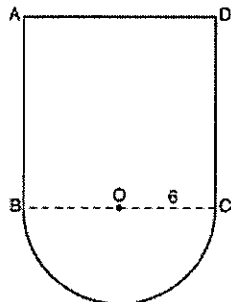
Example 18

What is the perimeter of the figure shown below, which consists of an isosceles trapezoid and a semicircle? (nearest tenth)



Example 19

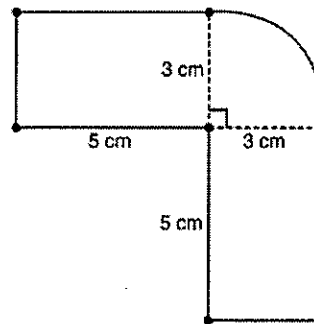
In the figure below, $ABCD$ is a square and semicircle O has a radius of 6.



What is the area of the figure? (in terms of π)

Example 20

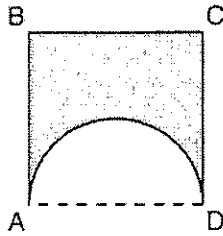
The figure shown below is composed of two rectangles and a quarter circle.



What is the area of this figure, to the nearest square centimeter?

Example 20

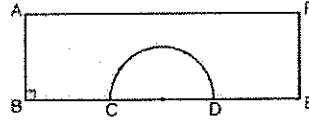
A figure consists of a square and a semicircle, as shown in the diagram below.



If the length of a side of the square is 6, what is the area of the shaded region? (in terms of π)

Example 21

In the diagram below of rectangle $AFEB$ and a semicircle with diameter CD , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.

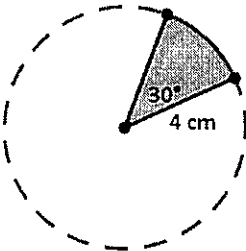


Circle Sectors:

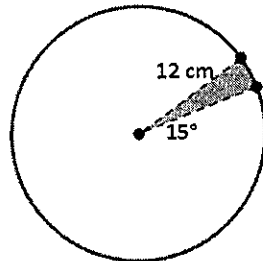
Examples:

Find the area and circumference of the circle sector given the shown angle.

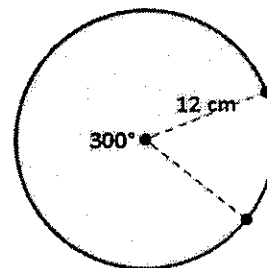
22. in terms of π



23. in terms of π

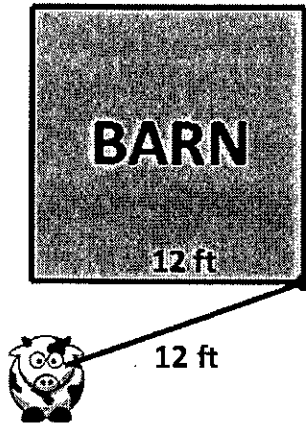


24. nearest tenth



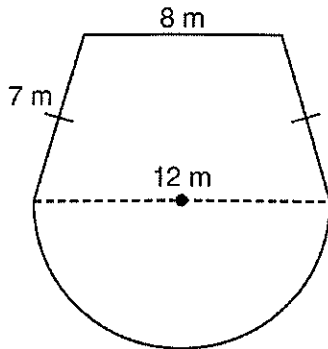
Example 25:

A cow named Buzz is tied to the edge of a square barn with a 12 foot leash.
This is a top down view of the barn and Buzz.
Buzz cannot go travel through the barn.
What is the total grazing area for Buzz the Cow to the nearest square foot?

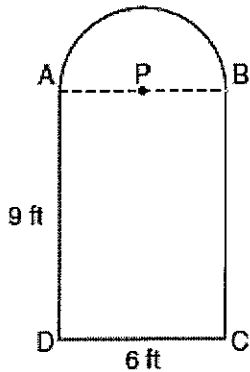


Unit 10 Lesson 1: Perimeter and Area

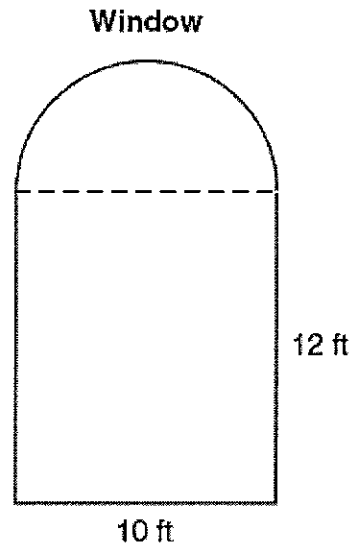
1. A garden is in the shape of an isosceles trapezoid and a semicircle, as shown in the diagram below. A fence will be put around the perimeter of the entire garden. How much fencing (in terms of π) will be needed?



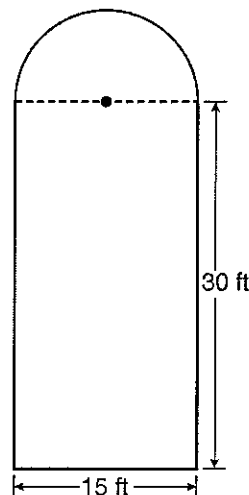
2. Serena's garden is a rectangle joined with a semicircle, as shown in the diagram below. Line segment AB is the diameter of semicircle P . Serena wants to put a fence around her garden. Calculate the length of fence Serena needs to the nearest tenth of a foot.



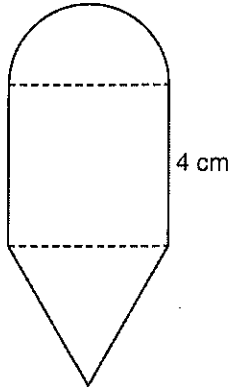
3. A window is made up of a single piece of glass in the shape of a semicircle and a rectangle, as shown in the diagram below. Tess is decorating for a party and wants to put a string of lights all the way around the outside edge of the window. To the nearest foot, what is the length of the string of lights that Tess will need to decorate the window?



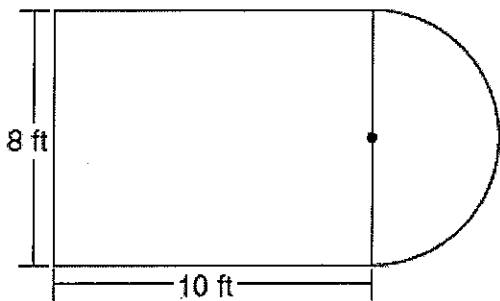
4. Ross is installing edging around his pool, which consists of a rectangle and a semicircle, as shown in the diagram below. Determine the length of edging, to the nearest tenth of a foot, that Ross will need to go completely around the pool.



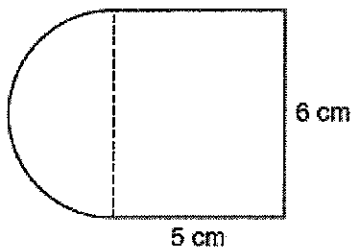
5. The diagram below consists of a square with a side of 4 cm, a semicircle on the top, and an equilateral triangle on the bottom. Find the perimeter of the figure to the *nearest tenth of a centimeter*.



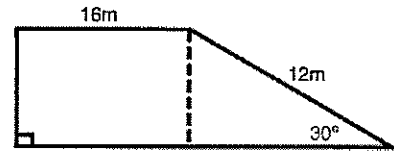
6. Luis is going to paint a basketball court on his driveway, as shown in the diagram below. This basketball court consists of a rectangle and a semicircle. Which expression represents the area of this basketball court, in square feet?



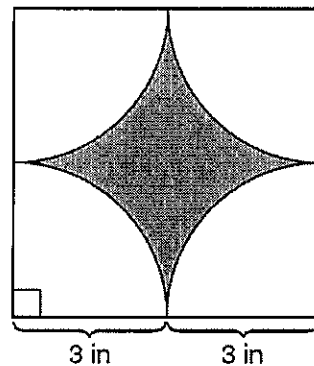
7. A figure is made up of a rectangle and a semicircle as shown in the diagram below. What is the area of the figure, to the *nearest tenth of a square centimeter*?



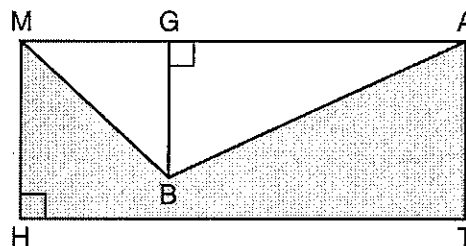
8. What is the area of the trapezoid below to the nearest square foot? (hint: Use TRIG)



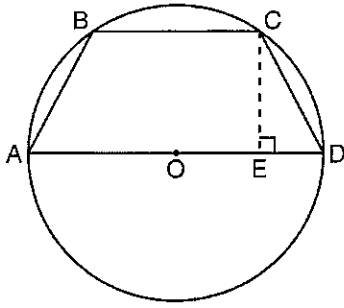
9. A designer created the logo shown below. The logo consists of a square and four quarter-circles of equal size. Express, in terms of π , the exact area, in square inches, of the shaded region.



10. In the diagram below, $MATH$ is a rectangle, $GB = 4.6$, $MH = 6$, and $HT = 15$. What is the area of polygon $MBATH$ to the *nearest tenth*?

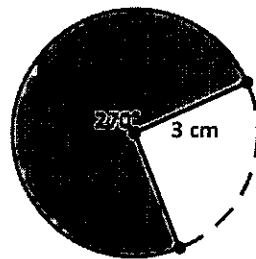


11. In the diagram below, the circumference of circle O is 16π inches. The length of \overline{BC} is three-quarters of the length of diameter \overline{AD} and $CE = 4$ inches. Calculate the area, in square inches, of trapezoid $ABCD$.



12. Determine the area and circumference of the circle sectors below.

a)

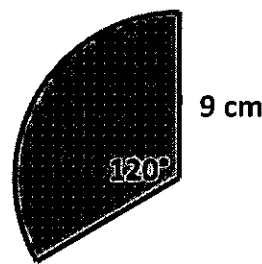


Area = _____

Circumference = _____

(hundredth)

b)

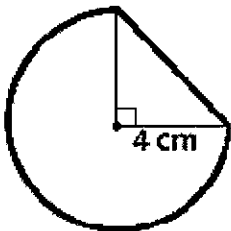


Area = _____

Circumference = _____

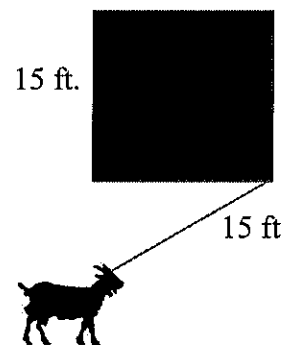
(in terms of π)

13. Find the area of the figure below.



Area = _____ (tenth)

14) A goat is tied to the edge of a square barn with a 15 foot lead. This is a top down view of the barn and the goat. The goat cannot go travel through the barn. What is the total grazing area for the goat in terms of π ?



Area = _____

Lesson 2: 3 Dimensional Geometry PRISMS

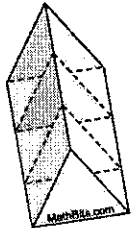
Solid: A 3-D closed figure



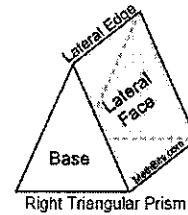
Polyhedron: A geometric solid with polygons as faces.



Prism: A polyhedron with exactly two parallel, congruent polygon faces, called bases.

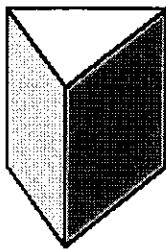


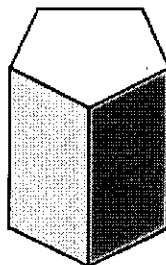
- The bases are parallel and congruent.
- The lateral faces are parallelograms.
- The lateral edges are parallel and congruent.
- All cross sections of a prism parallel to the bases will be congruent to the bases.
- Prisms are named for the shape of the bases.
- Prisms do NOT always sit on their bases (as shown in both the left and right diagrams)

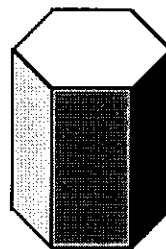


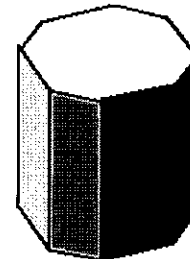
Example 1

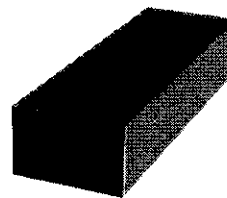
Name the Prism



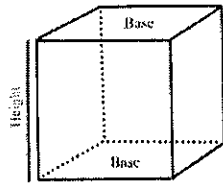




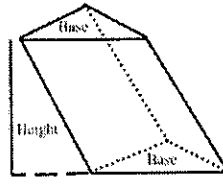




Right vs. Oblique



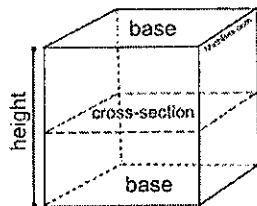
- Lateral edge is \perp to base.
- Lateral faces are rectangles.



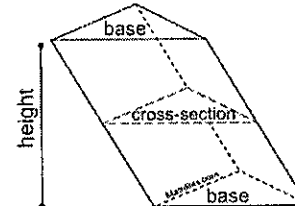
- Lateral edge is NOT \perp to base.
- Lateral faces are Parallelograms.

Cross Sections

Cross sections parallel to the bases in each prism (right or oblique) will be congruent to the bases.

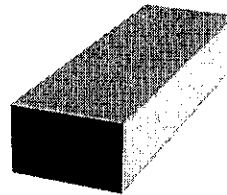
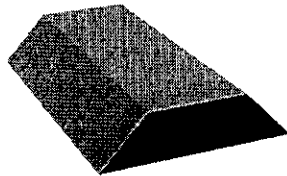


Right Rectangular Prism



Oblique Triangular Prism

Volume of a Prism



$$\text{Volume of Prism} = B h$$

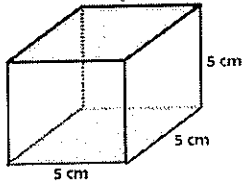
$$B = \text{Area of the Base}$$

Find the volume of each

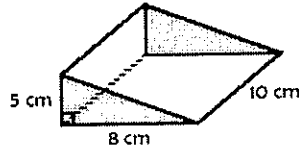
General Prisms

$$V = Bh$$

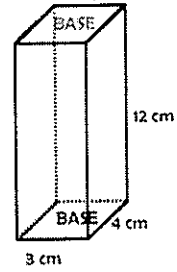
Example 2



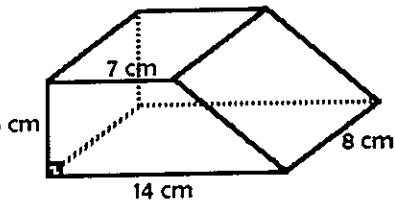
Example 3



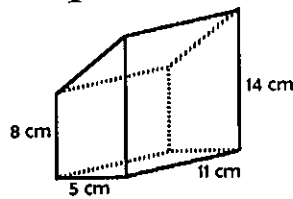
Example 4



Example 5



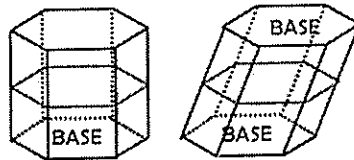
Example 6



This volume formula will work for both Oblique and Right prisms...

Thanks to **Cavalieri's** Stacking Principle

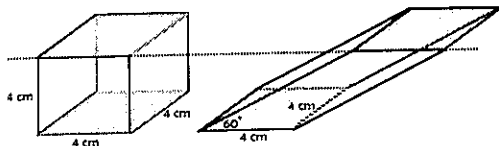
"Two prisms will have equal volumes if their bases have equal area and their altitudes (heights) are equal."



Volumes are equal.

Example 7

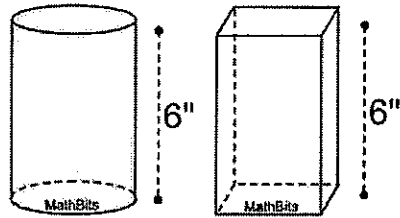
Cavalieri's principle says that these two prisms have equal volume. Explain why that is true?



Example 8

A right circular cylinder and a right rectangular prism are given.

According to Cavalieri's Principle, will the two solids have the same volume?

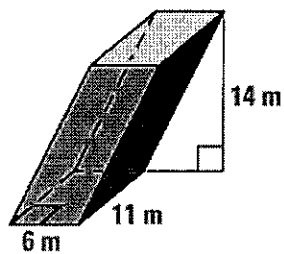


Find the volume of each

General Prisms

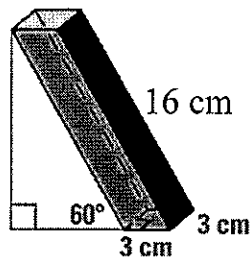
$$V = Bh$$

Example 9



Example 10

In simplest radical form.



Example 11

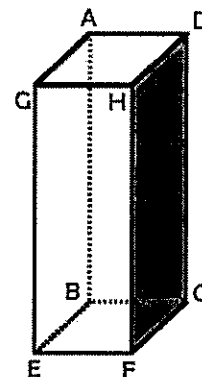
A fish tank with a rectangular base has a volume of 3,360 cubic inches. The length and width of the tank are 14 inches and 12 inches, respectively. Find the height, in inches, of the tank.

Example 12

A gallon of paint will cover approximately 450 square feet. An artist wants to paint all the outside surfaces of a cube measuring 12 feet on each edge. What is the *least* number of gallons of paint he must buy to paint the cube?

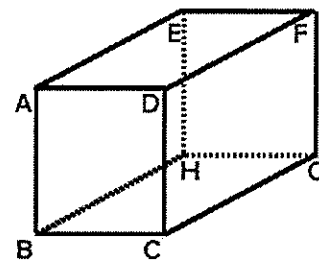
1. Match the following terms to the diagram.

Given the rectangular prism with face **BCFE** as one of its bases. Use each value **ONLY ONCE**.

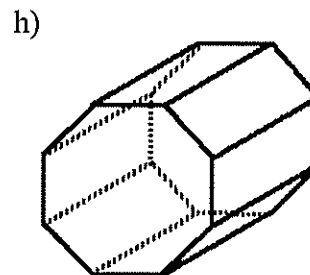
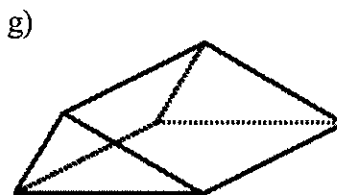
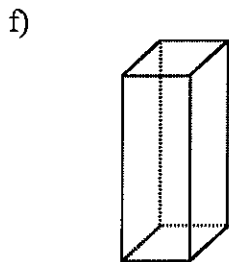
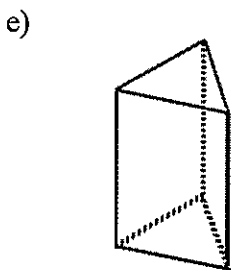
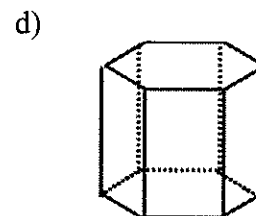
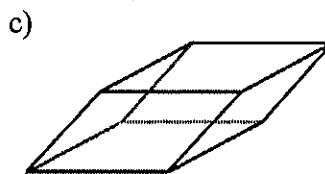
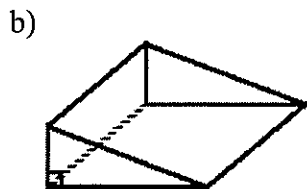
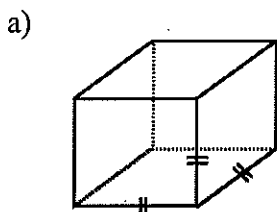


- | | |
|-----------------------|--------------------|
| _____ 1. Edge | A. Rectangle ADHG |
| _____ 2. Lateral Face | B. \overline{HF} |
| _____ 3. Base | C. \overline{AD} |
| _____ 4. Vertex | D. Point B |
| _____ 5. Height | E. Rectangle HDCF |

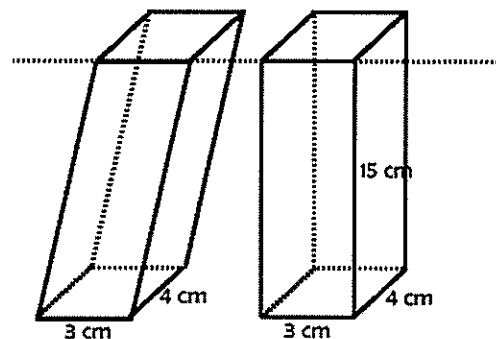
2. After looking at the rectangular prism to the right, a young lady in the class raises her hand and says, "Could I use rectangle ADCB as my base instead of rectangle BHGC?" How should the teacher respond?



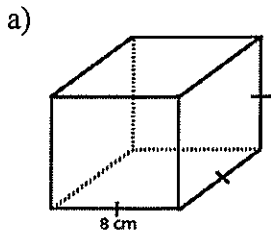
3. Properly name the following prisms.



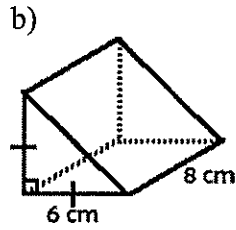
4. Cavalieri's principle says that these two prisms have equal volume. Explain why that is true?



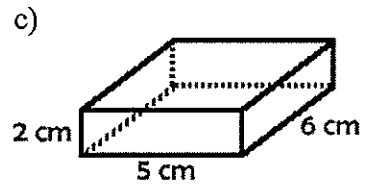
5. Determine the volume of the prisms. (Lines that appear perpendicular are perpendicular.)



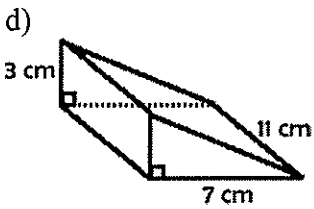
Volume = _____



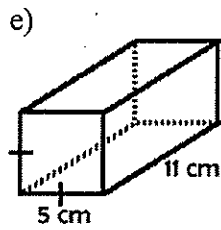
Volume = _____



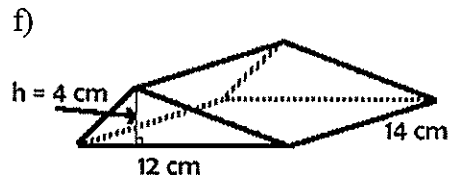
Volume = _____



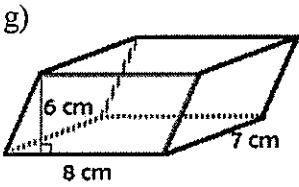
Volume = _____



Volume = _____



Volume = _____



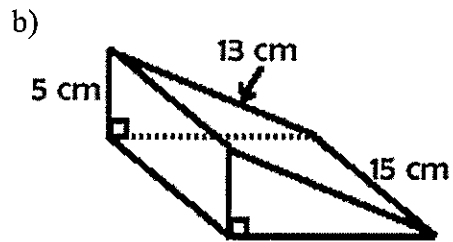
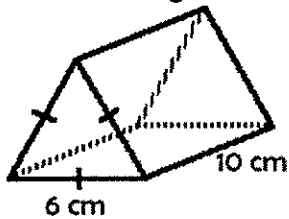
Volume = _____

Volume = _____

Volume = _____

6. Determine the volume of the prism.

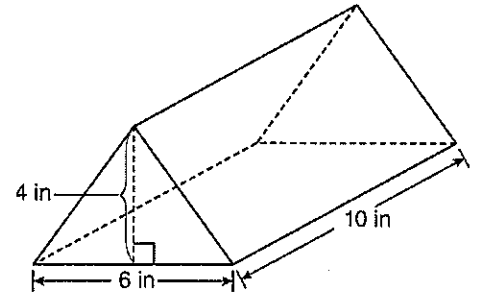
a) Equilateral Triangular Prism



7. Two prisms have equal heights and equal volumes. The base of one is a pentagon and the base of the other is a square. If the area of the pentagonal base is 36 square inches, how many inches are in the length of each side of the square base?

- 1) 6
- 2) 9
- 3) 24
- 4) 36

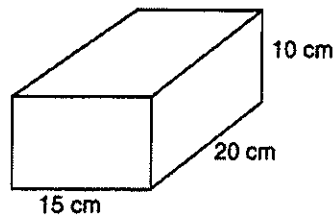
8. A packing carton in the shape of a triangular prism is shown in the diagram below. What is the volume, in cubic inches, of this carton?



9. 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 minimum height of the box such that the volume is *at least* 800 cubic inches.

10. A box in the shape of a cube has a volume of 64 cubic inches. What is the length of a side of the box?

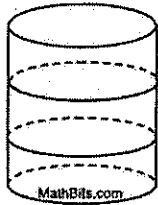
11. Jed bought a generator that will run for 2 hours on a liter of gas. The gas tank on the generator is a rectangular prism with dimensions 20 cm by 15 cm by 10 cm as shown below.



If Jed fills the tank with gas, how long will the generator run? Show how you arrived at your answer. [Note: $1000 \text{ cm}^3 = 1 \text{ liter}$]

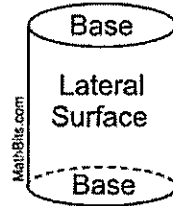
Lesson 3 Cylinders

Definition: A **cylinder** is a three-dimensional closed figure with congruent, parallel (usually circular) bases connected by the set of all line segments between the two circular bases (forming a curved surface).
The term "cylinder" is from the Greek meaning "tumbler" or "roller".



≡ Cross Sections
(parallel to bases)

- Cylinders are NOT called polyhedra since they have curved surfaces (not polygons).
- The bases are parallel and congruent.
- The bases are circles (curved), not polygons.
- All cross sections of a cylinder parallel to the bases will be **congruent** to the bases.
- While cylinders have several characteristics in common with prisms, they are not prisms.



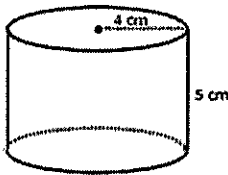
Right Circular Cylinder

Volume of a Cylinder

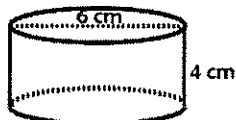
Cylinder

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

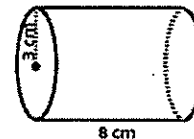
Example 1:
Find the volume
in terms of π



Example 2:
Find the volume
in terms of π



Example 3:
Find the volume
to nearest hundredth



Example 4:

A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches.

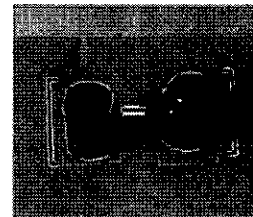
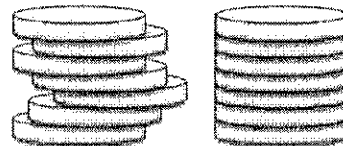
What is the radius of the cylinder to the *nearest tenth of an inch*?

Example 5:

Amanda needs a cylindrical container to hold 450 cubic inches of soil for a new plant. If the radius of the container must be 4 inches, what should the height be to the nearest tenth of an inch?

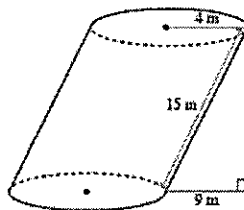
This volume formula will work for both Oblique and Right cylinders...

Thanks to **Cavalieri's** Stacking Principle

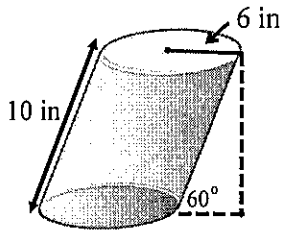


Example 6:

Find the volume to the nearest tenth.

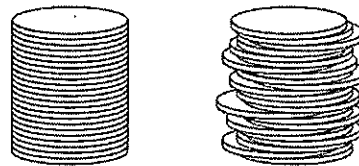


Example 7: Find the EXACT volume.



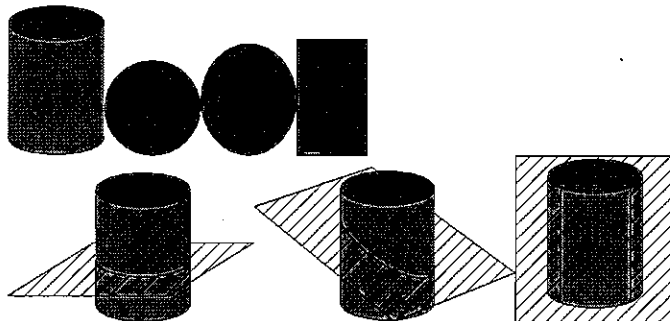
Example 8:

Two stacks of 25 quarters each are shown below. One stack forms a cylinder but the other stack does not form a cylinder.



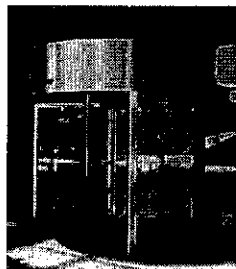
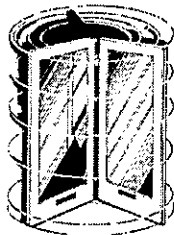
Use Cavalieri's principle to explain why the volumes of these two stacks of quarters are equal.

Cross Sections Cut NOT Parallel the Base can look very different



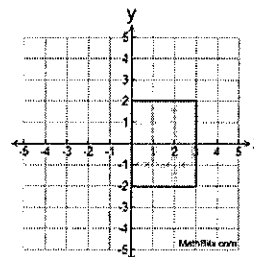
Solids of Revolution

Definition: A **solid of revolution** is a three-dimensional figure obtained by rotating a two-dimensional figure (or curve) around a straight line (called the axis) that lies in the same plane.



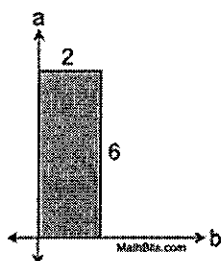
Example 9:

What is the volume (in terms of π) of the solid formed by rotating the given figure about the y-axis?

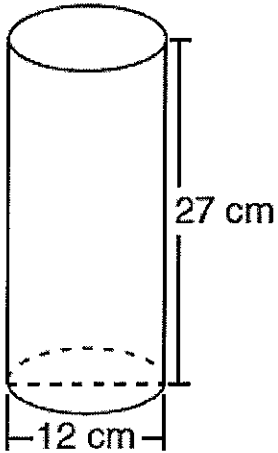


Example 10:

What is the volume (in terms of π) of the solid formed by rotating the given figure about the horizontal axis?



- 1 What is the volume, to the nearest hundredth, of the cylinder represented in the diagram below?



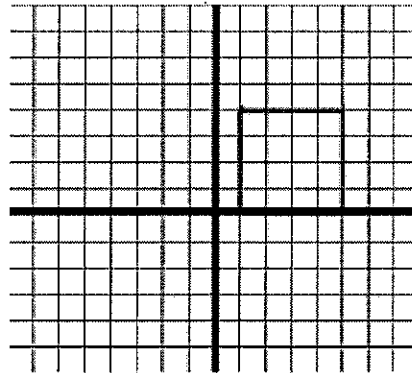
- 2 What is the volume, to the nearest cubic centimeter, of a cylinder that has a height of 15 cm and a diameter of 12 cm?

- 3 A cylinder has a height of 7 cm and a base with a diameter of 10 cm. Determine the volume, in cubic centimeters, of the cylinder in terms of π .

- 4 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*?

- 5 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*.

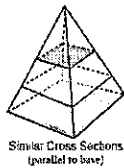
- 6 What is the volume (to nearest tenth) of the solid formed when the figure below is rotated about the x-axis?



Lesson 4

Pyramids, Cones, Spheres

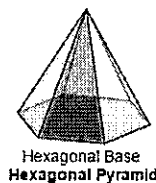
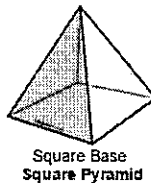
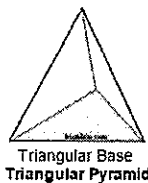
Definition: A **pyramid** is a polyhedron with one base, which is a polygon, and lateral faces that are triangles converging to a single point at the top.



- The one and only base of the pyramid is a polygon (no circles or ovals).
- Pyramids are also called polyhedra since their faces are polygons.
- The lateral faces are always triangles with a common vertex.
- The vertex of a pyramid (the point, the apex) is not in the same plane as the base.
- All cross sections of a pyramid parallel to the base will be similar to the base.



Pyramids are named for the shapes of their bases.

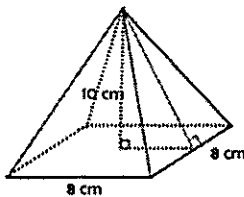


Volume of a Pyramid

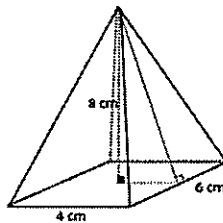
Pyramid $V = \frac{1}{3}Bh$

Find each volume to the nearest tenth.

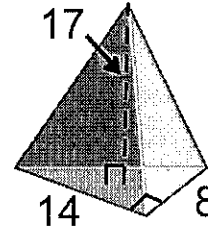
Example 1



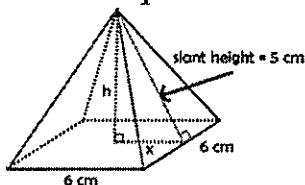
Example 2



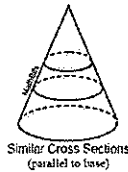
Example 3



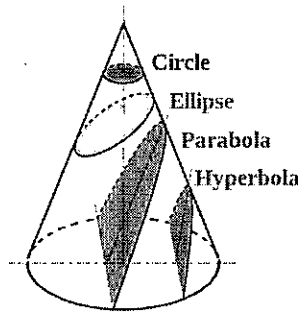
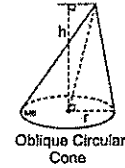
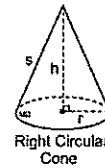
Example 4



Definition: A **cone** is a three-dimensional closed figure that has a circular base connected to a vertex (or apex) point outside the plane of the base.



- The one and only base of the cone is a circle (or other curved figure).
- Cones are NOT called **polyhedra** since their bases are curved (not polygons).
- The vertex of a cone (the point, the apex) is not in the same plane as the base.
- All cross sections of a cone parallel to the base will be similar to the base.
- While cones have several characteristics in common with pyramids, they are not pyramids.

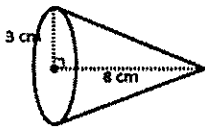


Volume of a Cone

Cone

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

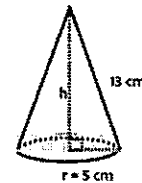
Example 5
in terms of Π



Example 6
nearest tenth

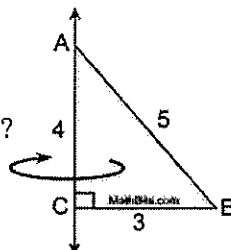


Example 7
in terms of Π



Example 8

What is the volume (to nearest tenth) of the solid formed when triangle ABC is rotated about the vertical axis?



Definition: A **sphere** is a set of points in three-dimensional space equidistant from a point called the center. The surface of a sphere is perfectly round.

Note: A "sphere" is the outer surface of a "ball" (or "solid sphere"). A "ball" is a sphere and everything inside the sphere. The word "sphere" is from the Greek meaning "globe".

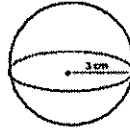


Cross Sections are Circles

- Spheres are perfectly round geometric objects.
- Spheres are NOT polyhedra.
- The intersection of a plane with a sphere is a circle (or a point if tangent to sphere).
- All cross sections of a sphere are circles. (All circles are similar to one another.)
- If two planes are equidistant from the center of a sphere, and intersecting the sphere, the intersected circles are congruent.

Volume of a Sphere

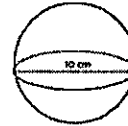
Example 9
in terms of π



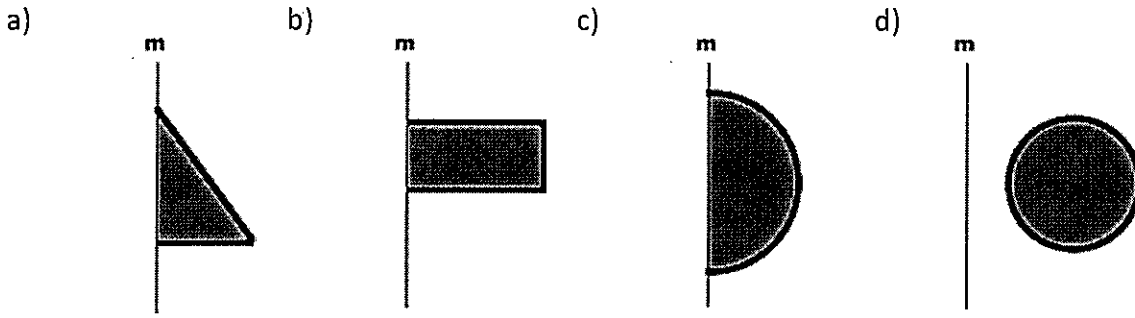
Sphere

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

Example 10
nearest tenth

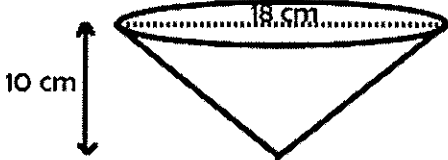


1. Describe the solid that is formed by rotating each of these figures about line m .

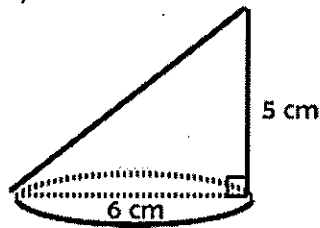


2. Determine the volume of the cone.

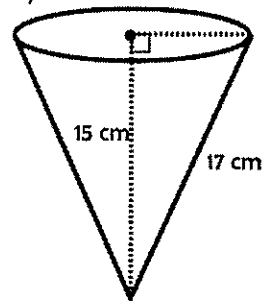
a) in terms of π



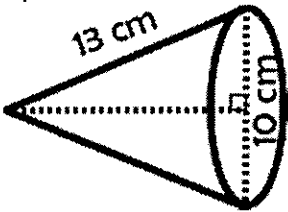
b) in terms of π



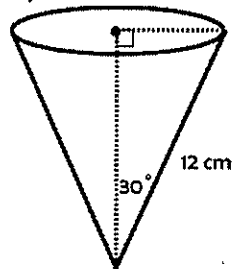
c) nearest tenth



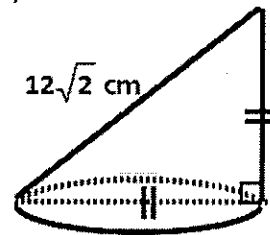
d) in terms of π



e) EXACT in terms of π

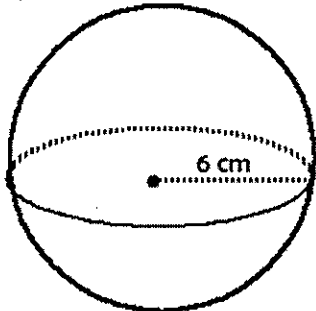


f) nearest tenth

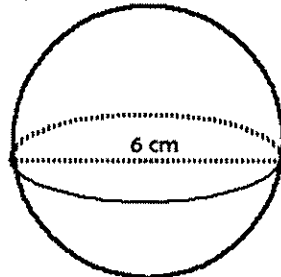


3. Determine the volume of the solid.

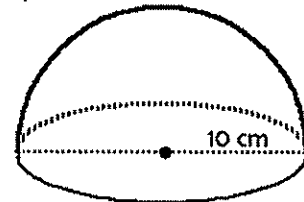
a) in terms of π



b) tenth



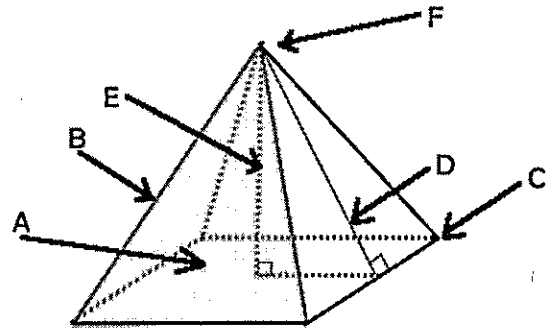
c) hundredth



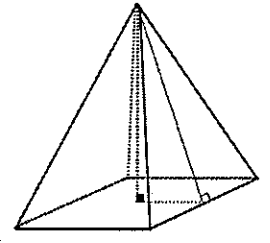
4. Match the following terms to the diagram.

Given the square pyramid.

- _____ 1. Slant Height
- _____ 2. Apex
- _____ 3. Height
- _____ 4. Lateral Edge
- _____ 5. Face
- _____ 6. Vertex

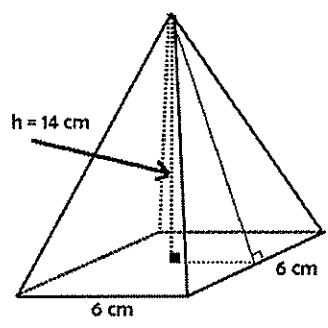


5. Jeff missed class and Dillon is explaining the notes. "The slant height and the height of the pyramid basically mean the same thing." Is this summary of height correct? Explain.

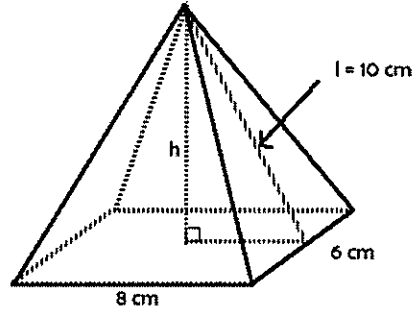


6. Determine the volume of the pyramid.

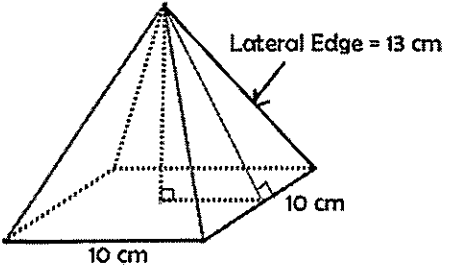
a) Square Pyramid



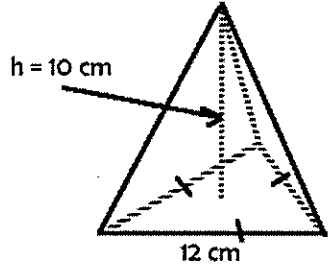
b) Rectangular Pyramid (nearest hundredth)



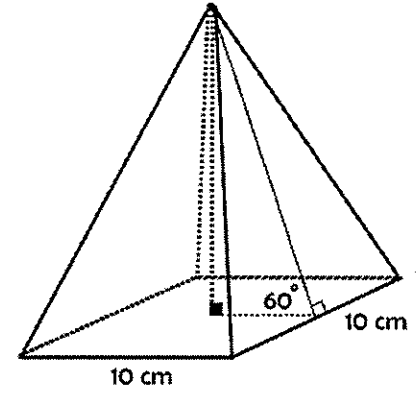
c) Square Pyramid (nearest tenth)



d) Equilateral Triangular Pyramid (Simplest Radical Form)



e) Square Pyramid (nearest integer)



Date _____

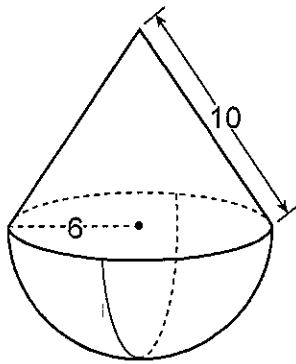
Geometry CC

Volume of Composite Shapes

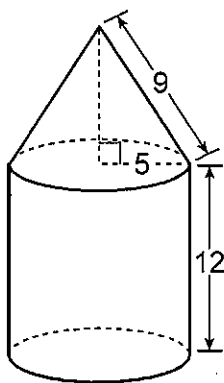
Questions 1 through 4 refer to the following:

Find, to the *nearest* hundredth, the volume of the given composite solid.

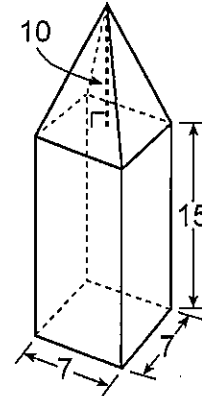
1)



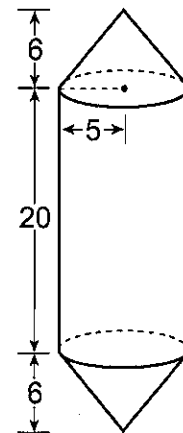
2)



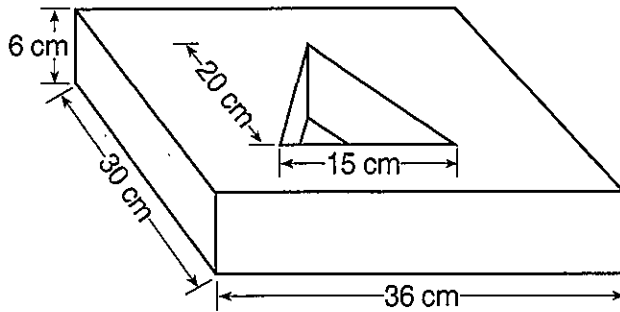
3)



4)

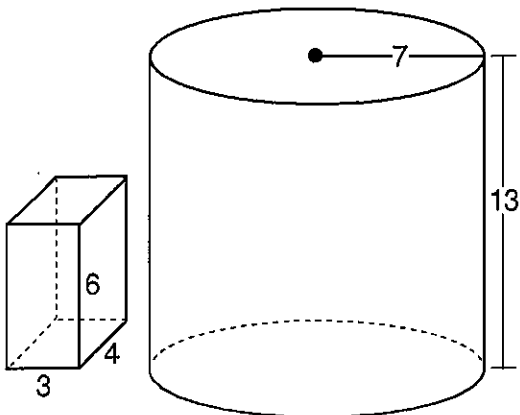


- 5) The figure below shows dimensions of a block of foam used to package a triangular shaped product. The foam is in the shape of a rectangular prism with a small triangular prism removed from the center.



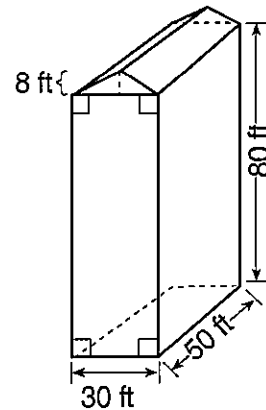
How many cubic centimeters of foam are used to package this product?

- 6) Elana is making spaghetti sauce. She is cooking it in a cylindrical pot that is 13 inches tall and has a radius of 7 inches. The sauce is 1 inch from the top of the pot. She plans on transferring the sauce to rectangular containers that are 6 inches tall, with bases that are 3 inches by 4 inches.



If she fills each rectangular container 1 inch from the top, approximately how many containers will she need to hold all of the sauce in the pot?

- 7) The cooling system for the building shown below can reduce the temperature 15°F at a rate of 925 cubic feet per minute.



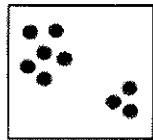
How many minutes will it take to lower the temperature of the building from 75°F to 60°F ? [Round the answer to the nearest minute.]

Lesson 6: Density

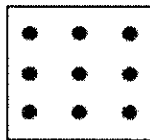
The term "density" basically refers to the degree to which something is filled or occupied.

Density is the quantity of something per unit measure (unit length, area, or volume).

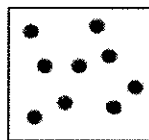
Population density is population (of animals, fish, people, plants, insects, etc) divided by total land area (or water volume).



Clumped



Uniform



Random

Population Density Example 1:

The world's population is approximately 7 billion people with the Earth's total area (land) being 58 million square miles. What is the Earth's population density (nearest whole number)?

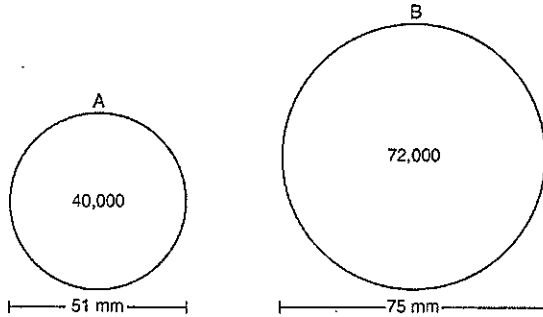
Population Density Example 2:

As of 2015, the most densely populated state in the US was New Jersey. The 2015 population of New Jersey was 8,957,907 people with 1218.1 people per square mile. What is the approximate land area of the state of New Jersey to the nearest square mile?

Population Density Example 3:

During an experiment, the same type of bacteria is grown in two petri dishes.
Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour.
Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.

Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.



Example 4 Volume Density:

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

Example 5:

A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?

Example 6:

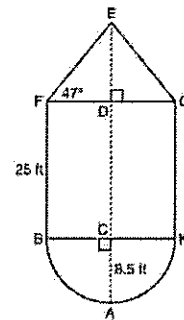
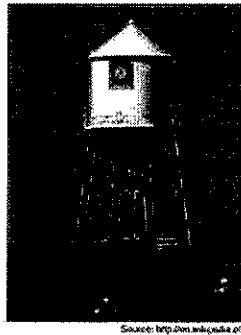
A hemispherical tank is filled with water and has a diameter of 10 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank, to the *nearest pound*?

Example 7:

A contractor needs to purchase 500 bricks. The dimensions of each brick are 5.1 cm by 10.2 cm by 20.3 cm, and the density of each brick is 1920 kg/m³. The maximum capacity of the contractor's trailer is 900 kg. Can the trailer hold the weight of 500 bricks? Justify your answer.

Example 8 June 2015:

The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let C be the center of the hemisphere and let D be the center of the base of the cone.



If $AC = 8.5$ feet, $BF = 25$ feet, and $m\angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower. The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

Example 9 August 2015:

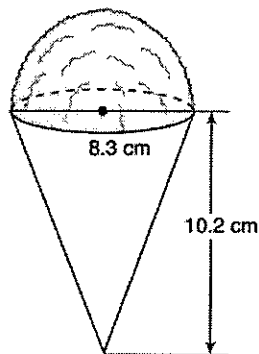
Walter wants to make 100 candles in the shape of a cone for his new candle business. The mold shown below will be used to make the candles. Each mold will have a height of 8 inches and a diameter of 3 inches. To the *nearest cubic inch*, what will be the total volume of 100 candles?



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? If Walter spent a total of \$37.83 for the molds and charges \$1.95 for each candle, what is Walter's profit after selling 100 candles?

Example 10 August 2016:

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.

Example 11 January 2017:

New streetlights will be installed along a section of the highway. The posts for the streetlights will be 7.5 m tall and made of aluminum. The city can choose to buy the posts shaped like cylinders or the posts shaped like rectangular prisms. The cylindrical posts have a hollow core, with aluminum 2.5 cm thick, and an outer diameter of 53.4 cm. The rectangular-prism posts have a hollow core, with aluminum 2.5 cm thick, and a square base that measures 40 cm on each side.

The density of aluminum is 2.7 g/cm^3 , and the cost of aluminum is \$0.38 per kilogram.

If all posts must be the same shape, which post design will cost the town less?

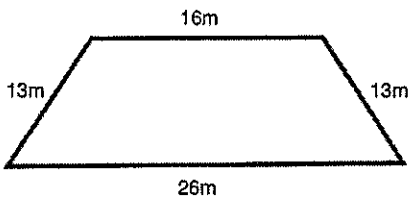
How much money will be saved per streetlight post with the less expensive design?

Example 12:

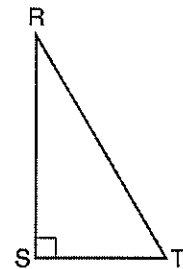
Trees that are cut down and stripped of their branches for timber are approximately cylindrical. A timber company specializes in a certain type of tree that has a typical diameter of 50 cm and a typical height of about 10 meters. The density of the wood is 380 kilograms per cubic meter, and the wood can be sold by mass at a rate of \$4.75 per kilogram. Determine and state the minimum number of whole trees that must be sold to raise at least \$50,000.

- 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*?
- A designer needs to create perfectly circular necklaces. The necklaces each need to have a radius of 10 cm. What is the largest number of necklaces that can be made from 1000 cm of wire?

- What is the area of the trapezoid pictured below (nearest square meter)?

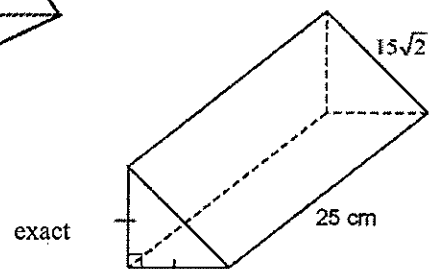
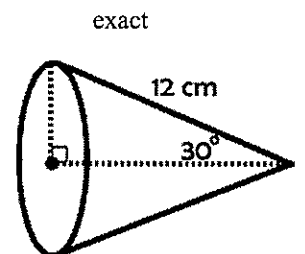
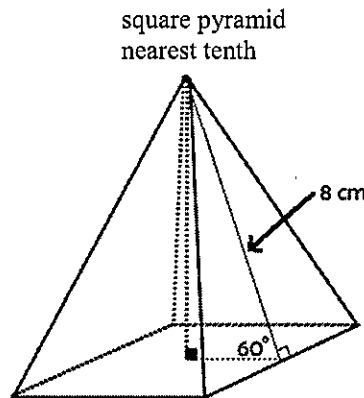
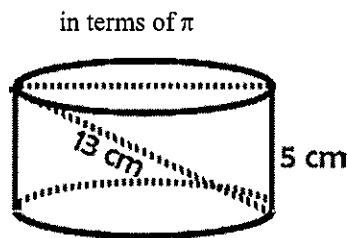
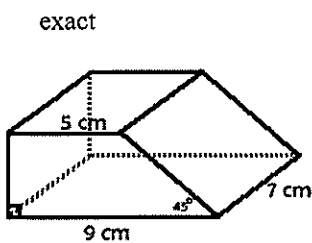


- Which object is formed when right triangle RST shown below is rotated around leg \overline{RS} ?

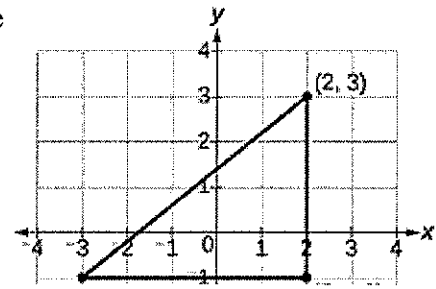


- A gallon of paint will cover approximately 450 square feet. An artist wants to paint all the outside surfaces of a cube measuring 12 feet on each edge. What is the *least* number of gallons of paint he must buy to paint the cube?
- Two prisms have equal heights and equal volumes. The base of one is a hexagon and the base of the other is a square. If the area of the hexagonal base is 49 square inches, how many inches are in the length of each side of the square base?

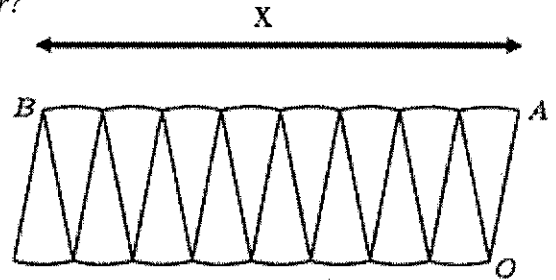
- Find the volume of each:



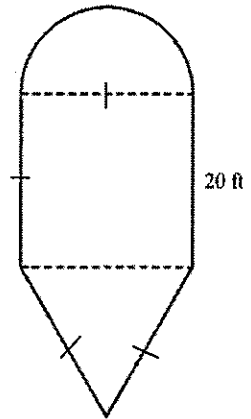
8. What is the volume (to the nearest tenth) of the solid formed when the figure below is rotated continuously around the line $y = -1$.



9. A circle with a radius of 10 was divided into 16 congruent sectors. The sectors were then rearranged, as shown in the diagram below. What is the value of x to the nearest integer?



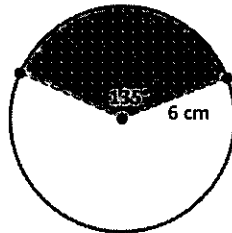
10. How much fencing (nearest tenth) is needed to enclose the playground pictured?



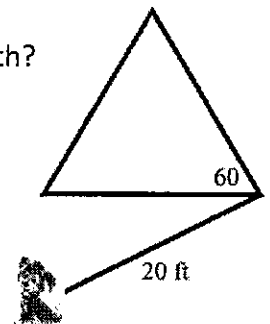
11. Name 2 types of polyhedron studied this unit. Why are they polyhedrons?

12. Name a solid that is not a polyhedron and explain why it is not.

13. What is the area of the sector in terms of π ?

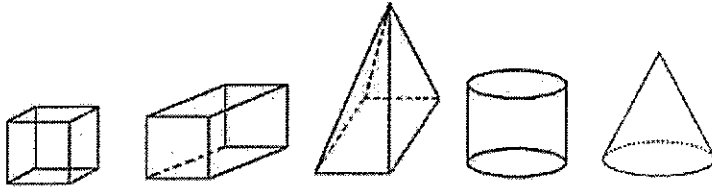


14. What is the total area that the dog can roam while attached to his leash to nearest tenth?



15. One quart of paint will cover 100 square feet. Matthew is trying to paint a school project which is in the shape of a cube measuring 4 feet on each side. Will one quart of paint be enough? Justify your answer.

16. State the 2-dimensional cross section shape for each solid (parallel to base).

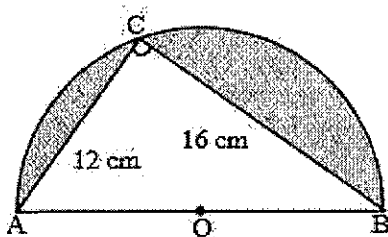


17. A right circular cylinder has a volume of 800 cubic feet and a height of 6 feet. What is the radius of the cylinder to the nearest tenth of a foot?

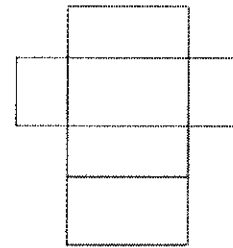
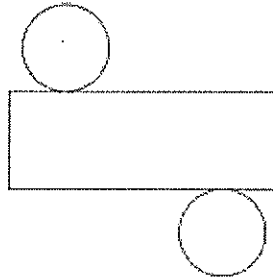
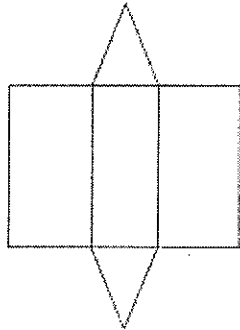
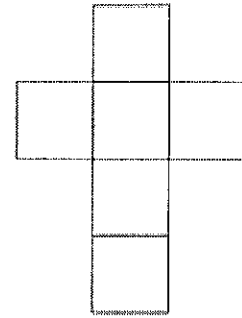
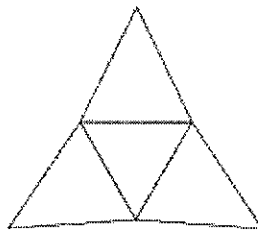
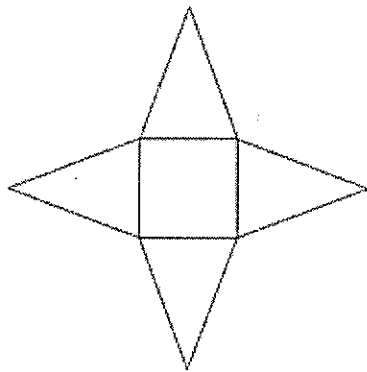
18. Michael is making pudding for a school project. He fills each rectangular cup with dimensions 2in, 3 in, 1in with 4 cubic inches of pudding. What percent of each cup is empty?

19. The diameter of a softball is 3.5 inches and the diameter of a soccer ball is 8.5 inches. Approximately how many times larger is the volume of the soccer ball?

20. What is the area of the shaded region which consists of a right triangle inside of a semi-circle in terms of π ?



21. Name each shape:



22. A kitchen was remodeled and granite counter tops were installed. A rectangular island in the kitchen now has a granite top measuring 6 ft. by 8 ft. by 1.2 inches. The density of granite is 168.6 pounds per ft^3 .

How much does the granite top on the island weigh, to the nearest tenth of a pound?

The average grown man can comfortably carry 110 pounds. How many men will be needed to carry the granite top into the kitchen for installation?