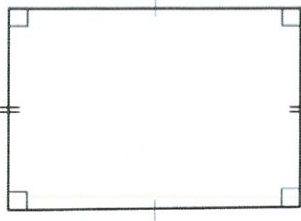
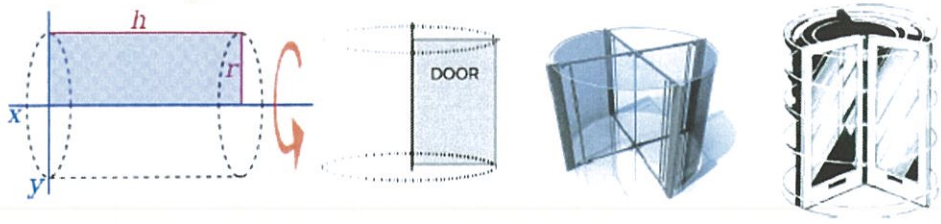
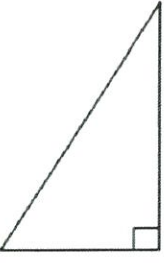
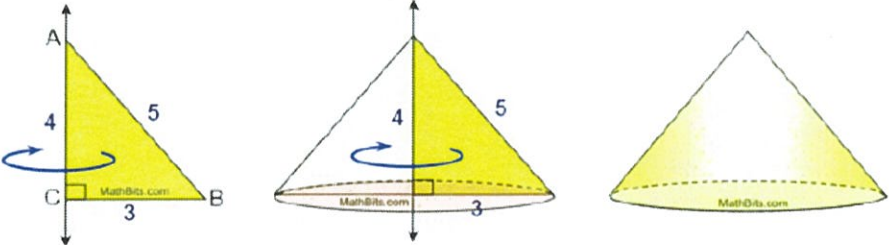
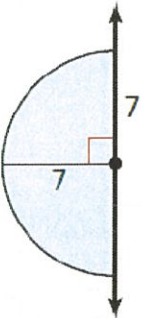
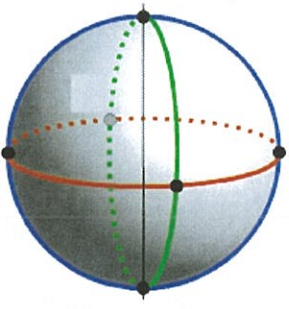
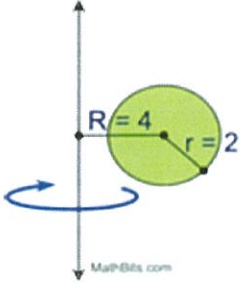
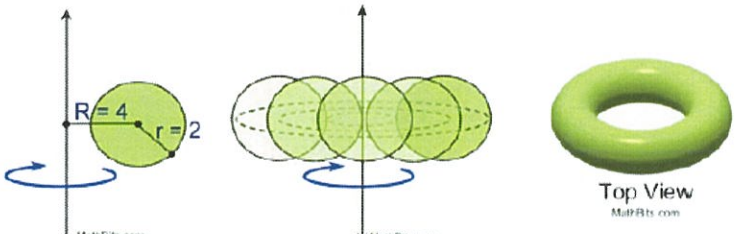


LESSON #8: REVOLUTIONS AND CROSS SECTIONS

Two dimensional figure	Revolutions
<p>Rectangle</p> 	<p>Name: <u>cylinder</u></p> 
<p>Right Triangle</p> 	<p>Name: <u>cone</u></p> 
<p>Semicircle touching the axis</p> 	<p>Name: <u>sphere</u></p> 
<p>Circle NOT touching the axis</p> 	<p>Name: <u>DONUT</u></p> 

1. Match each figure with the correct solid of revolution.

1) B



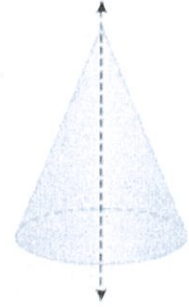
~~a)~~



2) C



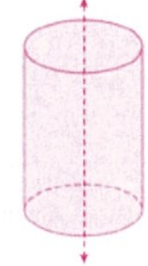
~~b)~~



3) d



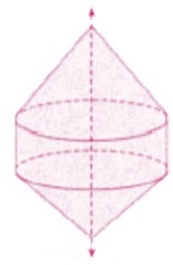
c)



4) a



~~d)~~



2. Describe the solid that is formed by rotating each of these figures about line m and sketch it.



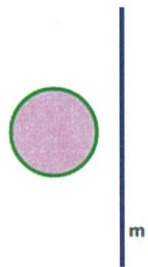
sphere



cone

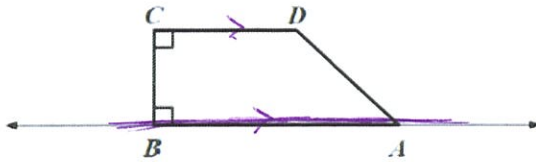


cylinder



Donut

3. In the diagram, $ABCD$ is a trapezoid where $AB \parallel CD$, angles B and C are right angles, and $m\angle A = 60^\circ$.



The trapezoid is rotated 360° about AB . Which describes resulting three-dimensional figure?

- (1) The union of a cylinder and a cone. (2) The union of two cones.
 (3) The union of a prism and a pyramid. (4) The union of two pyramids.

4. Which figure would be rotated 360 degrees to create a cone with an altitude perpendicular to its base?

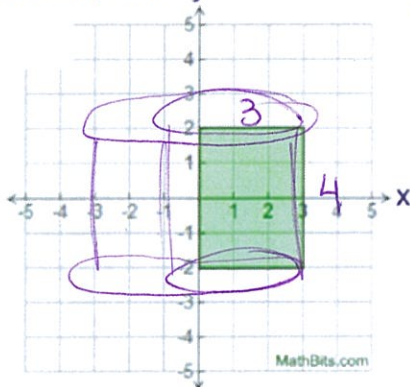
- (1) An obtuse triangle (2) a rectangle (3) a right triangle rotated about its leg (4) a hexagon

5. Given the graph below:

a) Sketch the 3-D figure on the graph generated by rotating the 2-D shape about the stated axis of rotation.

b) Identify the 3-D figure: cylinder

Rotate about y-axis: y



c) Determine its volume:

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

$$V = \pi (3)^2 (4)$$

$$V = 36\pi$$

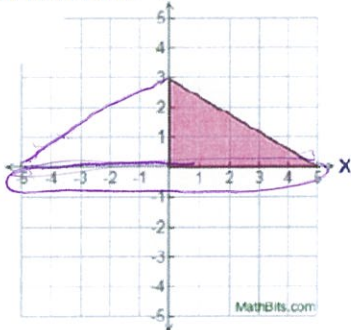
$$V = 113.10 \text{ u}^3$$

6. Given the graph below:

a) Sketch the 3-D figure on the graph generated by rotating the 2-D shape about the stated axis of rotation.

b) Identify the 3-D figure: cone

Rotate about x-axis: x



c) Determine its volume:

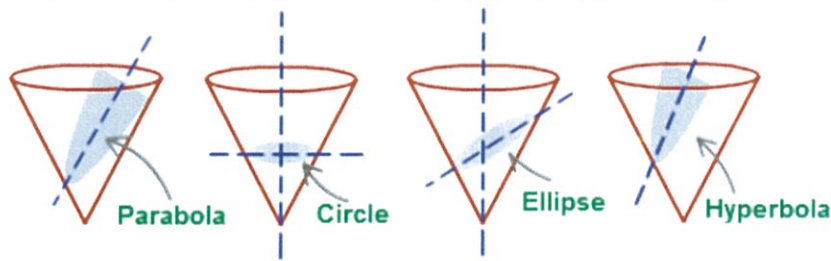
$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi (5)^2 (3)$$

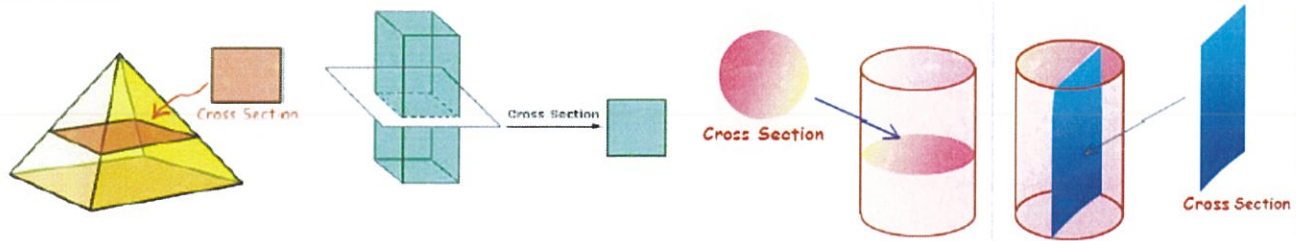
$$V = 25\pi$$

$$V = 78.54 \text{ u}^3$$

A cross section is the intersection of a figure in three-dimensional space with a plane. A cross section is two-dimensional.

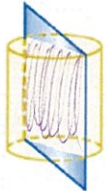
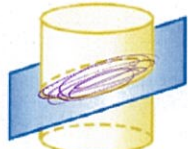
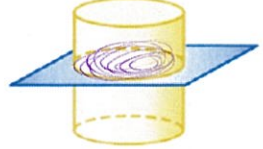


A slice is the intersection of a plane with a solid whereas a cross-section is a slice made parallel to the plane of solid's base.


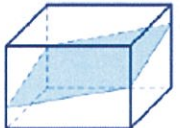
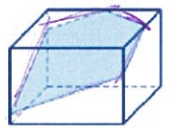
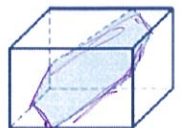


THEOREM: The maximum number of "sides" of a cross section equals the number of faces (surfaces) of the solid. Since the rectangular prism shown above has 6 faces, a cross section of that solid may have at most 6 sides. So a hexagon (6 sided) cross section is possible, but an octagon (8 sided) cross section is not possible.

8. Below are cylinders, identify each cross section.

<p>a)</p>  <p style="color: purple; font-size: 1.2em;">rectangle</p>	<p>b)</p>  <p style="color: purple; font-size: 1.2em;">oval</p>	<p>c)</p>  <p style="color: purple; font-size: 1.2em;">circle</p>
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9. Below are rectangular prisms, identify each cross section.

<p>a)</p>  <p style="color: purple; font-size: 1.2em;">Triangle</p>	<p>b)</p>  <p style="color: purple; font-size: 1.2em;">parallelogram</p>	<p>c)</p>  <p style="color: purple; font-size: 1.2em;">Pentagon</p>	<p>d)</p>  <p style="color: purple; font-size: 1.2em;">Hexagon</p>
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10. What is the shape of a cross section parallel to the base of the cone?

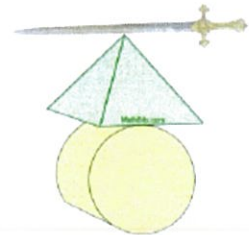
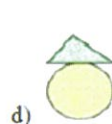
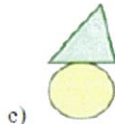
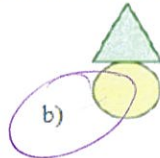
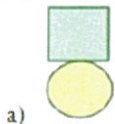
circle

11. What is the shape of a cross section perpendicular to the base of the cone?

Triangle



12. A right square pyramid sits atop a right circular cylinder as shown at the right. A sword will make a vertical slice through both figures starting at the vertex of the pyramid. Which of the following shapes represents the cross section?



13. A cube is intersected by a plane. Which shape could NOT be the resulting cross-section?

(1) triangle ✓ *ce 5 sides*

(2) pentagon

(3) hexagon

(4) octagon *too many sides*

14. Of the choices "square", "rectangle" and "triangle", which of the following are possible cross sections obtained when slicing a cube?

(1) square only (2) square and rectangle only (3) square and triangle only (4) square, rectangle and triangle

15. Given a right circular cylinder with a radius of 8 inches and a height of 20 inches. Which of the following choices is NOT a possible cross section of this cylinder?

(a) circle ✓

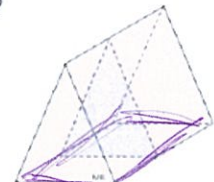
(b) ellipse ✓

(c) square

(d) rectangle

16. Given a right triangular prism as shown at the right. A cross section is made parallel to the bases. Which of the following statements is true regarding the area of the cross section and the area of the base?

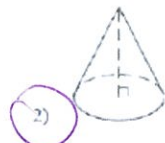
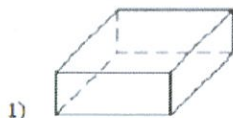
- a) The area of the cross section is equal to the area of the base.
- b) The area of the cross section is less than the area of the base.
- c) The area of the cross section is greater than the area of the base.
- d) There is insufficient data to determine these area relationships.



17. A solid has a triangle as a cross section. Which of the following solids could NOT have a triangle as a cross section?

- (a) Cube
- (b) Square pyramid
- (c) Triangular prism
- (d) Rectangular prism
- (e) All of the above have triangular cross sections.

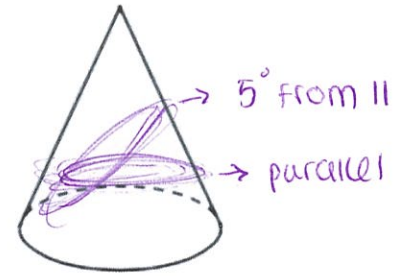
18. Which figure can have the same cross section as a sphere?



MORE PRACTICE!

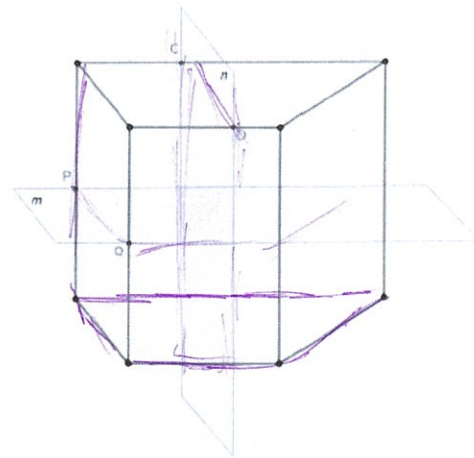
1. Jennifer is trying to determine if there is any difference in shape for various horizontal cross sections of a cone. She works with two cones that are similar to the one pictured below. Jennifer takes a cross-section of the first cone that is parallel to the base of the cone. Next she takes a cross section of the second cone that is slanted 5 degrees from parallel. What were her results?

- (1) The cross sections were both circles.
- (2) The cross sections were both ellipses.
- (3) The first cross section was a circle and the second cross section was an ellipse.**
- (4) The first cross section was an ellipse and the second cross section was a circle.

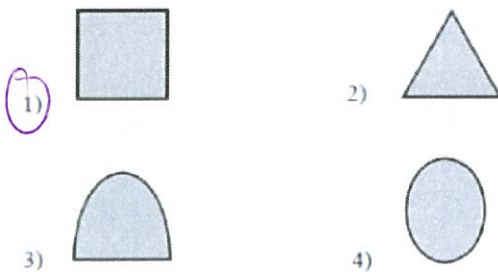


2. A right trapezoidal prism is shown in the diagram below. Vertical plane n intersects the prism at points C and D and horizontal plane m intersects the prism at points P and Q . What are the shapes of the cross sections created by the two planes with the prism?

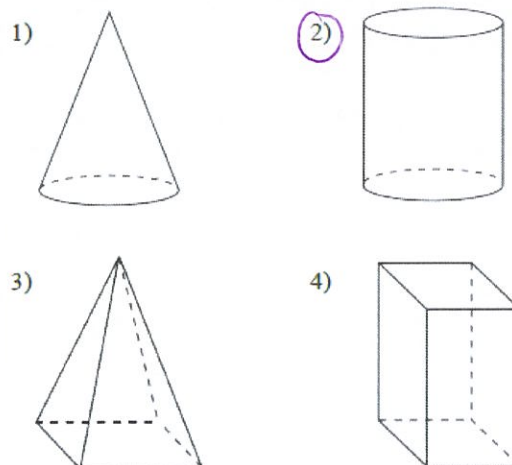
- (1) Trapezoid and rectangle** ↖ \perp vertical slice
- ~~(2) Trapezoid and parallelogram~~ ↖ \parallel to the base
- (3) Parallelogram and rectangle
- (4) Two trapezoids



3. Which drawing can not be a cross section of a cone?



4. 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?



<http://www.shodor.org/interactivate/activities/CrossSectionFlyer/>

https://www.youtube.com/watch?v=hID_j3AtxGs Math Shorts Ep. 8 – Slicing 3D Figures