

## 5E Lesson Plan

# 3-D Attributes

**teachHOUSTON Student Name:**

**Mentor Teacher Name:**

**Grade Level:** 5<sup>th</sup>

**Lesson Teaching Date and Time:**

**Concept(s):** Three-dimensional (3D) shapes have three dimensions: length, width, and height. The majority of real life objects are three-dimensional, so it is important to learn their attributes.

**TEKS:** The student is expected to:

5.7.A identify essential attributes...of two- and three-dimensional geometric figures.

<b>Objectives</b> <b>The student will be able to:</b>	<b>Evaluation Question for each Objective</b>
1. Identify and classify prisms and pyramids.	
2. List attributes of prisms and pyramids (i.e. how many faces, vertices and edges).	
3. Identify prisms and pyramids given certain attributes (i.e. how many faces, vertices and edges).	

## Materials List and Advanced Preparations:

For the teacher:

- A large bag of pretzel sticks
- A large bag of marshmallows
- Transparencies of the two included charts
- Transparency pens
- The book, The Greedy Triangle by Marilyn Burns

For each group:

- A set of relational geo solids that include the following: a cone, a cube, a cylinder, a hexagonal prism, a rectangular prism, a square prism, a triangular prism, square pyramid and a triangular pyramid. (Remove the sphere and half-sphere if there is one in the set)

For each set of partners:

- Approximately 32 pretzel sticks
- Approximately 22 marshmallows

Note: Leave the marshmallows out for a few days to allow them harden.

Engagement		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>Read <i>The Greedy Triangle</i> aloud to the class.</p> <p>Instead of finishing the story all of the way, the teacher will stop reading on the second to last page which begins with "The triangle was delighted..."</p>	<p>What do you think will happen next in the story? <i>Various predictions about the future of the story will be given.</i></p> <p>The triangle was very happy to back to his old self, but he still liked to have some fun. Do you see any pictures on this page that show a shape similar to a triangle but different? <i>A pyramid; it is made up of triangles, but it is 3-dimensional instead of 2-dimensional.</i></p>	<p>Students will actively listen and participate when possible.</p>

<p>Teacher will facilitate discussion on the difference between 2D and 3D.</p>	<p>The triangle liked the variety of being both a 2-dimensional and a 3-dimensional shape. What is the difference between a 2-dimensional shape and a 3-dimensional shape?  <i>A 2-D shape is flat; it only has 2 dimensions: length and width</i>  <i>A 3-D shape is not flat; it has 3 dimensions: length, width, and height</i></p> <p>What is an example of something that is 2-D?  <i>A piece of paper</i></p> <p>What is an example of something that is 3-D?  <i>A building</i>  <i>My desk</i>  <i>A pencil</i></p>	
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**Transition:** The triangle in our story became a pyramid which is a 3-dimensional shape. In our exploration we will learn more about pyramids and other 3-dimensional shapes.

<b>Exploration</b>		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>Break the students up into groups of 4 and provide each group with a set of Relational Geo Solids.</p> <p>The teacher will distinguish between the scientific meaning and the mathematical meaning of solid. The word “solid” can refer to something that is hard and takes up space, but it also has another meaning. In math, a solid refers to a 3-dimensional</p>	<p>What do you think of when you hear the word “solid?”  <i>Something that is hard or impossible to see through</i></p> <p>What do you notice about the solids you have at your desks?</p>	

<p>figure.</p> <p>The teacher will monitor groups as they sort their solids. Encourage all types of sorting as long as student can give the criteria for their groups.</p> <p>After students have had ample time to create their own categories, the teacher will help students “discover” the conventional categories of prism and pyramid by asking leading questions.</p>	<p><i>Some of the solids have many flats sides</i>  <i>Some of them have circle, rectangles, triangles, etc</i>  <i>Some are pointy</i></p> <p>Possible questions to probe the work of various groups:</p> <p>Why did you puts these solids together?  <i>Answers will depend on what the groups have done so far.</i></p> <p>What criteria must a shape meet to be included in this group?</p> <p>What if you put these solids together? Could they form a valid group? Why or why not?</p> <p>What if you could only sort your solids into 2 groups? How would you sort them?  <i>This question will be answered during student presentations in the Explanation section of the lesson.</i></p>	<p>Students will work together in groups to separate the solids into categories. They may create as many categories as they like. There are many ways that solids can be categorized; some students may group them by their general “look;” others by the shape of the base.</p> <p>Students will attempt to sort the solids into only two groups.</p>
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**Transition:** Now that you have had time to sort your solids in many different ways, some of the groups will get a chance to share their groupings.

<b>Explanation</b>		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>Intentionally select groups to share with interesting and unique groupings. Selecting groups with common misconceptions will allow for meaningful class discussion and</p>	<p>Why did you puts these solids together?  <i>Answers will depend on what the groupings students have made</i></p> <p>What criteria must a shape meet</p>	<p>Selected groups will share their groupings and the reasons behind the groupings.</p>

<p>can allow the teacher to lead students to see their misconceptions.</p> <p>The teacher will interact with groups presenting and the class to eventually showcase the conventional grouping of prisms vs. pyramids. It is likely that a group may have created these categories on their own with one or two mistakes (i.e. students often place a triangular prism in the pyramid group). Use probing questions to fix any problems and then connect the vocabulary with their groups.</p>	<p>to be included in this group?</p> <p>What if you put these solids together? Could they form a valid group? Why or why not?</p> <p>What do all these shapes (the prisms) have in common? <i>The sides are rectangular</i> <i>They are flat on the top and bottom</i></p> <p>How many bases does a prism have? <i>Two</i></p> <p>What do you notice about the bases? <i>They are congruent and parallel</i></p> <p>What do all these shapes (the pyramids) have in common? <i>They are all pointy</i> <i>They all have triangles for sides</i></p> <p>How many bases does a pyramid have? <i>One</i></p>	<p>Students will share observations about prisms.</p> <p>Students will share observations about pyramids.</p>
<p>The teacher will hold up a square pyramid and a triangular pyramid.</p> <p>The teacher will hold up a rectangular prism and a triangular prism.</p> <p>The teacher will hold up a cylinder.</p>	<p>We said these are both pyramids, but they are not identical. How can we distinguish between them? <i>Each pyramid has a different shape for the base. We can call one a square pyramid and the other a triangular pyramid.</i></p> <p>What should we call these two shapes? <i>One is a rectangular prism; the other is a triangular prism</i></p> <p>This shape could be called a circular prism, but it actually has a special name. What is it?</p>	<p>Students will brainstorm how to distinguish between different types of prisms and pyramids.</p>

The teacher will hold up a cone.	<p><i>A cylinder</i></p> <p>This shape could be called a circular pyramid; it also has a special name. What is it?</p> <p><i>A cone</i></p>	
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**Transition:** Now that you can name any solid, we will learn more about their attributes and build them.

<b>Elaboration</b>		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
The teacher will hold up a 3-D solid (anything except a cone or cylinder).	<p>This solid has edges. What is an edge? Where is it located on the shape?</p> <p><i>An edge is a line segment on a solid. It is found at the intersection of two sides.</i></p> <p>Hold up one of your solids and point to an edge.</p> <p>Solids also have faces. What do think a face is?</p> <p><i>Each side is called a face</i></p> <p>Hold up one of your solids and point to a face.</p> <p>Besides edges and faces, there is one more important part of a solid. What do you think it is?</p> <p><i>The corner points</i></p> <p>The corner points of a solid have a special name: vertices. Hold up one of your solids and point to a vertex (singular of vertices)</p>	Students will use the sets of solids at their desks to answer the questions.
The teacher will hold up a square pyramid.	<p>How many vertices/edges/faces does this square prism have?</p> <p><i>1 vertex</i></p> <p><i>8 edges</i></p>	

<p>The teacher will hold up a hexagonal prism.</p>	<p><i>5 faces</i></p> <p>How many vertices/edges/faces does a hexagonal prism have?</p> <p><i>12 vertices</i></p> <p><i>18 edges</i></p> <p><i>8 faces</i></p>	
<p>The teacher will pass out “Build a 3-D Figure” Activity Sheet and marshmallows and pretzels for each group.</p>	<p>We are going to build solids with marshmallows and pretzels. What part of the solid do you think the pretzels will represent?</p> <p><i>The edges</i></p> <p>What part of the solid do you think the marshmallows will represent?</p> <p><i>The vertices</i></p> <p>Could we build a cone and cylinder? Why or why not?</p> <p><i>No because they don't have edges or vertices.</i></p>	<p>In pairs, students will build given solids and then list the number of vertices, faces, and edges for each solid.</p> <p>Students will use the pretzels and marshmallows to build a figure with the given attributes.</p> <p>If there is time, selected students can present their constructions and answers to the class.</p>

**Transition:** Today we learned how to categorize solids into cones, pyramids, prisms and cylinders. We also learned how to count the vertices, edges and faces of a 3-D solid. Now, let’s examine how much we have learned today by taking a short assessment.

<p><b>Evaluation</b></p>
<p>Give the students the following assessment activity in order to gage their understanding of the day’s material.</p>

## Build a 3-Dimensional Figure

Use the marshmallows and pretzels to build each solid listed below. Count the number of vertices, edges, and faces on each solid.

Name of Solid	Vertices	Edges	Faces
Triangular Prism			
Triangular Pyramid			
Hexagonal Prism			
Pentagonal Pyramid			

Use the marshmallows and pretzels to build a figure with the given attributes. Write down the name of the solid you built.

Vertices	Edges	Faces	Name of Solid
8	12	6	
5	8	5	