

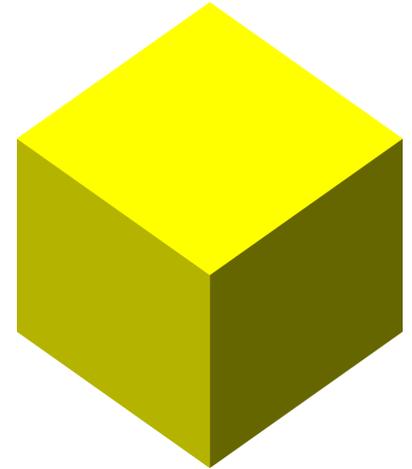
Geometric Creatures

Background: We have been learning about geometric shapes, such as squares, triangles, rectangles, circles, cubes, rectangular solids, spheres, pyramids, cones, and cylinders.

Design Challenge: Design and build an imaginary geometric creature using both plane and solid geometric shapes. Your geometric creature must stand by itself and have at least two moving parts.

Criteria: Your creature must

- have at least five plane shapes
- have at least three solid shapes
- have two moving parts that incorporate simple machines
- stand by itself for five minutes
- be colorful and neatly constructed.



Materials: Select from the list below.	Tools: Select from the list below.
<ul style="list-style-type: none"> • balloons • construction paper • craft sticks • empty containers • flattened cardboard containers • glue • paper fasteners 	<ul style="list-style-type: none"> • pipe cleaners • scrap paper • spools • straws • string or yarn (limit 12 inches) • tag board • tape (limit 12 inches)

Targeted Standard of Learning: Mathematics 3.14

Supporting SOL: English 3.1, 3.2; Mathematics 3.9; Science 3.1, 3.2

Targeted Standard for Technological Literacy: 9

Supporting STL: 8, 10, 11

Tips for Teachers

Targeted Standard of Learning:

Mathematics 3.14 The student will identify, describe, compare, and contrast characteristics of plane and solid geometric figures (circle, square, rectangle, triangle, cube, rectangular prism, square pyramid, sphere, cone, and cylinder) by identifying relevant characteristics, including the number of angles, vertices, and edges, and the number and shape of faces, using concrete models.

Supporting SOL: English 3.1, 3.2; Mathematics 3.9; Science 3.1, 3.2

Targeted Standard for Technological Literacy:

9 Students will develop an understanding of engineering design.

Supporting STL: 8, 10, 11

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
<ul style="list-style-type: none"> Exposure to targeted Mathematics Standard of Learning 3.14 including constructing solid shapes Exposure to the design process Exposure to simple machines (Science Standard of Learning 3.2) 	<ul style="list-style-type: none"> Check Design Brief for recommended materials. Teacher may substitute materials. In advance, collect empty food packaging, paper towel and toilet paper rolls, and tissue boxes. 	<ul style="list-style-type: none"> Discuss proper use of tools 	<ul style="list-style-type: none"> Small groups Students can write about their creatures using math vocabulary. 	<ul style="list-style-type: none"> Design Brief Guided Portfolio (adapt as appropriate/ optional) Rubric Assessments 	<p>Follow the Design Process:</p> <ul style="list-style-type: none"> Restate the problem. Brainstorm solutions. Create the best solution. Test the solution. Evaluate the solution.

Guided Portfolio, p2

Name _____



2. Brainstorm solutions. Sketch and/or describe some possible solutions.

Name _____

4. Test your solution.

Does your creature have at least five plane shapes? YES NO

- Identify each plane shape.

Does your creature have at least three solid shapes? YES NO

- Identify each solid shape.

Does your creature have two parts that use simple machines to move? YES NO

- Identify each simple machine, and explain how it works.

Does your creature stand by itself for at least five minutes? YES NO

- How long can your creature stand? _____

Does your creature remain standing when its parts are moving? YES NO

Is all of your work colorful and neatly done? YES NO

Guided Portfolio, p5

Name _____

5. Evaluate your solution.

Was it the best solution? Why, or why not?

Look back at your brainstorming page. Would one of your other ideas have been better? Explain your reasoning.

What did you learn by designing and creating this model?

Rubric for Geometric Creatures

Name _____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Design Brief Rubric	0	1	2	3	4
The student restated the problem in his/her own words.					
The student brainstormed more than one idea.					
The student shared problems that occurred and their solutions through written notes or oral communication per teacher's instructions.					
The student tested the creature <ul style="list-style-type: none"> • for at least five different plane shapes • for at least three solid shapes • for two parts that use simple machines to move • to see if it could stand by itself for at least five minutes • to see if it remained standing when its parts were moving • to see if the work was colorful and neatly done. 					
The student evaluated how he/she could make it better next time.					

Rubric for Geometric Figures

Name _____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Oral Communication Rubric	0	1	2	3	4
<p>3.1 The student will use effective communication skills in group activities.</p> <ul style="list-style-type: none"> a) Listen attentively by making eye contact, facing the speaker, asking questions, and summarizing what is said. b) Ask and respond to questions from teachers and other group members. c) Explain what has been learned. d) Use language appropriate for context. e) Increase listening and speaking vocabularies. 					
<p>3.2 The student will present brief oral reports using visual media.</p> <ul style="list-style-type: none"> a) Speak clearly. b) Use appropriate volume and pitch. c) Speak at an understandable rate. d) Organize ideas sequentially or around major points of information. e) Use contextually appropriate language and specific vocabulary to communicate ideas. 					

Standards of Learning

English (2010)

Oral Language

- 3.1 The student will use effective communication skills in group activities.
- Listen attentively by making eye contact, facing the speaker, asking questions, and summarizing what is said.
 - Ask and respond to questions from teachers and other group members.
 - Explain what has been learned.
 - Use language appropriate for context.
 - Increase listening and speaking vocabularies.
- 3.2 The student will present brief oral reports using visual media.
- Speak clearly.
 - Use appropriate volume and pitch.
 - Speak at an understandable rate.
 - Organize ideas sequentially or around major points of information.
 - Use contextually appropriate language and specific vocabulary to communicate ideas.

Mathematics (2009)

Measurement

- 3.9 The student will estimate and use U.S. Customary and metric units to measure
- length to the nearest 12-inch, inch, foot, yard, centimeter, and meter;
 - liquid volume in cups, pints, quarts, gallons, and liters;
 - weight/mass in ounces, pounds, grams, and kilograms; and
 - area and perimeter.

Science (2010)

Scientific Investigation, Reasoning, and Logic

- 3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- observations are made and are repeated to ensure accuracy;
 - predictions are formulated using a variety of sources of information;
 - objects with similar characteristics or properties are classified into at least two sets and two subsets;
 - natural events are sequenced chronologically;

- e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques;
- f) time is measured to the nearest minute using proper tools and techniques;
- g) questions are developed to formulate hypotheses;
- h) data are gathered, charted, graphed, and analyzed;
- i) unexpected or unusual quantitative data are recognized;
- j) inferences are made and conclusions are drawn;
- k) data are communicated;
- l) models are designed and built; and
- m) current applications are used to reinforce science concepts.

Force, Motion, and Energy

- 3.2 The student will investigate and understand simple machines and their uses. Key concepts include
- a) purpose and function of simple machines;
 - b) types of simple machines;
 - c) compound machines; and
 - d) examples of simple and compound machines found in the school, home, and work environments.

Standards for Technological Literacy

- Standard 8: Students will develop an understanding of the attributes of design.
- Standard 9: Students will develop an understanding of engineering design.
- Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- Standard 11: Students will develop the abilities to apply the design process.

Please give us some feedback.

Complete the form below to let us know how this design brief worked for you and your students. Please be specific so that we might use your suggestions to improve the activity. *You can fill this out on your computer, or you can print it, fill it out manually, and scan it.*

Teacher: _____

School: _____

School division: _____

Design brief title: _____

Background	<i>Put an X in the appropriate column:</i>	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does it set the context for the activity?				
Is it age-appropriate in language, length, and complexity?				
Does it reference prior learning and/or research that the students did that will facilitate designing a solution to a problem?				
Is it detailed enough that an adult will understand the purpose for the design brief?				
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>				

Design Challenge	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does the challenge support your curriculum?			
Is it age-appropriate in language, length, and complexity?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>			

Criteria Criteria are part of the challenge. They set the limitations for the design. They are not directions.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Are the limitations age-appropriate?				
Do the limitations encourage critical thinking?				
Is the application of mathematic knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of science knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of social studies knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Are language skills integrated into the criteria? If not, should the skill area be addressed?				
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>				

Materials Materials help set the limitations for the design. The list should include materials that might work.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Does the materials list encourage a variety of design solutions?				
Does the materials list include a variety of choices for joining items?				
Does the materials list include materials that force students to make decisions?				
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>				

Tools Tools can be used in the construction of the designed product. They are used to manipulate materials. They cannot become part of the product.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the tools listed age appropriate?			
Are all tools needed for the activity included?			
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>			

Standards of Learning	Yes	No
Does the design brief reinforce the targeted Standard of Learning(s)?		
Are the supporting Standards of Learning appropriate?		
What Standards of Learning would you add or remove?		

Standards for Technological Literacy	Yes	No
Does the design brief reinforce the targeted Standard(s) for Technological Literacy?		
Are the supporting Standards for Technological Literacy appropriate?		
What Standards for Technological Literacy would you add or remove?		

Tips for Teachers	Yes	No
Are the tips listed in the chart helpful for a first-time teacher?		
What tips would you add?		

Guided Portfolio	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the instructions and questions age appropriate and clear?			
In the "Test your solution" section, do the questions force students to thoroughly test their solutions?			
In the "Evaluate your solution" section, do the questions force students to honestly evaluate their solutions			
COMMENTS. <i>If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.</i>			

<p>Additional Comments Please use this area to provide general suggestions for improving this design brief.</p>