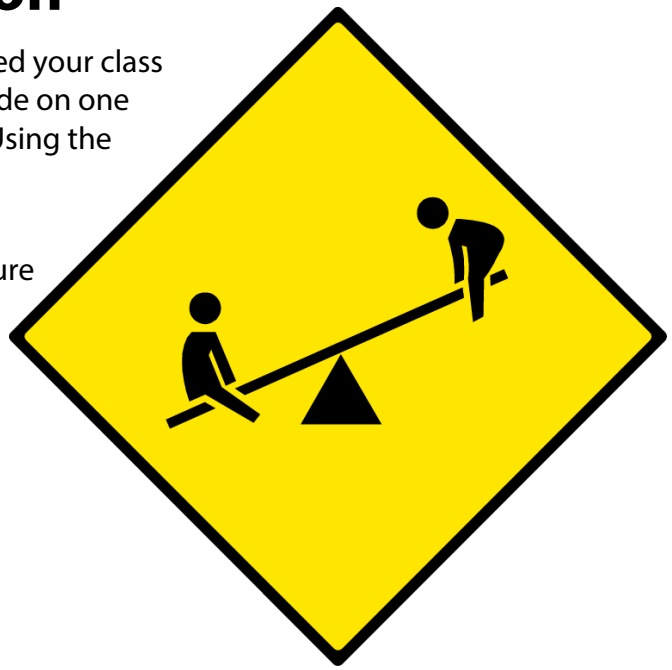
Playground Construction



Background: Your school leaders have decided to build a new playground, and they have asked your class to design and build a model of a playground that students would enjoy. Each student will decide on one structure to build for the playground, and each structure should be different from the others. Using the Internet and other resources, find information on school playground equipment.

Design Challenge: Design and build a structure for the playground. Write a short paragraph describing the geometric concepts that apply to your structure. Make a drawing of your structure labeling edges and giving their measurements to the nearest 1/8 inch. Be prepared to share your paragraph and structure drawing with the class.

Criteria: Your structure must

- ☐ fit within your 10 by 10 inch coordinate square on the playground model
- ☐ be no more than 12 inches tall
- ☐ contain examples of polygons with varying numbers of sides
- ☐ be labeled with lengths and show at least three sets of equivalent measurements
- ☐ be colorful and neat.

Materials: Select from the list below.		**Tools:** Select from the list below.	
• cardboard base (10-inch square) • card stock • craft sticks • glue	• recycled and/or found materials • straws • wooden dowels • yarn or string	• markers, colored pencils, crayons • pencils • ruler	• safety glasses • saw • scissors

Targeted Standard of Learning: Mathematics 4.10
Supporting SOL: Mathematics 4.5, 4.7, 4.12; English 4.7, 4.8

Targeted Standard for Technological Literacy: 12
Supporting STL: 11, 20

Tips for Teachers

Targeted Standards of Learning:

Mathematics 4.10 The student will
a) identify and describe representations of points, lines, line segments, rays, and angles, including endpoints and vertices; and
b) identify representations of lines that illustrate intersection, parallelism, and perpendicularity.

Supporting SOL: Mathematics 4.5, 4.7, 4.12; English 4.7, 4.8

Targeted Standards for Technological Literacy:

12 Students will develop the ability to use and maintain technological products and systems.

Supporting STL: 11, 20

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
• Targeted Mathematics Standard of Learning 4.10 • Basic understanding of the design process	• See Design Brief for materials. • Recycled and found objects may be used in place of wooden dowels.	• Safe use of tools	• Individuals or pairs	• Design Brief • Guided Portfolio (adapt as appropriate/ optional) • Rubric Assessments • KWL	Follow the Design Process: • Restate the problem. • Brainstorm solutions. • Create the best solution. • Test the solution. • Evaluate the solution.

Differentiation Option: For students with more advanced reading skills, the following page is provided as an alternative to page 1.

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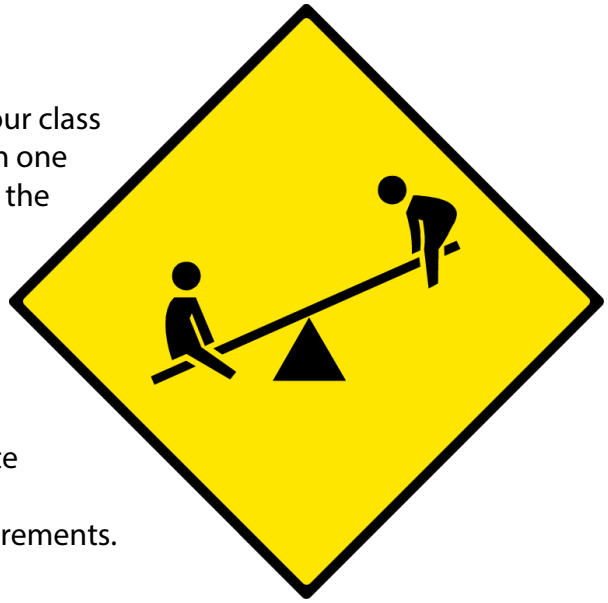


Background: Your school leaders have decided to build a new playground, and they have asked your class to design and build a model of a playground that students would enjoy. Each student will decide on one structure to build for the playground, and each structure should be different from the others. Using the Internet and other resources, find information on school playground equipment.

Design Challenge: Design and build a structure for the playground. Write a short paragraph describing the geometric concepts that apply to your structure. Make a drawing of your structure labeling edges and giving their measurements to the nearest 1/8 inch. Be prepared to share your paragraph and structure drawing with the class.

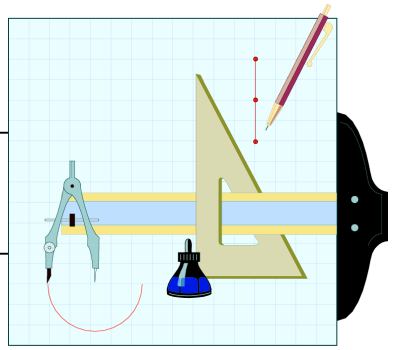
Your structure must be no more than 12 inches tall and must fit within your 10 by 10 inch coordinate square on the playground model. Be sure to include polygons with varying numbers of sides. When labeling the lengths of the structure's edges, you must show at least three sets of equivalent measurements. Your structure should be colorful and neat.

Materials: Select from the list below.		**Tools:** Select from the list below.	
• cardboard base (10-inch square) • card stock • craft sticks • glue	• recycled and/or found materials • straws • wooden dowels • yarn or string	• markers, colored pencils, crayons • pencils • ruler	• safety glasses • saw • scissors

Targeted Standard of Learning: Mathematics 4.10
Supporting SOL: Mathematics 4.5, 4.7, 4.12; English 4.7, 4.8

Targeted Standard for Technological Literacy: 12
Supporting STL: 11, 20

Guided Portfolio



Name _____

Group Members _____

1. **What is the problem?** State the problem in your own words.

_____

_____

_____

_____

2. **Research.** Use the Internet, encyclopedias, or other reference books to research the structure you will design and build. Write down any information you find.

_____

_____

_____

_____

_____

Name _____

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

Name _____

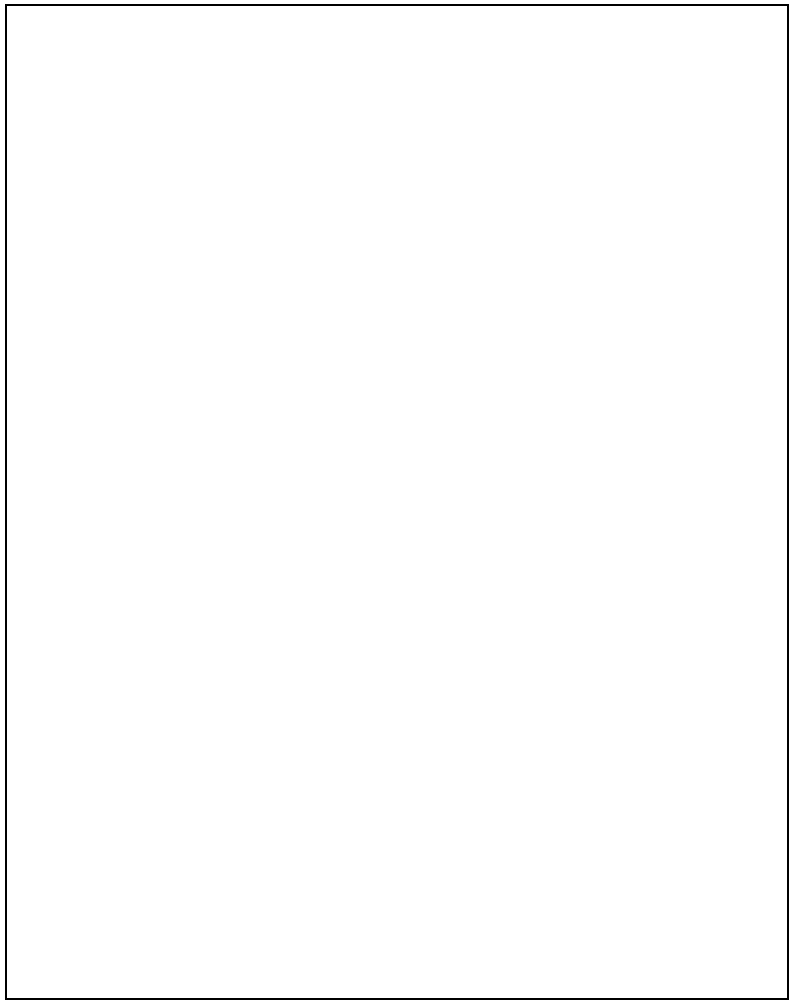
4. Plan your playground structure.

Make a drawing to show how your design will work. Draw the working parts, and label the materials you will use on each part of the structure.

Name _____

5. Create the solution you think is best.

Keep notes about your problems and how you solve them. Make sketches if they help.



Name _____

6. Test your solution.

Does your structure fit on the 10-inch-by-10-inch base?	YES	NO
Is your structure no more than 12 inches tall?	YES	NO
Does your structure contain polygons?	YES	NO

Which polygons did you use? _____

Does your drawing contain labeled edges with measurements?	YES	NO
Is your project neat and colorful?	YES	NO

Name _____

7. Evaluate your solution.

Was it the best solution? Would one of your other ideas have been better? Why, or why not?

_____

_____

_____

What would you have done differently?

_____

_____

_____

Could you add to it to make it better? What would you add to it?

_____

_____

_____

Guided Portfolio, p6

Name _____

8. Use geometry to build a playground.

Materials List		**Identify and describe the geometric concepts your playground structure demonstrates.**
Material	Total Length	

Name _____

KWL: Playground Construction

What we **K**now	What we **W**ant to know	What we **L**earned
	Sample Questions: What safety issues are related to playground construction? What materials should be used? What are popular playground structures?	

Rubric for Playground Construction

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 conducted research and recorded information.					
The student brainstormed more than one idea.					
The student drew a plan and labeled materials.					
The student kept notes and/or made sketches while creating a solution, to include problems and how they were solved.					
The student tested the structure to make sure					
• it fits in the 10 by 10 inch base					
• it is no more than 12 inches tall					
• it contains polygons					
• its design drawing contains edges labeled with measurements					
• it is colorful and neat.					
The student evaluated how he/she could make it better next time.					

Rubric for Playground Construction

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

Communication: Speaking, Listening, Media Literacy Rubric	**0**	**1**	**2**	**3**	**4**
4.1 The student will use effective communication skills in a variety of settings.					
a) Present accurate directions to individuals and small groups.					
b) Contribute to group discussions across content areas.					
c) Seek ideas and opinions of others.					
d) Use evidence to support opinions.					
e) Use grammatically correct language and specific vocabulary to communicate ideas.					
f) Communicate new ideas to others.					
g) Demonstrate the ability to collaborate with diverse teams.					
h) Demonstrate the ability to work independently.					
4.2 The student will make and listen to oral presentations and reports.					
a) Use subject-related information and vocabulary.					
b) Listen to and record information.					
c) Organize information for clarity.					
d) Use language and style appropriate to the audience, topic, and purpose.					

Standards of Learning

English (2010)

Communication: Speaking, Listening, Media Literacy

4.1 The student will use effective oral communication skills in a variety of settings.

a) Present accurate directions to individuals and small groups.
b) Contribute to group discussions across content areas.
c) Seek ideas and opinions of others.
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4.2 The student will make and listen to oral presentations and reports.

a) Use subject-related information and vocabulary.
b) Listen to and record information.
c) Organize information for clarity.
d) Use language and style appropriate to the audience, topic, and purpose.

Writing

4.7 The student will write cohesively for a variety of purposes

a) Identify intended audience.
b) Focus on one aspect of a topic.
c) Use a variety of pre-writing strategies.
d) Organize writing to convey a central idea.
e) Recognize different modes of writing have different patterns of organization.
f) Write a clear topic sentence focusing on the main idea.
g) Write two or more related paragraphs on the same topic.
h) Use transition words for sentence variety.
i) Utilize elements of style, including word choice and sentence variation.
j) Revise writing for clarity of content using specific vocabulary and information.
k) Include supporting details that elaborate the main idea.

4.8 The student will edit writing for correct grammar, capitalization, spelling, punctuation, sentence structure, and paragraphing.
- a) Use subject-verb agreement.
- b) Include prepositional phrases.
- c) Eliminate double negatives.
- d) Use noun-pronoun agreement.
- e) Use commas in series, dates, and addresses.
- f) Incorporate adjectives and adverbs.
- g) Use correct spelling for frequently used words, including common homophones.
- h) Use singular possessives.

Mathematics (2009)

Computation and Estimation

4.5 The student will
- a) determine common multiples and factors, including least common multiple and greatest common factor;
- b) add and subtract fractions having like and unlike denominators that are limited to 2, 3, 4, 5, 6, 8, 10, and 12, and simplify the resulting fractions, using common multiples and factors;
- c) add and subtract with decimals; and
- d) solve single-step and multistep practical problems involving addition and subtraction with fractions and with decimals.

Measurement

4.7 The student will
- a) estimate and measure length and describe the results in metric and U.S. Customary units; and
- b) identify equivalent measurements between units within the U.S. Customary system (inches and feet; feet and yards; inches and yards; yards and miles) and between units within the metric system (millimeters and centimeters; centimeters and meters; and millimeters and meters).

Geometry

4.10 The student will
- a) identify and describe representations of points, lines, line segments, rays, and angles, including endpoints and vertices; and
- b) identify representations of lines that illustrate intersection, parallelism, and perpendicularity.

4.12 The student will
- a) define *polygon*; and
- b) identify polygons with 10 or fewer sides.

Standards for Technological Literacy

Standard 11: Students will develop the abilities to apply the design process.

Standard 12: Students will develop the ability to use and maintain technological products and systems.

Standard 20: Students will develop an understanding of and be able to select and use construction technologies.

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 *Put an X in the appropriate column:*	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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

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. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Additional Comments Please use this area to provide general suggestions for improving this design brief.