Fourth Grade
Mathematics
Design Brief

Pack Your Trunk

Background: You have decided to sail to Jamestown. You are allowed only one trunk to carry all of the things you will need to survive when you reach the settlement. Use your knowledge of Virginia history to help you make a list of things you should take. Your teacher will tell you how to represent the items that will go into your trunk.

Design Challenge: Design and build a trunk to hold the items you must take with you on your trip to the Jamestown colony. Because of space restrictions, the trunk must be built to contain between 36 and 60 cubic inches of space. To make loading the trunks onto the ship easier, all of the edges and sides of the trunk should be parallel and perpendicular to the other edges and the height of your trunk must measure less than the width.

Criteria:

Your trunk should

- hold a volume greater than 36 cubic inches and less than 60 cubic inches
- have edges that are parallel and perpendicular to other edges
- be wider than it is tall
- have a top that will stay closed if the trunk is turned on its side or upside down
- have a means of carrying it.

Materials: You may select from the items below.

- cardboard
- cardboard tubes
- glue/paste
- poster board
- pipe cleaners
- card stock
- straws
- scissors
- egg cartons
- craft sticks
- 12 inches of string
- no tape of any kind

Targeted Standard of Learning:	Mathematics 4.16
Supporting Standards of Learning:	Mathematics 4.11, 4.12 History and Social Science VS.3, VS.4 English 4.1, 4.2, 4.5, 4.6
Targeted Standard for Technological Literacy:	9
Supporting Standards for Technological Literacy:	8, 10, 11

Tips for Teachers

Pack Your Trunk

Targeted Standard of Learning: Mathematics 4.16

- The student will identify lines which illustrate intersection, parallelism, and perpendicularity.

Targeted Standard for Technological Literacy: Standard 9

- Students will develop an understanding of engineering design.

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Time Management
• Exposure to targeted Mathematics Standard of Learning 4.16 • Some under-standing of the design process	• Check Design Brief for recommended materials. Teacher may substitute materials. • Following the teacher's directions, students should make a list of the items that need to be packed. • Students could draw pictures or make small models of items to be placed in the trunk.	• None	• Small groups or pairs • Each student keeps own Guided Portfolio. • Teacher should approve plans before students begin building.	• Design Brief • Guided Portfolio • Rubric Assessments	• Session 1: Introducing Design Brief and Portfolio (45 min.) • Session 2: Building (60 min.) • Session 3: Sharing and evaluating (45 min.)

Guided Portfolio—1
Name _____

Pack Your Trunk

Group Members: _____

_____ _____ _____

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

_____

_____

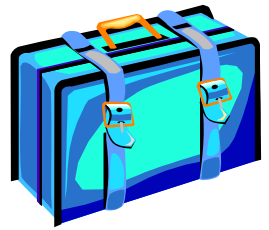
_____

_____

_____

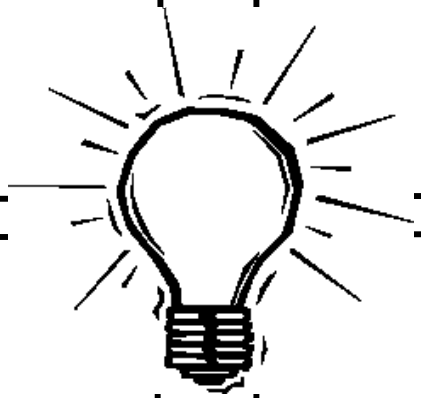
Targeted Standard of Learning:	Mathematics 4.16	Targeted Standard for Technological Literacy:	9
Supporting Standards of Learning:	Mathematics 4.11, 4.12 History and Social Science VS.3, VS.4 English 4.1, 4.2, 4.5, 4.6	Supporting Standards for Technological Literacy:	8, 10, 11

Name _____



2. Brainstorm solutions.

Draw or describe some possible solutions.



Guided Portfolio—3
Name _____

3. Create the solution you think is best.

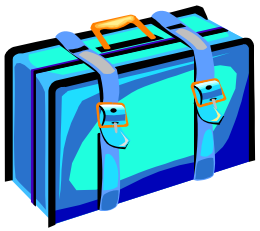
Keep notes below about the problems you have and how you solve them.

Guided Portfolio—4
Name _____

4. Test your solution.

- Does your trunk hold a volume greater than 36 cubic inches and less than 60 cubic inches? YES NO
- Is your trunk wider than it is tall? YES NO
- Are the edges of your trunk all parallel and perpendicular to other edges? YES NO
- Does the top stay closed if the trunk is turned on its side or upside down? YES NO
- Does your trunk have a means of carrying it? YES NO

Guided Portfolio—5
Name _____



5. Evaluate your solution.

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

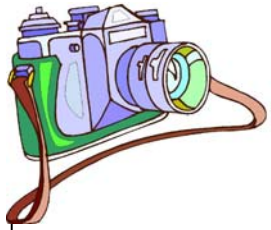
What would you have done differently?

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

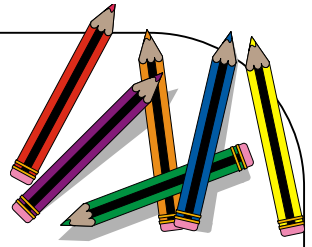
Guided Portfolio—6

Name _____

Attach a photograph of your final project here. If you do not have a photograph, draw a picture of your final project.



How would you make your project better? Draw a picture showing how it would look after you have made changes to it.



Rubric for *Pack Your Trunk*

Name_____ Date _____

Design Brief Rubric	no evidence 0	limited understanding 1	some understanding with room for improvement 2	good understanding with room for improvement 3	substantial understanding 4
The student restated the problem in his/her own words.					
The student brainstormed more than one idea.					
The student created and labeled a sketch to use as a "blueprint."					
The student included notes about problems that occurred and their solutions.					
The student tested the trunk to make sure					
• it held a volume greater than 36 cubic inches and less than 60 cubic inches					
• it was wider than it was tall					
• that the edges were parallel and perpendicular					
• the top stayed closed when it was turned upside down					
• it had a means of carrying it.					
The student evaluated how he/she could make it better next time.					

Rubric for *Pack Your Trunk*

Name_____ Date _____

Oral Communication Rubric	no evidence 0	limited understanding 1	some understanding with room for improvement 2	good understanding with room for improvement 3	substantial understanding 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					
c) Seek ideas and opinions of others.					
d) Use evidence to support opinions.					
e) Use grammatically correct language and specific vocabulary to communicate ideas.					
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.					

Standards of Learning

English (2002)

Oral Language

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.
c) Seek the ideas and opinions of others.
d) Use evidence to support opinions.
e) Use grammatically correct language and specific vocabulary to communicate ideas.

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.

Reading

4.5 The student will read and demonstrate comprehension of nonfiction.

a) Use text organizers such as type, headings, and graphics to predict and categorize information.
b) Formulate questions that might be answered in the selection.
c) Explain the author's purpose.
d) Make literal inferences using information from texts.
e) Draw conclusions using information from texts.
f) Summarize content of selection, identifying important ideas and providing details for each important idea.
g) Describe relationship between content and previously learned concepts or skills.
h) Distinguish between cause and effect and between fact and opinion.
i) Identify new information gained from reading.

4.6 The student will demonstrate comprehension of information resources to research a topic.

a) Construct questions about a topic.
b) Collect information using the resources of the media center including online, print, and media resources.
c) Evaluate and synthesize information.

Mathematics (2001)

Measurement

4.11 The student will

a) estimate and measure length, using actual measuring devices, and describe the results in both metric and U.S. Customary units, including part of an inch (1/2, 1/4, and 1/8), inches, feet, yards, millimeters, centimeters, and meters;

b) identify equivalent measurements between units within the U.S. Customary system (inches and feet; feet and yards; inches and yards) and between units within the metric system (millimeters and centimeters; centimeters and meters; and millimeters and meters); and

c) estimate the conversion of inches and centimeters, yards and meters, and miles and kilometers, using approximate comparisons (1 inch is about 2.5 centimeters, 1 meter is a little longer than 1 yard, 1 mile is slightly farther than 1.5 kilometers, or 1 kilometer is slightly farther than half a mile). *

** The intent of this standard is for students to make ballpark comparisons and not to memorize conversion factors between U.S. Customary and metric units.*

4.12 The student will

a) estimate and measure liquid volume, using actual measuring devices and using metric and U.S. Customary units, including cups, pints, quarts, gallons, milliliters, and liters;

b) identify equivalent measurements between units within the U.S. Customary system (cups, pints, quarts, and gallons) and between units within the metric system (milliliters and liters); and

c) estimate the conversion of quarts and liters, using approximate comparisons (1 quart is a little less than 1 liter, 1 liter is a little more than 1 quart).*

** The intent of this standard is for students to make ballpark comparisons and not to memorize conversion factors between U. S. Customary and metric unit.*

Geometry

4.16 The student will identify and draw representations of lines that illustrate intersection, parallelism, and perpendicularity.

History and Social Science (2001)

Colonization and Conflict: 1607 through the American Revolution

VS.3 The student will demonstrate knowledge of the first permanent English settlement in America by

a) explaining the reasons for English colonization;

b) describing how geography influenced the decision to settle at Jamestown;

c) identifying the importance of the charters of the Virginia Company of London in establishing the Jamestown settlement;

d) identifying the importance of the Virginia Assembly(1619) as the first representative legislative body in English America;

e) identifying the importance of the arrival of Africans and women to the Jamestown settlement;

f) describing the hardships faced by settlers at Jamestown and the changes that took place to ensure survival;

g) describing the interactions between the English settlers and the Powhatan people, including the contributions of the Powhatans to the survival of the settlers.

History and Social Science (2001) continued

Colonization and Conflict: 1607 through the American Revolution

VS.4 The student will demonstrate knowledge of life in the Virginia colony by

a) explaining the importance of agriculture and its influence on the institution of slavery;
b) describing how European (English, Scotch-Irish, German) immigrants, Africans, and American Indians (First Americans) influenced the cultural landscape and changed the relationship between the Virginia colony and England;
c) explaining how geography influenced the relocation of Virginia's capital from Jamestown to Williamsburg to Richmond;
d) describing how money, barter, and credit were used.

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.