Please note: All the links in this lesson were working when this site launched. If you find a link that does not work, please use a search engine such as Google to find an article on the same topic.

Loading a Ship Lesson

The Loading a Ship Lesson is intended to increase students' knowledge and skills of the transportation systems of shipping. Students will:

- Examine international trade and the impact of trade on the Port of Baltimore;
- Use physics to understand how cargo is systematically loaded onto container ships; and
- Design scale models of cargo containers

What is international trade and how does it affect the Port of Baltimore?

Teacher's Note: The interactive Loading a Ship requires students to load and unload the SS Evergreen at fictional ports around the world. This lesson addresses the international trade requirements the SS Evergreen would be subject to, as it relates to shipping and transportation by introducing students to the World Trade Organization (WTO), and the North American Free Trade Agreement (NAFTA). The lesson is in a reading and questioning format, probably most effectively done after students engage in the Loading a Ship interactive. It could be assigned to individuals or pairs. The questions could be used for full class discussion after the sections are read.

Concepts:

1. International trade requirements are set by the World Trade Organization (WTO) for its 153 member nations.
2. The North American Free Trade Agreement (NAFTA) regulates trade between the United States, Canada, and Mexico.
3. Trade agreements are reached through a series of discussions, regulated by agencies such as the WTO and NAFTA, who help outline rules and govern how countries decide appropriate means to regulate trade between them.
4. A lesson on "Governing Trade" is provided.

Standards:

1. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study. (STL 3)
    a. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across fields. (STL3-H)

2. Students will develop an understanding of the cultural, social, economic, and political effects of technology. (STL 4)

    a. Making decisions about the use of technology involves weighing the trade-offs between positive and negative effects. (STL 4-I)

3. Students will develop the understanding of the role of society in the development and use of technology. (STL6)

    a. The decision whether to develop a technology is influenced by social opinions and demands, in addition to corporate cultures. (STL6-I)

4. Students will use the abilities to assess the impact of products and systems. (STL 13)

    a. Synthesize data, analyze trends, and draw conclusions regarding the effects of technology on the individual, society, and the environment. (STL13-K)

References:

a. "Glossary – World Trade Organization." World Trade Organization. 4 Mar. 2009 http://www.wto.org/english/thewto_e/glossary_e/glossary_e.htm
b. "The WTO in Brief – World Trade Organization." World Trade Organization. 4 Mar. 2009 http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr01_e.htm
c. "North American Free Trade Agreement – NAFTA." North American Free Trade Agreement. 4 Mar. 2009 http://www.fas.usda.gov/itp/Policy/nafta/nafta.asp
d. "Ed Brooks: Trade Apples – Careers in International Trade and Transportation." Port of Seattle. 4 Mar. 2009 http://www.portseattle.org/community/education/

Key Terms:

- World Trade Organization (WTO)
- GATT
- North American Free Trade Agreement (NAFTA)
- Tariff
- Applied Rates
- Bound Rates

International Trade Worksheet:

- Use the handout entitled "International Trade Worksheet" to have students answer the following questions. The handout is located at the end of this lesson.
- This lesson is to take one class period. Students will require a computer with Internet access to complete the assignment. The teacher will introduce the International Trade Worksheet and allow students time in class to complete the assignment.

Directions:

Use the following website (http://www.wto.org/english/thewto_e/glossary_e/glossary_e.htm) to help identify key terms. Record the definition next to the term.

1. Define the following Terms:

   a. WTO: World Trade Organization, responsible for maintaining trade regulations between its 153 member countries.

   b. NAFTA: North American Free Trade Agreement, responsible for maintaining trade regulations between, the United States, Canada, and Mexico.

   c. GATT: General Agreement on Tariffs and Trade, the precursor to the WTO, responsible for outlining trade of goods.

   d. Tariff: Custom duties on merchandise imports

   e. Applied Rate: Duties actually charged on imports

   f. Bound Rate: An agreed upon rate of duty, not to exceed this rate

Directions:

Use the following website (http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr01_e.htm) to answer the following questions. Record your answers in complete sentences underneath the question.

2. What is the World Trade Organization (WTO)?

   Answer: The WTO is the only international organization that establishes global rules of trade between nations, focusing on the desire for trade to flow as smoothly, predictably and freely as possible.

3. The World Trade Organization (WTO) is the successor to what?

   Answer: The WTO is the successor to the Global Agreement on Tariffs and Trade.

4. How does the World Trade Organization (WTO) ensure that trade flows as smoothly as possible?

Answer: The WTO ensures trade flow by administering trade agreements, creating a forum for negotiation, settling disputes, assisting developing countries, and working with international organizations.

5. The World Trade Organization accounts for what percentage of the world trade?

   Answer: The WTO accounts for 97% of the world trade.

6. The World Trade Organization (WTO) regulates what three major types of trade?

   Answer: The WTO regulates the trade of goods, services, and intellectual property.

7. What percentage of the World Trade Organization (WTO) are developing countries?

   Answer: Over seventy five percent of WTO members are developing nations. Answer will change over time.

Directions:

Use the following website (http://www.fas.usda.gov/itp/Policy/nafta/nafta.asp) to answer the following questions. Record your answers in complete sentences underneath the question.

8. What is the North American Free Trade Agreement (NAFTA) and which nations comprise this trade agreement?

   Answer: NAFTA eliminated all non-tariff barriers for agricultural trade between the United States, Canada, and Mexico.

Directions:

Apply what you know about the WTO and NAFTA to the following questions.

9. Briefly describe how the WTO affects trade through the Port of Baltimore?

   Answer: Answer should reflect how international trade is conducted and how the Port of Baltimore looks to the WTO for regulations regarding trade.

10. Briefly describe how NAFTA affects trade through the Port of Baltimore?

    Answer: Answer should reflect how trade between Mexico, Canada, and the United States is conducted and how the Port of Baltimore looks to NAFTA for regulations regarding trade.

Trade Memo Activity:

- Use the handout entitled "Trade Memo Activity" to have students address the following topics. The handout is located at the end of this lesson.
- This lesson is to take two class periods.
    - Day 1: Teacher will introduce the Trade Memo Activity and review instructions to individuals or group. Students will read passage highlighting items of interest and identify memo templates.
    - Day 2: Teacher will review Trade Memo Activity and allow students time to complete memo. Assignment due end of period.

Directions:

Read the passages below and prepare a memo to your teacher addressing the four concerns outlined at the bottom of the document.

Ed Brooks had a new job and wanted to get up to speed right away.

After four years as the Latin America Marketing Director for the Washington Apple Commission, Ed recently was promoted to the position of International Marketing Director. Ed now was responsible for coordinating the marketing and promotion of Washington State apples to countries around the world. Given that exports typically accounted for 1/3 of the sales of Washington apples and that Washington State growers had produced over $800 million dollars worth of apples in 1998, Ed knew he had big responsibilities in his new job.

The Washington Apple Commission was created in 1937 by the state's governor to help Washington's apple growers market their crop. Apple growers typically weren't big enough by themselves to handle their own marketing, so they essentially "hired" the Apple Commission to advertise and promote their apples. Back then, growers paid an advertising tax of one cent for each box of apples picked for the "fresh" market, that is, for apples that were picked to be eaten and not made into applesauce, jam, or other types of food. When Ed took his new job, apple growers were paying 25 cents per box for the Apple Commission's help advertising and promoting their apples.

Over the years, the Apple Commission had used these advertising dollars to make sure that people all over the world thought of Washington State as producing the best apples in the world. That effort had been successful in making Washington State the top apple producer and seller in the United States. In 1998, for instance, Washington's approximately 95 million 42-pound boxes of apples made up over half of the total U.S. fresh apple production. And the identification of Washington's 14 varieties of apples as "good eating apples" meant that Washington State far surpassed other states in producing apples for fresh eating.

As International Marketing Director, Ed's primary responsibility was to market and promote Washington apples worldwide. To do that, he worked with Apple Commission representatives in other countries to make sure they were getting the word out about Washington State apples. He worked with shippers to make sure Washington apples were displayed at retail stores around the world looking fresh

and in good condition. He helped coordinate TV, radio, and billboard advertising around the world, and helped organize special promotions in other countries to promote Washington apples.

Ed knew that about 1/3 of Washington apples were exported. But what else did he need to know to succeed? (TAKE NOTES ON THE ABOVE READING)

As Ed researched the apple export market, he concluded that there were two potential problems he'd have to watch. The first was **competition** from other apple-growing countries.

Although Ed personally considered Washington apples superior to anything else on the market, he knew that Washington growers faced competition from growers in other states and countries. In Southeast Asia, for instance, where Washington State apples had about a 57% market share, Washington apples competed against apples from China, New Zealand, South Africa, France, Chile, British Columbia, Japan, South Korea, and Australia.

From that list, Ed's biggest concern was China. With its huge land mass and temperate climate, China had become a major apple producer over the last several decades. By the late 1990s, growers in China were producing nearly 1 billion boxes of apples a year, more than four times the total U.S. crop. Chinese growers primarily grew the Fuji apple, a spicy-sweet apple particularly popular in Asia. And although China still needed to improve its infrastructure so that it could better care for and ship its apples, the country produced so many apples, it could afford to sell only its very best apples and still sell far more than other countries.

Ed had no doubt that Washington apples were as good as – if not better than – Chinese apples. And he knew that Washington State's more advanced fruit storage and shipping systems meant the state's growers could sell a higher percentage of their crop. But he had watched as the worldwide garlic market had been completely turned upside down simply because of the size of the crop from China… and he didn't want to see the same thing happen in the apple market.

What should he do? (TAKE NOTES ON THE ABOVE READING)

As Ed continued his research, he identified a second potential problem for Washington apple exports: **non-tariff barriers** imposed by other countries.

Trade agreements between countries regulated how much "tariff" or tax could be charged on an item that came from another country. These trade agreements were set through the World Trade Organization (WTO) for its 153 member nations, and through the North American Free Trade Agreement (NAFTA) for trade between the U.S., Canada, and Mexico. But, as Ed knew, even if the tariff level on an item such as a box of apples was set, there were many other ways another country could block that product. These other means of blocking products were called "non-tariff barriers."

In the case of apples, non-tariff barriers were usually based around concern about introducing new plant pests. In the mid-1990s, for instance, Japan had virtually closed its markets to Washington State apples, insisting that each individual variety of apple undergo years of rigorous testing to prove it was not carrying a pest called the codling moth. After several years of scientific tests and negotiations between the two countries about how best to treat the codling moth, the U.S. finally realized it would never be able to sell its apples to Japan at this rate. The U.S. filed a claim against Japan with the WTO, asking that Japan accept results from one variety of apples as applying to all varieties.

The U.S. was successful in that appeal against Japan. But, as Ed researched, he learned that South Korea, Australia, and South Africa all posed restrictions on Washington apples based on pest concerns. Would the U.S. decide to go back to the WTO to protest the restrictions imposed by each of these countries too?

Ed remembered a trade dispute from his former job as Latin America Marketing Director. Mexico had closed down its markets to Washington apples – specifically to the Red and Golden Delicious varieties – claiming the U.S. was dumping fruit, or selling it for less than it was being sold in the U.S. Going through NAFTA, which regulated trade between the U.S. and Mexico, could take years. Instead, the Apple Commission worked with U.S. trade officials to negotiate a deal with their counterparts in Mexico to reopen the market.

Ed reviewed what he had learned so far. Overall, Washington apples seemed in pretty good shape internationally. But there were certainly going to be challenges ahead. Ed decided to summarize what he had learned in a memo to his boss, the Washington Apple Commission's President. His memo would include the following information:

1. What is the export status of Washington apples?
2. What competition problems do Washington apples face?
3. What non-tariff barriers do Washington apples face?
4. What does Ed think the Apple Commission should do about these challenges?

Loading and Unloading a Cargo Ship Efficiently: Examining Center of Gravity

Teacher's Note: The loading and unloading of containers from a cargo ship is a delicate balancing act. As cargo is loaded or unloaded, the change in weight caused by adding or subtracting containers greatly affects the ships' center of mass. Ships that are not balanced run inefficiently or take on water. This lesson addresses center of mass by having students conduct experiments. The lesson is in an experiment and application format, probably most effectively done after students engage in the game activity. It could be assigned to individuals or pairs. The questions could be used for full class discussion after the sections are calculated.

Concepts:

1. Students will experiment with center of mass.
2. Students will examine how center of mass relates to shape.
3. Students will examine how center of mass and balance are connected.
4. Students will examine how understanding center of mass is necessary to load container ships the right way.
5. An experiment set entitled "Center of Mass Experiments" is attached.

Standards:

1. Students will develop an understanding of the core concepts of technology. (STL-2)
    a. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems. (STL2-W)
    b. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development. (STL-2AA)
2. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study. (STL-3)
    a. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across fields. (STL-3H)
3. Students will use the abilities to assess the impact of products and systems. (STL 13)
    a. Synthesize data, analyze trends, and draw conclusions regarding the effects of technology on the individual, society, and the environment. (STL13-K)

References:

a. "PhysicsLAB – Center of Mass." PhysicsLAB Online Resource Lesson. 5 Mar. 2009 http://dev.physicslab.org/Document.aspx?doctype=3&filename=RotaryMotion_CenterMass.xml

b. "Fun with Gravity and Center of Mass." GRACE – Gravity Recovery and Climate Experiment. 5 mar. 2009 http://www.csr.utexas.edu/grace/education/activities/pdf/Fun_Gravity.pdf

Key Terms:

- Center of Mass
- Gravity
- Balance

Center of Mass Experiments:

- Use the handout entitled "Center of Mass Experiments" to have students answer the following questions.
- This lesson is to take one class period. For the first four experiments, each group will require one pencil, one chair, a backpack, wall space, one male volunteer, and one female volunteer. The fifth and final experiment will require one cork, two forks, one glass, and one tooth pick. Groups can include up to four people.
- In experiment #2, male students should not be able to complete the activity. BE CAREFUL they do not hurt themselves by falling over.

Directions: Break up into groups of four. One pencil, one chair, a backpack, wall space, one male group member, and one female group member are required for the first four experiments. Once finished, the teacher will provide you with one tooth pick, two forks, one cork, and one glass in order for you to complete the fifth experiment. Follow the steps as they are listed below to complete the experiment. Complete questions after conducting each experiment.

Inventory:

1. 1 pencil
2. 1 chair
3. 1 backpack (preferably with books)
4. Wall space
5. 1 male group member
6. 1 female group member
7. 1 toothpick
8. 2 forks
9. 1 cork
10. 1 glass

Experiment 1:

Set Up:

Place the chair firmly against a wall so that it cannot be slid back. Have one student sit in the chair with their feet flat on the floor in front of the chair. Have student sit upright so that students' back is against back of chair. Have student grip seat of chair and try to stand up, making sure his/her back is against the chair and both feet are flat on the floor. Repeat if desired.

Questions:

1. Was the student(s) able to stand? Why?

   Answer: NO, the student's center of mass was over the chair and not over their feet.

2. What factors affected the student's ability to stand up?

   Answer: Center of gravity

Experiment 2:

Set Up:

Place chair sideways to the wall. Have female student stand so her feet are not under the chair, bent over at the waist, with her head positioned against the wall so that her back is flat. Have group members make sure student's back is flat. Have student grip the seat of the chair and lift the chair, bringing the chair to her chest. Without releasing the chair, have student stand up. Repeat for boy student.

Questions:

1. Was the female student successful? Why?

   Answer: Yes, the female's center of mass is closer to her hips therefore even though she is bent over her center of mass is still located above her feet.

2. Was the male student successful? Why?

   Answer: No, the male's center of mass is closer to the middle of his chest. Therefore, when he tries to stand up, his center of mass is over the chair and not over his feet.

Experiment 3:

Set Up:

Have student stand with feet and back against the wall. Place pencil on the floor at his/her feet. Have student bend over and pick up pencil. BE CAREFUL and watch your balance. Repeat process for both male and female students.

Questions:

1. Was any student able to bend down to touch the pencil? Why?

   Answer: Some may, and some may not. As the student's center of mass shifts, they may feel themselves losing their balance.

2. Was any student successful in attempting to pick up the pencil? Why?

   Answer: Most students will not be able to do this. When people bend over, their body extends to counterbalance them, keeping their center of mass over their feet. When a person is standing flat against a wall, their body cannot extend and act as a counterbalance.

Experiment 4:

Have any student repeat the above activities with a backpack on.

Questions:

1. How is your center of mass affected when wearing a backpack?

   Answer: Additional weight will change your center of mass.

2. What is the ideal location for a female student to wear a backpack (exclude fashion and think in terms of center of mass)? Why?

   Answer: A female's center of mass is between her hips, and therefore the ideal location to wear a backpack is lower, in the front of her body.

3. What is the ideal location for a male student to wear a backpack (think in terms of center of mass)? Why?

   Answer: A male's center of gravity is closer to the center of his chest, and therefore the ideal location to wear a backpack is high on their back.

Experiment 5: Balancing Act

A handout for this experiment is included at the end of the lesson plan.

Directions:

Using one toothpick, two forks, one cork, and one glass, create a system where both forks, the cork, and the toothpick are balanced on the glass. It is required that the toothpick be the only object touching the glass, but the toothpick cannot touch the glass in more than one location. Brainstorm ideas and list them below. Choose your best idea and sketch your system in the space provided. Create a prototype of the system. Test it to see if an equal center of mass was created. Revise your system as necessary, and be sure to sketch any additional ideas in the space provided. Once finished, answer the following questions in complete sentences.

Brainstorming: List ideas (you may use preliminary sketches to explain your ideas)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Sketching: Choose the best idea from your brainstorming list and sketch it below in the space provided. If you are redesigning your original system, sketch redesign in the space provided.

Original Idea:

Redesign 1:

Answer: The system your students create may be different than the picture below.

Questions: Answer in complete sentences.

1. List the steps you took to solve this problem?

   Answer: The steps will vary for each group. They should reflect the design process.

2. Were you able to create a system that balanced the toothpick on the glass in your first attempt? What conclusions did you draw from the first test?

   Answer: No, the process of redesigning a system is necessary to ensure the system is the most efficient.

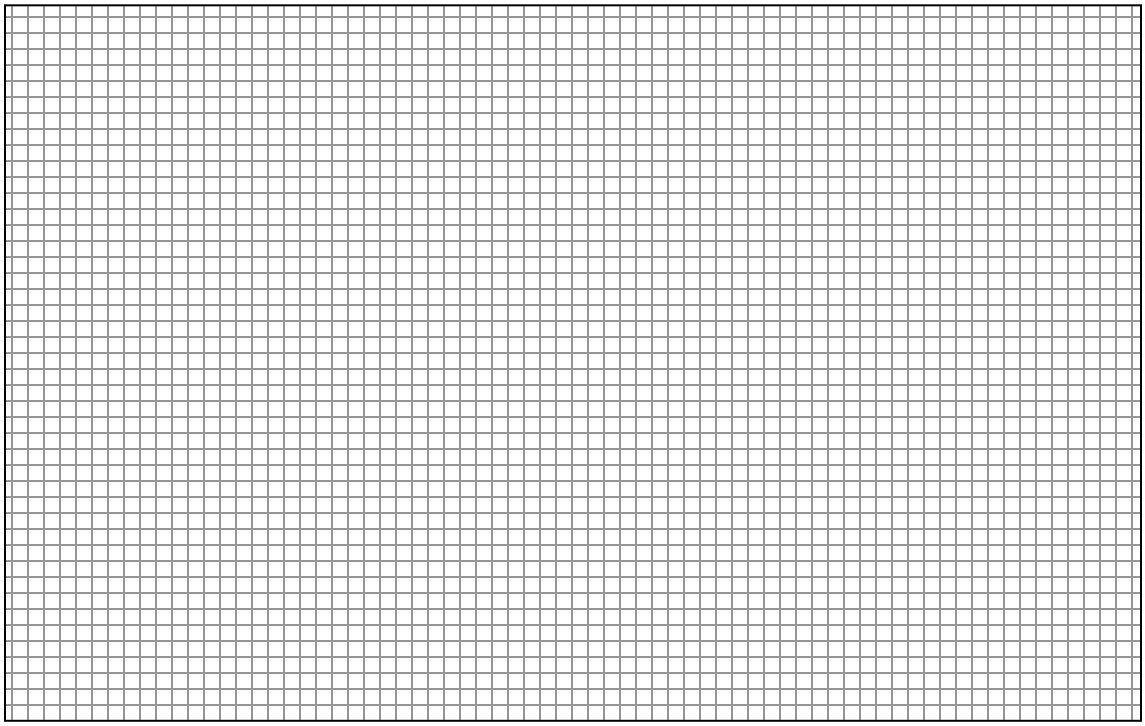
3. How is center of mass applied in your design?

   Answer: The systems' center of mass is balanced so that the toothpick can rest on the edge of the glass.

4. Is it necessary for a container ship to understand center of mass? Why?

   Answer: Yes, container ships must account for center of mass since containers must be stacked correctly for efficient transport. If container ships did not account for balance or center of mass, stacks of containers would fall and cargo would be lost.

5. Based on the Loading a Ship online activity, sketch one alternative way container ships could stack cargo in the space provided below.



Types of Containers: Designing a Container

Teacher's Note: Often cargo containers are fairly nondescript and involve a complex routing strategy to ensure they arrive at their destination. Containerization, as outlined by the International Organization for Standardization (ISO), has driven container modifications to force standard sizes, standard shapes, and increased cargo security, ultimately revolutionizing cargo shipping. This lesson addresses different types of containers found at the Port of Baltimore. Students identify container types and research how containers are designed. Students will design and create a container for a specific cargo. The lesson is in a design and prototype format, probably most effectively done after students engage in the game activity. It could be assigned to individuals or pairs. The questions could be used for full class discussion after the sections are calculated.

Concepts:

1. The Port of Baltimore has established a maritime tradition for excellence dating back to 1706 and separates cargoes into the following types: auto, containers, forest products, and roll on / roll off (RO/RO).
2. Students will examine how cargo containers are manufactured.
3. A lesson on "Creating a Cargo Container Activity" is included.

Standards:

1. Students will develop an understanding of the core concepts of technology. (STL-2)
    a. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems. (STL2-W)
    b. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development. (STL-2AA)
    c. Selecting resources involves trade-offs between competing values, such as availability, cost, desirability, and waste. (STL2-Z)
    d. New technologies create new processes. (STL2-DD)
2. Students will develop an understanding of the relationships among technologies, and the connections between technology and other fields of study. (STL-3)
    a. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across fields. (STL-3H)
3. Students will use the abilities to assess the impact of products and systems. (STL 13)
    a. Synthesize data, analyze trends, and draw conclusions regarding the effects of technology on the individual, society, and the environment. (STL13-K)

Resources:

- "The Port of Baltimore's Cargo." Department of Transportation Port Administration. 5 Mar. 2009 <http://www.marylandports.com/info/cargo.htm>
- "Sea Box 40' Containers." Sea Box. 5 Mar. 2009 <http://www.seabox.com/>

Key Terms:

- Cargo Containers
- Forest Products
- Roll on / Roll off (RO/RO)

Cargo Container Types Worksheet:

- Use the handout entitled "Cargo Container Types Worksheet" to have students answer the following questions. The handout is included at the end of this lesson.
- This lesson is to take one class period. Students will need a computer with Internet access to complete the assignment. The teacher will introduce the Cargo Container Types Worksheet and allow students time in class to complete the assignment.

Directions: Use the following site (http://www.marylandports.com/info/cargo.htm) to help identify the types of cargo that enter the Port of Baltimore. Record your answers in complete sentences underneath the question.

1. List the five types of cargo that enter the Port of Baltimore?

   Answer: The five types of cargo that enter the Port of Baltimore are autos, containers, forest products, specialized cargo, and RO/RO.

2. How many cars move through the Port of Baltimore per year?

   Answer: More than half a million cars move through the Port of Baltimore annually.

3. Why is, the Port of Baltimore consistently ranked among America's top auto ports?

   Answer: The Port of Baltimore has a "white glove policy" (policy dealing with exemplary car care) in dealing with autos, is located near major highways and interstates, and its imports reach dealers / consumers quickly.

4. Containers account for what percentage of cargo that comes through the Port of Baltimore?

   Answer: Containers account for more than 60% of the cargo.

5. Why are forest products specifically targeted in the Port of Baltimore's business plan?

   Answer: The import of forest products is currently experiencing a double digit increase in volume. Forest products are in demand.

6. What types of goods are considered specialized cargo?

   Answer: Specialized machinery, heavy cargo / machinery, and military specialized packaging are example of specialized cargo.

7. What does the acronym RO/RO stand for?

   Answer: RO/RO stands for roll on / roll off.

8. What are some of the key factors that make the Port of Baltimore successful?

   Answer: Located near major interstates, the Port handles cargoes efficiently, maintains large storage facilities, is capable of handling large specialized items, and is situated near consumer markets with attractive demographics.

Creating a Cargo Container Activity:

- Use the handout entitled "Creating a Cargo Container Activity" (located at the end of this lesson) to have students address the following topics. This lesson requires the use of a computer with internet access, (10) 3"x5" index cards, and 10" of masking tape per student.
- This lesson is to take two class periods.
    - Day 1: Teacher will introduce the Creating a Cargo Container Activity and review instructions to individuals. Students will use a computer to access cargo container types, choose a container type to model, assign a scale for their container, sketch their container design, and begin construction of their container model.
    - Day 2: Teacher will review Creating a Cargo Container Activity and allow students time to complete construction of their container model. Students will destructively test a container model and calculate its efficiency of design. Students will then complete the conclusion and questions on the worksheet. Assignment is due end of period.

Challenge Problem:

- Design and construct a cargo container that will support the most weight.

Rules:

1. Do not use more than the provided materials
2. Cargo container model is to be designed after a cargo container type

3. Cargo container model is to have an assigned scale
4. Use only books provided by the teacher to test your cargo container
5. Weight both a single book and your cargo container before destructively testing record weights in grams

Materials:

1. (10) 3”x5” index cards
2. 10” masking tape

Step 1: Research

Directions:

Use the following site (http://www.seabox.com/v3/catalog/40ft/) to help identify three types of cargo containers that can be used as a guide to help you design your cargo container model. You can look at the specific PDF descriptions of the containers to gather more information.

1. Cargo Container 1:
    a. Purpose:
2. Cargo Container 2:
    a. Purpose:
3. Cargo Container 3:
    a. Purpose:

Step 2: Brainstorming Solutions

Directions:

Create two sketches of possible solutions. Note the scale at which the model would be constructed in the lower right hand corner of the space.

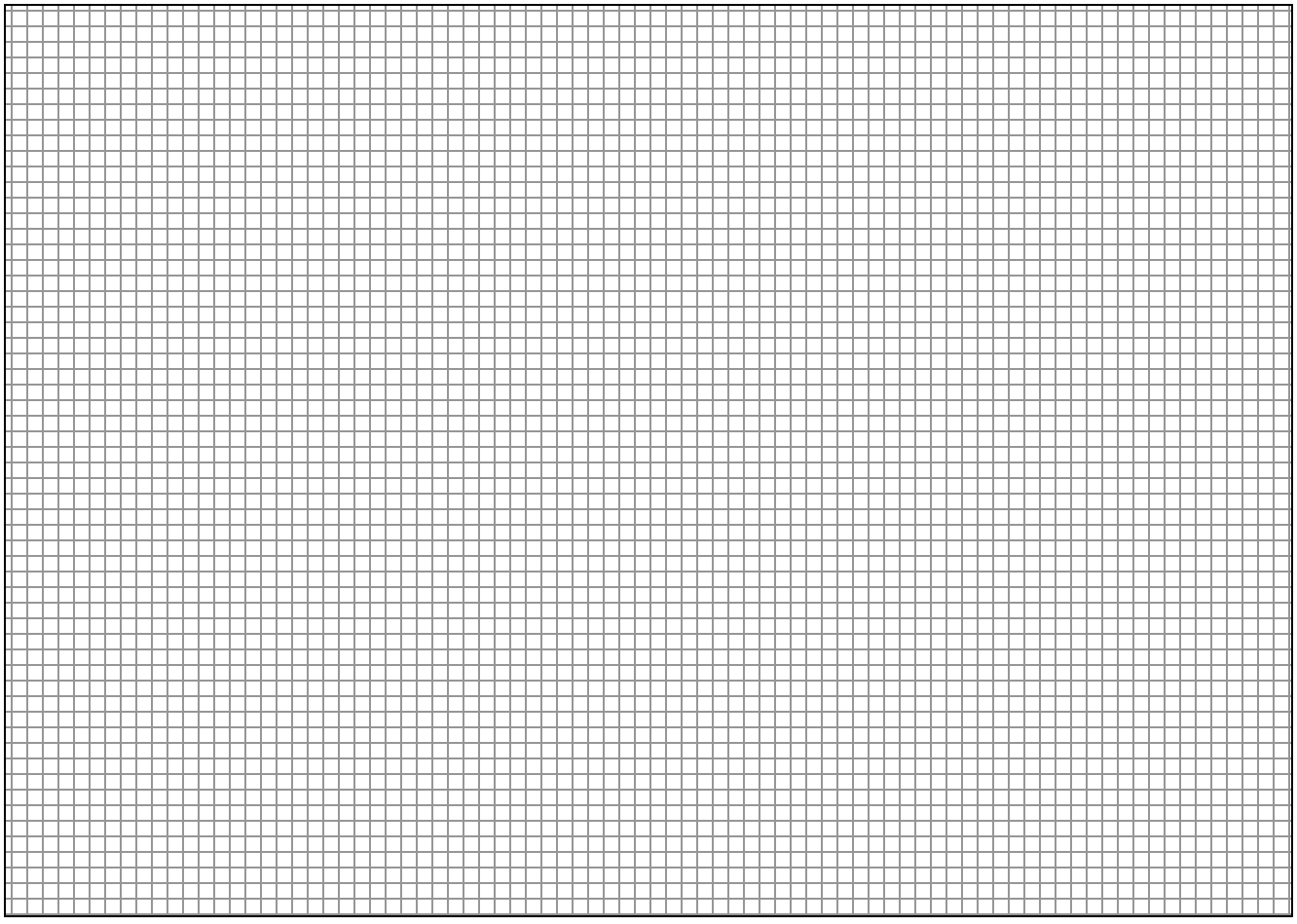
Examine both design ideas. Create a list of positives and negatives for each design. Based on your lists, choose your final design.

Design 1		Design 2	
Positives:	Negatives:	Positives:	Negatives:
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

Step 4: Designing the final solution

Directions:

Choose a final design and create a detailed sketch. Note the scale at which the model will be constructed in the lower right hand corner of the space.



Step 6: Testing

Directions:

Using a scale, weigh your cargo container model and a single text book. Place text books on your scale model until your scale model collapses. All measurements will be recorded in grams.

Weight of text book:_____ Number of text books held: _____

Total weight held: _____ Weight of container: _____

Calculate the efficiency of your model using the following equation:

Efficiency = Load supported in grams / Mass of cargo container in grams

Questions:

1. What was the efficiency of you cargo container?

   Answer will be different for each student

2. What changes or adjustments did you make for your solution to be successful?

   Answer will be different for each student

3. How would you redesign your model to be more efficient?

   Answer will be different for each student

International Trade Worksheet

Name: _____ Date: _____

Directions:

Use the following website (http://www.wto.org/english/thewto_e/glossary_e/glossary_e.htm) to help identify key terms. Record the definition next to the term.

1. Define the following Terms:
    a. WTO:
    b. NAFTA:
    c. GATT:
    d. Tariff:
    e. Applied Rate:
    f. Bound Rate:

Directions:

Use the following website (http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr01_e.htm) to answer the following questions. Record your answers in complete sentences underneath the question.

2. What is the World Trade Organization (WTO)?

3. The World Trade Organization (WTO) is the successor to what?

4. How does the World Trade Organization (WTO) ensure that trade flows as smoothly as possible?

5. The World Trade Organization accounts for what percentage of the world trade?

6. The World Trade Organization (WTO) regulates what three major types of trade?

7. What percentage of the World Trade Organization (WTO) are developing countries?

Directions:

Use the following website (http://www.fas.usda.gov/itp/Policy/nafta/nafta.asp) to answer the following questions. Record your answers in complete sentences underneath the question.

8. What is the North American Free Trade Agreement (NAFTA) and which nations comprise this trade agreement?

Directions:

Apply what you know about the WTO and NAFTA to the following questions.

9. Briefly describe how the WTO affects trade through the Port of Baltimore?

10. Briefly describe how NAFTA affects trade through the Port of Baltimore?

Trade Memo Activity

Name: _____ Date: _____

Directions:

Read the passages below and prepare a memo to your teacher addressing the four concerns outlined at the bottom of the document.

Ed Brooks had a new job and wanted to get up to speed right away.

After four years as the Latin America Marketing Director for the Washington Apple Commission, Ed recently was promoted to the position of International Marketing Director. Ed now was responsible for coordinating the marketing and promotion of Washington State apples to countries around the world. Given that exports typically accounted for 1/3 of the sales of Washington apples and that Washington State growers had produced over $800 million dollars worth of apples in 1998, Ed knew he had big responsibilities in his new job.

The Washington Apple Commission was created in 1937 by the state's governor to help Washington's apple growers market their crop. Apple growers typically weren't big enough by themselves to handle their own marketing, so they essentially "hired" the Apple Commission to advertise and promote their apples. Back then, growers paid an advertising tax of one cent for each box of apples picked for the "fresh" market, that is, for apples that were picked to be eaten and not made into applesauce, jam, or other types of food. When Ed took his new job, apple growers were paying 25 cents per box for the Apple Commission's help advertising and promoting their apples.

Over the years, the Apple Commission had used these advertising dollars to make sure that people all over the world thought of Washington State as producing the best apples in the world. That effort had been successful in making Washington State the top apple producer and seller in the United States. In 1998, for instance, Washington's approximately 95 million 42-pound boxes of apples made up over half of the total U.S. fresh apple production. And the identification of Washington's 14 varieties of apples as "good eating apples" meant that Washington State far surpassed other states in producing apples for fresh eating.

As International Marketing Director, Ed's primary responsibility was to market and promote Washington apples worldwide. To do that, he worked with Apple Commission representatives in other countries to make sure they were getting the word out about Washington State apples. He worked with shippers to make sure Washington apples were displayed at retail stores around the world looking fresh and in good condition. He helped coordinate TV, radio, and billboard advertising around the world, and helped organize special promotions in other countries to promote Washington apples.

Ed knew that about 1/3 of Washington apples were exported. But what else did he need to know to succeed? (TAKE NOTES ON THE ABOVE READING)

As Ed researched the apple export market, he concluded that there were two potential problems he'd have to watch. The first was **competition** from other apple-growing countries.

Although Ed personally considered Washington apples superior to anything else on the market, he knew that Washington growers faced competition from growers in other states and countries. In

Southeast Asia, for instance, where Washington State apples had about a 57% market share, Washington apples competed against apples from China, New Zealand, South Africa, France, Chile, British Columbia, Japan, South Korea, and Australia.

From that list, Ed's biggest concern was China. With its huge land mass and temperate climate, China had become a major apple producer over the last several decades. By the late 1990s, growers in China were producing nearly 1 billion boxes of apples a year, more than four times the total U.S. crop. Chinese growers primarily grew the Fuji apple, a spicy-sweet apple particularly popular in Asia. And although China still needed to improve its infrastructure so that it could better care for and ship its apples, the country produced so many apples, it could afford to sell only its very best apples and still sell far more than other countries.

Ed had no doubt that Washington apples were as good as – if not better than – Chinese apples. And he knew that Washington State's more advanced fruit storage and shipping systems meant the state's growers could sell a higher percentage of their crop. But he had watched as the worldwide garlic market had been completely turned upside down simply because of the size of the crop from China… and he didn't want to see the same thing happen in the apple market.

What should he do? (TAKE NOTES ON THE ABOVE READING)

As Ed continued his research, he identified a second potential problem for Washington apple exports: **non-tariff barriers** imposed by other countries.

Trade agreements between countries regulated how much "tariff" or tax could be charged on an item that came from another country. These trade agreements were set through the World Trade Organization (WTO) for its 153 member nations, and through the North American Free Trade Agreement (NAFTA) for trade between the U.S., Canada, and Mexico. But, as Ed knew, even if the tariff level on an item such as a box of apples was set, there were many other ways another country could block that product. These other means of blocking products were called "non-tariff barriers."

In the case of apples, non-tariff barriers were usually based around concern about introducing new plant pests. In the mid-1990s, for instance, Japan had virtually closed its markets to Washington State apples, insisting that each individual variety of apple undergo years of rigorous testing to prove it was not carrying a pest called the codling moth. After several years of scientific tests and negotiations between the two countries about how best to treat the codling moth, the U.S. finally realized it would never be able to sell its apples to Japan at this rate. The U.S. filed a claim against Japan with the WTO, asking that Japan accept results from one variety of apples as applying to all varieties.

The U.S. was successful in that appeal against Japan. But, as Ed researched, he learned that South Korea, Australia, and South Africa all posed restrictions on Washington apples based on pest concerns. Would the U.S. decide to go back to the WTO to protest the restrictions imposed by each of these countries too?

Ed remembered a trade dispute from his former job as Latin America Marketing Director. Mexico had closed down its markets to Washington apples – specifically to the Red and Golden Delicious varieties – claiming the U.S. was dumping fruit, or selling it for less than it was being sold in the U.S. Going through NAFTA, which regulated trade between the U.S. and Mexico, could take years. Instead,

the Apple Commission worked with U.S. trade officials to negotiate a deal with their counterparts in Mexico to reopen the market.

Ed reviewed what he had learned so far. Overall, Washington apples seemed in pretty good shape internationally. But there were certainly going to be challenges ahead. Ed decided to summarize what he had learned in a memo to his boss, the Washington Apple Commission's President. His memo would include the following information:

1. What is the export status of Washington apples?
2. What competition problems do Washington apples face?
3. What non-tariff barriers do Washington apples face?
4. What does Ed think the Apple Commission should do about these challenges?

Center of Mass Experiments

Name: _____ Date: _____

Directions: Break up into groups of four. One pencil, one chair, a backpack, wall space, one male group member, and one female group member are required for the first four experiments. Once finished, the teacher will provide you with one tooth pick, two forks, one cork, and one glass in order for you to complete the fifth experiment. Follow the steps as they are listed below to complete the experiment. Complete questions after conducting each experiment.

Inventory:

1. 1 pencil
2. chair
3. 1 backpack (preferably with books)
4. Wall space
5. 1 male group member
6. 1 female group member
7. 1 toothpick
8. 2 forks
9. 1 cork
10. 1 glass

Experiment 1:

Set Up:

Place the chair firmly against a wall so that it cannot be slid back. Have one student sit in the chair with their feet flat on the floor in front of the chair. Have student sit upright so that students' back is against back of chair. Have student grip seat of chair and try to stand up, making sure his/her back is against the chair and both feet are flat on the floor. Repeat if desired.

Questions:

1. Was the student(s) able to stand? Why?

2. What factors affected the student's ability to stand up?

Experiment 2:

Set Up:

Place chair sideways to the wall. Have female student stand so her feet are not under the chair, bent over at the waist, with her head positioned against the wall so that her back is flat. Have group members make sure student's back is flat. Have student grip the seat of the chair and lift the chair, bringing the chair to her chest. Without releasing the chair, have student stand up. Repeat for boy student.

Questions:

1. Was the female student successful? Why?

2. Was the male student successful? Why?

Experiment 3:

Set Up:

Have student stand with feet and back against the wall. Place pencil on the floor at his/her feet. Have student bend over and pick up pencil. BE CAREFUL and watch your balance. Repeat process for both male and female students.

Questions:

1. Was any student able to bend down to touch the pencil? Why?

2. Was any student successful in attempting to pick up the pencil? Why?

Experiment 4:

Have any student repeat the above activities with a backpack on.

Questions:

1. How is your center of mass affected when wearing a backpack?

2. What is the ideal location for a female student to wear a backpack (exclude fashion and think in terms of center of mass)? Why?

3. What is the ideal location for a male student to wear a backpack (think in terms of center of mass)? Why?

Balancing Act

Name: _____ Date: _____

Directions:

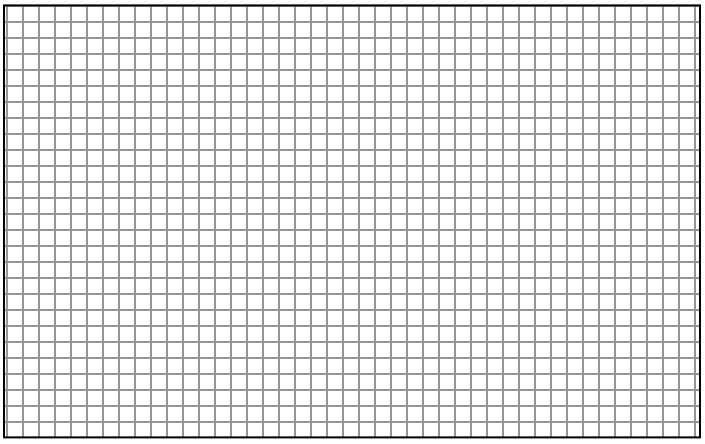
Using one toothpick, two forks, one cork, and one glass, create a system where both forks, the cork, and the toothpick are balanced on the glass. It is required that the toothpick be the only object touching the glass, but the toothpick cannot touch the glass in more than one location. Brainstorm ideas and list them below. Choose your best idea and sketch your system in the space provided. Create a prototype of the system. Test it to see if an equal center of mass was created. Revise your system as necessary, and be sure to sketch any additional ideas in the space provided. Once finished, answer the following questions in complete sentences.

Brainstorming: List ideas (you may use preliminary sketches to explain your ideas)

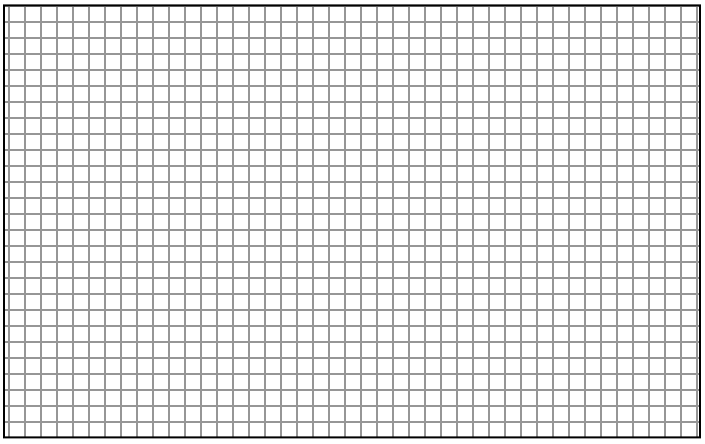
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

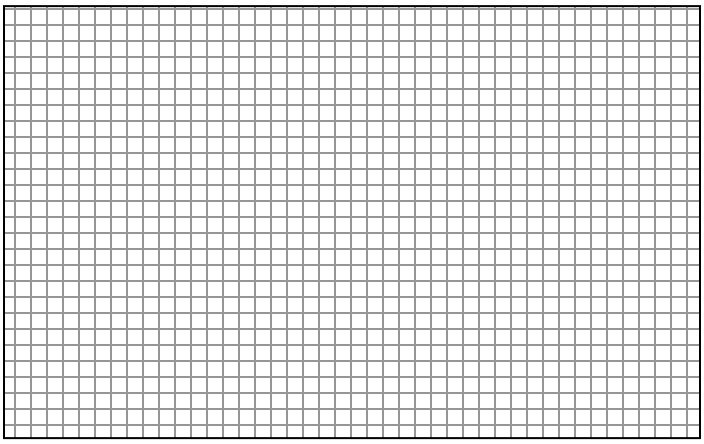
Sketching: Choose the best idea from your brainstorming list and sketch it below in the space provided. If you are redesigning your original system, sketch redesign in the space provided.

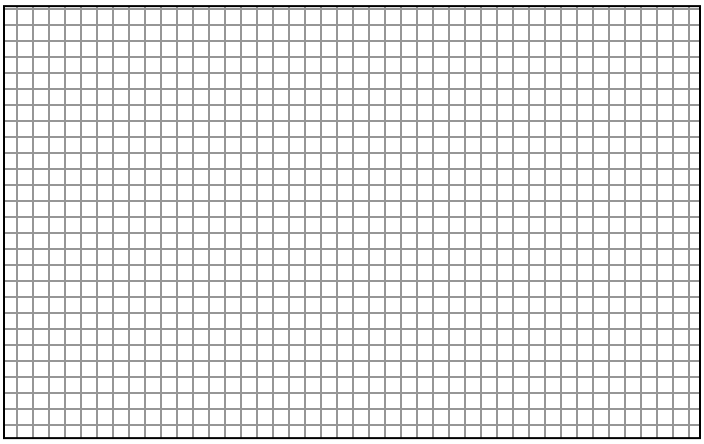
Original Idea:



Redesign 1:







Questions: Answer in complete sentences.

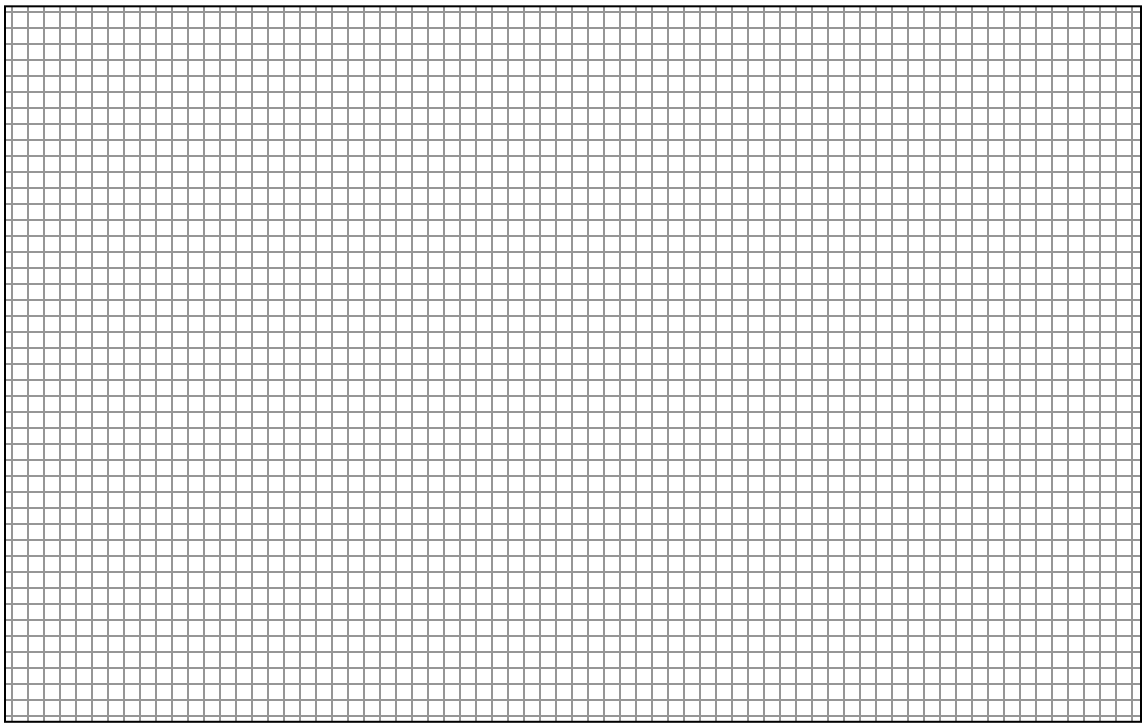
1. List the steps you took to solve this problem?

2. Were you able to create a system that balanced the toothpick on the glass in your first attempt? What conclusions did you draw from the first test?

3. How is center of mass applied in your design?

4. Is it necessary for a container ship to understand center of mass? Why?

5. Based on the Loading a Ship online activity, sketch one alternative way container ships could stack cargo in the space provided below.



Cargo Container Types Worksheet

Name: _____ Date: _____

Directions: Use the following site (http://www.marylandports.com/info/cargo.htm) to help identify the types of cargo that enter the Port of Baltimore. Record your answers in complete sentences underneath the question.

1. List the five types of cargo that enter the Port of Baltimore?

2. How many cars move through the Port of Baltimore per year?

3. Why is, the Port of Baltimore consistently ranked among America's top auto ports?

4. Containers account for what percentage of cargo that comes through the Port of Baltimore?

5. Why are forest products specifically targeted in the Port of Baltimore's business plan?

6. What types of goods are considered specialized cargo?

7. What does the acronym RO/RO stand for?

8. What are some of the key factors that make the Port of Baltimore successful?

Creating a Cargo Container Activity

Name: _____ Date: _____

Challenge Problem:

- Design and construct a cargo container that will support the most weight.

Rules:

1. Do not use more than the provided materials
2. Cargo container model is to be designed after a cargo container type
3. Cargo container model is to have an assigned scale
4. Use only books provided by the teacher to test your cargo container
5. Weight both a single book and your cargo container before destructively testing record weights in grams

Materials:

1. (10) 3”x5” index cards
2. 10” masking tape

Step 1: Research

Directions:

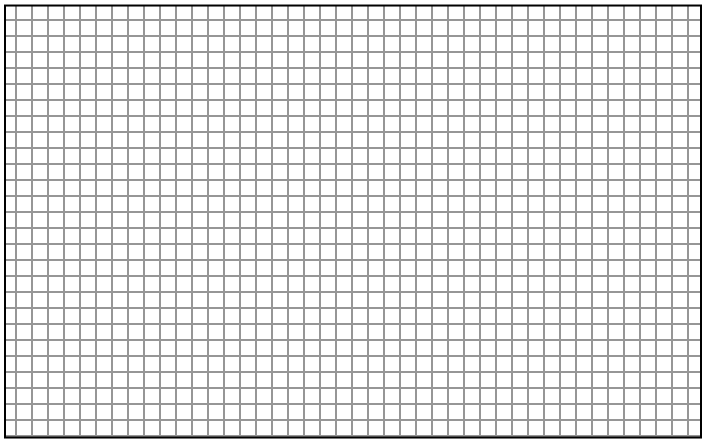
Use the following site (http://www.seabox.com/v3/catalog/40ft/) to help identify three types of cargo containers that can be used as a guide to help you design your cargo container model. You can look at the specific PDF descriptions of the containers to gather more information.

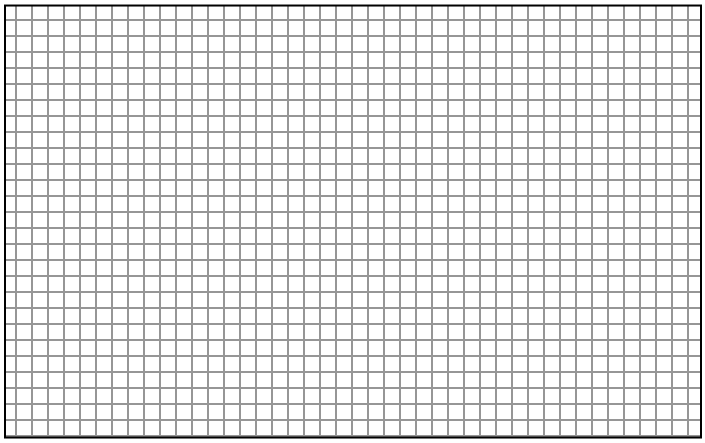
1. Cargo Container 1:
    a. Purpose:
2. Cargo Container 2:
    a. Purpose:
3. Cargo Container 3:
    a. Purpose:

Step 2: Brainstorming Solutions

Directions:

Create two sketches of possible solutions. Note the scale at which the model would be constructed in the lower right hand corner of the space.





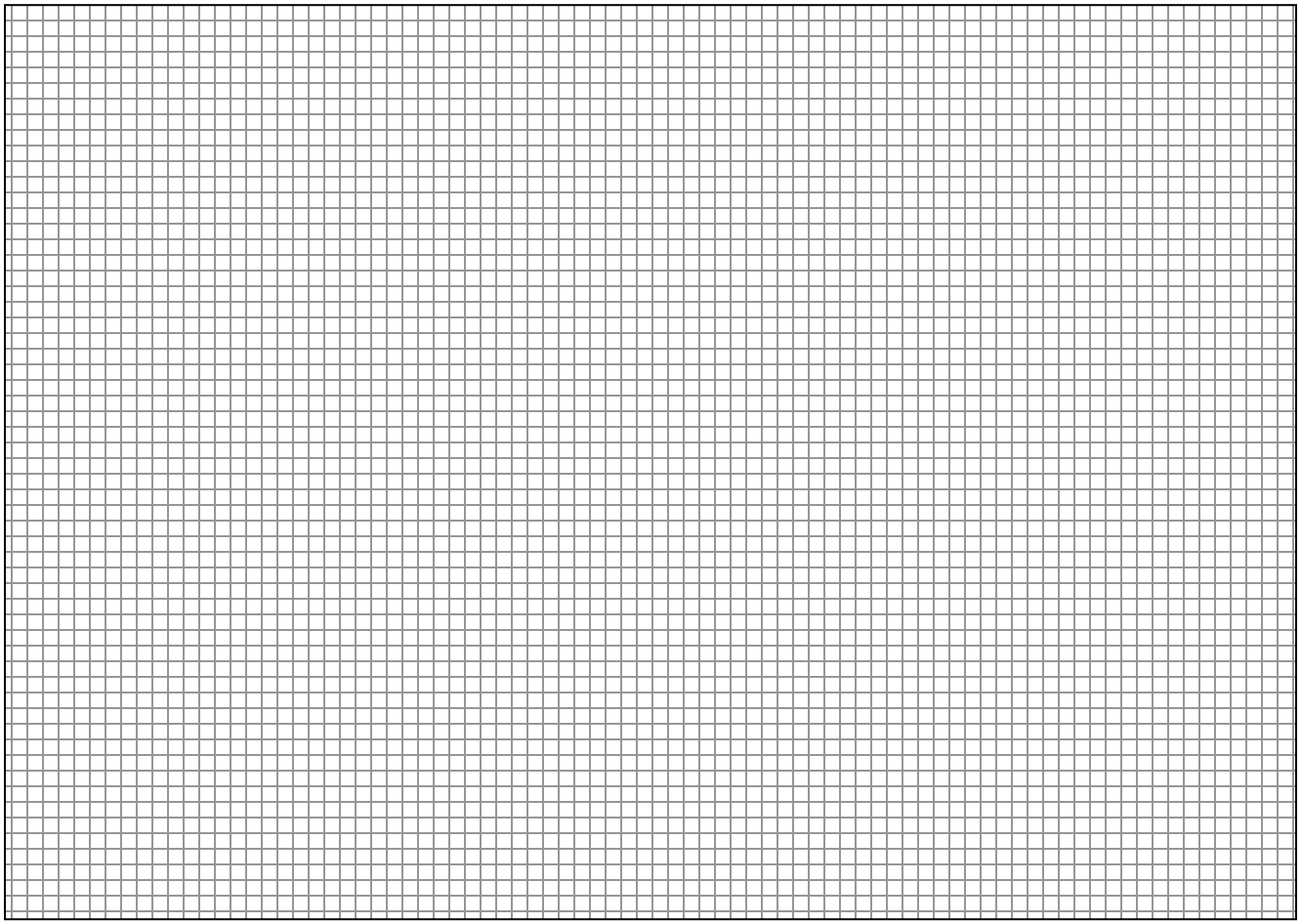
Examine both design ideas. Create a list of positives and negatives for each design. Based on your lists, choose your final design.

Design 1		Design 2	
Positives:	Negatives:	Positives:	Negatives:
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

Step 4: Designing the final solution

Directions:

Choose a final design and create a detailed sketch. Note the scale at which the model will be constructed in the lower right hand corner of the space.



Using a scale, weigh your cargo container model and a single text book. Place text books on your scale model until your scale model collapses. All measurements will be recorded in grams.

Weight of text book:_____ Number of text books held: _____

Total weight held: _____ Weight of container: _____

Calculate the efficiency of your model using the following equation:

Efficiency = Load supported in grams / Mass of cargo container in grams

Questions:

1. What was the efficiency of you cargo container?
2. What changes or adjustments did you make for your solution to be successful?
3. How would you redesign your model to be more efficient?