Railroad Logistics

FINAL REPORT

winmath

CAPSTONE PROJECT

Name _____ Date_____

winma+h CAPSTONE

Project Title

Railroad Logistics

Career Cluster

Career: Transportation, Distribution and Logistics
Occupation: Rail Transportation Planner/Manager

Mission

Trains are used throughout the country to transport people and materials. Rail transportation offers a significant economic advantage over trucks when shipping freight long distances. Using trains to move freight is not only less expensive, it's better for the environment. Trains consume less fuel than do trucks.

A rail planner/manager needs to determine which types of rail cars to use for different types of products and how much can fit into a particular car. The types of rail cars used in this project include the following.

- Boxcars
- Tank cars (tankers)
- Hopper cars
- Refrigerator cars
- Plain Gondola Cars

Each type of car typically carries certain types of material and has a specific size. Knowing the size of the contents, the size of the cars (volume), and the distance the freight must travel are important to determining the number and type of cars and the cost of the transportation.

At stops along the way, the train picks up and drops off freight cars. Not only do freight planners need to figure out how many of each type of car are needed to transport the materials, they need to decide the order in which the cars should be attached. Removing the last car on the train is easiest. When possible, the cars that should be left at a particular stop should be the last cars.

Mission (continued)

In this project, you will be the Rail Transportation Planner. You will need to compute the volume of freight that will be transported and figure out which cars should be used carry the freight to its destination.

Standards

CC.8.G.1 Verify experimentally the properties of rotations, reflections, and translations:

- Lines are taken to lines, and line segments to line segments of the same length.
- Angles are taken to angles of the same measure.
- Parallel lines are taken to parallel lines.

CC.8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

CC.8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

CC.8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Freight Products

You must convince your new boss, the vice-president of materials distribution, that the figures in your shipping manifest are correct and represent the least-cost scenario. For each product, the boss asked a series of questions to test your knowledge.

Write a report to answer the boss's questions. Use information from the worksheets to write the report. Provide as much detail as possible so your new boss will have complete confidence in your decisions.

Apples

Explain how you determined how many pallets will fit into a car and how many cars are needed to ship all the pallets.

How much did you save the company by finding the least-cost scenario? Explain how you know.

Freight Products
(continued)

Molded Dashboard Covers

Explain how you determined how many pallets will fit in a car.

Explain how you found the number of cars needed and the total cost.

Freight Products
(continued)

Road Salt

Explain how you determined the volume of a covered hopper.

Explain how you determined the volume of salt and the number of cars required to ship it.

Freight Products
(continued)

Barley

Explain how you determined the volume, in cubic feet, of one car.

Explain how you determined the volume of barley.

Freight Products
(continued)

Liquid Fertilizer

Explain how you found the number of cars required to ship the liquid fertilizer.

Freight Products
(continued)

Plastic Chemicals

Explain how you determined how much plastic chemical will fit in each car and the number of cars required to ship all the material?

Freight Products
(continued)

Fresh-Cut Logs

Explain how you know how many logs will fit into a car and how many cars are required to ship them.

Shipping Manifest: Outbound Route

This section of the report summarizes the plans. For each cell in the tables, insert the information you ultimately used to make the final decision about the number of cars required to ship the materials. Be certain to include the units.

From	To	Freight	Amount of Freight	Car Type	Amount of Freight per Car	# of Rail Cars Needed	# of Legs	Cost per Leg	Total Shipping Cost
Boston, MA	Chicago, IL								
Boston, MA	Detroit, MI								
Newark, NJ	Pittsburgh, PA								
Pittsburgh, PAj	Indianapolis, IN								

Shipping Manifest: Inbound Route

From	To	Freight	Amount of Freight	Car Type	Amount of Freight per Car	# of Rail Cars Needed	# of Legs	Cost per Leg	Total Shipping Cost
Detroit, MI	Chicago, IL								
Chicago, IL	Newark, NJ								
Indianapolis, IN	Boston, MA								

Loading Instructions

Indicate the order in which the cars should be attached in Boston. At each stop, make an ordered list of what the loading crew should do. Indicate, by type of car and cargo, what should be loaded or unloaded. Be sure to indicate how many of each car the loading crew should expect to load or unload.

Boston

Newark

Pittsburgh

Indianapolis

Chicago

Detroit

Chicago

Indianapolis

Newark

Boston