2003 Transportation Education Academy Activities

High School Activities: Water, Land, Multi-Modal

Barge Efficiency

LEARNING AREA: Mathematical Concepts
EDUCATIONAL LEVEL: High School
CONTENT STANDARDS: Technical Applications

STANDARD: A student shall:

Demonstrate knowledge of computational technology.

Demonstrate understanding of the essential role of mathematical tools and how they are essential to scientific inquiry.

Analyze information for optimum production.

WHAT THE STUDENTS WILL LEARN:

DESCRIPTION:

This unit will be used to compare barge transportation to a large semi-trailer in terms of fuel efficiency, fuel costs, and the overuse of our highway system.

PRODUCTS/EVIDENCE OF LEARNING:

The students will be able to:

1. Calculate the capacity of one barge in cubic feet.
2. Convert tons to pounds.
3. Calculate the number of bushels of corn a barge and semi can haul.
4. Calculate fuel consumption of a transportation method.
5. Use the Internet to locate information.

OVERVIEW:

Students will compare the amount of fuel needed to transport a load of corn from St. Paul to St. Louis using a fifteen-tow barge and one large semi-trailer. The students will also realize the advantages the river system has over our nation's highway system in the terms of reducing roadbed abuse and congestion.

CHECKLIST:

Use the worksheet the student has completed to give more insight on the riverboat transportation system.

Enrichment: Have the students construct a barge out of any material but to your size requirements that will float nine pounds. May also have a contest to see which one will support the most weight.

Minnesota Department of Transportation ● Office of Aeronautics ● Aviation Education Section
222 E. Plato Boulevard, St. Paul MN 55107-1618 ● www.mnaero.com/aved ● 651-297-1600 |

Transportation Unit Name_____

Efficiency of Barge Transportation

Using your calculator answer the following questions. Please write out the equation you used to find your answer. (Show your work)

1. Calculate the cubic feet of one typical large barge found on the Mississippi.

Height:	14.5 feet
Width:	35 feet
Length:	200 feet

2. If a ton of corn uses 67 cubic feet, how many tons can this single barge carry? Round your answer to the nearest hundredth. Calculate this weight in pounds.

_____ Total tons

_____ Total pounds

3. Calculate the total weight in tons and pounds a typical fifteen-barge tow on the Mississippi can haul.

_____Total tons

_____Total pounds

4. A towboat is a twin power plant with 2500 horsepower engines. What is the total horsepower output?

5. A towboat uses one gallon of fuel per horsepower every 24 hours. What is the total fuel consumption of this one towboat in one day?

6. It takes 7 full days to travel from St. Paul to St. Louis. How many gallons of fuel will this 15-barge tow consume?

7. What is the total fuel bill for one trip down if fuel costs $1.50 per gallon?

8. A $.20 per gallon fuel surcharge (tax) is applied to all the fuel used on the river. What is the amount the company will pay to the U.S. Army Corps of Engineers for this one trip?

9. Calculate the amount of fuel used per ton of product and the cost per ton.

   _____ Gallons per ton

   _____Cost per ton

10. Using the Internet, find the total mileage from St. Paul to St. Louis. List the web site used.

11. A large semi-trailer-truck can haul 26 tons of products. This is equal to how many pounds? How many bushels of corn can be loaded on this one trailer? (*Answer: 56 pounds per bushel.)*

   _____Pounds

   _____ Bushels

12. A semi-trailer averages eight miles per gallon. How many gallons of fuel are needed for this trip?

13. If fuel costs $1.50 per gallon, what is the total cost of this trip?

14. What is the total cost per ton hauled?

15. How many semi-trailers would be needed to fill a fifteen-barge tow?

CHECKLIST:

STUDENT	TEACHER	
_____	_____	1. Complete safety checklist.
_____	_____	2. Find information about overhaul.
_____	_____	3. Test on tools and equipment.
_____	_____	4. Understand basic engine function.
_____	_____	5. Keep accurate records about repairs.
_____	_____	6. Test on engine systems.
_____	_____	7. Engine complete as per instruction.
_____	_____	8. Complete all job task lists.
_____	_____	9. Perform engine run test.
_____	_____	10. Performance test.