

DREDGING THE MISSISSIPPI

Students will calculate the appropriate channel depth for barges to safely navigate the upper Mississippi River.

TEACHER NOTES FOR DISCUSSION

To get students thinking about calculating volume, bring in a shoe box and wooden blocks. Discuss strategies for figuring out how many blocks will fit into the shoe box. From this discussion talk about the formula for volume and strategies for figuring out channel depth.

Answer Key

The channel is 55 miles long. An average of 9 feet in depth must be removed from a channel that measures 102 feet wide. Calculate the cubic feet of earth that will be moved per mile.

Hint: a mile is 5,280 feet

$$V = l \cdot w \cdot h$$

$$V = 5,280 \cdot 102 \cdot 9$$

$$V = 4,847,040 \text{ ft.}^3$$

Now, calculate the cubic feet from St. Paul to La Crosse.

$$V = l \cdot w \cdot h$$

$$V = (5,280 \cdot 55) \cdot 102 \cdot 9$$

$$V = 290,400 \cdot 102 \cdot 9$$

$$V = 266,587,200 \text{ ft.}^3$$

If the Army Corps of Engineers can move an average of 550,000 cubic feet of earth a day, calculate the number of days would it take to finish the project.

$$266,587,200 \text{ ft.}^3$$

$$550,000 \text{ ft.}^3$$

484.7 days to move the earth

RELATED STANDARDS AND BENCHMARKS

National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics*. <http://standards-e.nctm.org/1.0/normal/standards/intr_MAIN.html>, March 16, 2000.

Standard 6: Problem Solving

- develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics

Standard 9: Connections

- recognize, use, and learn about mathematics in contexts outside of mathematics

Standard 2: Patterns, Functions and Algebra

- use mathematical models and analyze change in both real and abstract contexts

Standard 4: Measurement

- apply a variety of techniques, tools, and formulas for determining measurements

Objective

After completing this activity, students should be able to calculate cubic feet and rate of flow.

Time Considerations

Instructor preparation:
15 minutes

Student activity:
one class



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UNDERSTAND YOUR MISSION

In this activity, you will calculate the amount of earth that is to be removed and the length of time a dredging project will take the Army Corps of Engineers to complete.

LEARN THE LINGO

channel	the bed where a natural stream of water flows
cubic feet	a measurement using length, width, and height to calculate volume
dredge	remove sediment from the bottom of a waterway
mile	a unit of distance 5,280 feet long
volume	amount of space occupied by a 3-D object (a cube, a bowl, a swimming pool)

Gather Your Supplies

- paper
- pencil
- calculator

Go Beyond

Look at a water utility statement from a home or a local business, or call the city waterworks to find how much a cubic foot of water costs. Figure out how much it would cost the city to fill a city park pond that measures 24 feet by 16 feet and has a depth of 4 feet.

BACKGROUND

Between St. Paul, Minnesota, and La Crosse, Wisconsin, barges are having difficulty passing. The Army Corps of Engineers regulates the river to make sure that there is a constant channel depth of nine feet. This means that for various reasons they need to remove earth deposits from the bottom of the river (dredging) to make it safe and passable for all river vessels.

CHART A COURSE FOR EXPLORATION

Example

If the channel to be dredged is 105 miles long and measures 88 feet in width and needs to be an average of 5 feet deeper, how many cubic feet of earth would be removed from the channel?

$$V = l \cdot w \cdot h$$

$$V = (5,280 \cdot 105) \cdot 88 \cdot 5$$

$$V = 554400 \cdot 88 \cdot 5$$

$$V = 243,936,000 \text{ ft}^3$$

The Army Corps of Engineers has decided that the Mississippi River channel between the cities of St. Paul, Minnesota, and La Crosse, Wisconsin, must be made an average of 9 feet deeper for the barges to pass through without difficulty.

1. The channel is 55 miles long. An average of 9 feet in depth must be removed from a channel that measures 102 feet wide. Calculate the cubic feet of earth that will be moved per mile. Now, calculate the cubic feet from St. Paul to La Crosse.
2. If the Army Corps of Engineers can move an average of 550,000 cubic feet of earth a day, calculate the number of days would it take to finish the project.



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Have students calculate the volume of their bath tub and its rate of flow.

REFERENCES

Chapin, Suzanne H., Mark Illingworth, Marsha S. Landau, Joanna O. Masingila, and Leah McCracken. *Middle Grades Mathematics*, Prentice Hall Publishing, Inc., 1995 ed.