iMath Readers

A Year at the Fairgrounds:
Finding Volume

by Renata Brunner-Jass

Math Objective

Children understand what cubic units are and how they relate to finding volume. They learn how models are used to show volume. They also learn the formula to find the volume of an object, such as a rectangular prism. Children use operations like addition, subtraction, multiplication, or division to find volume.

iMath Discover Activity

In this activity, children use blocks to estimate the volume of a cardboard box. Then, they use the formula for volume to check their estimate. They may use an operation to find the volume in another way.

➤ Objectives

Children will:
• manipulate objects to estimate volume.
• take measurements.
• use a formula to find volume.
• use an operation such as addition, subtraction, multiplication, or division to find volume.
• compare volumes.

Materials

- Several cardboard boxes, such as cereal boxes
- scissors
- ruler
- paper
- pencil

Lesson Plan

Before Reading

Investigation	Math Concepts
Ask children to look at the picture on pp. 4–5. Read the text. Ask: *What might happen at the fairgrounds at other times of the year?* Record children's answers on the board.	Connecting to what they know helps children engage in the topic.
Ask: *Have you seen a miniature horse before? How would you calculate the minimum size for a trailer that might hold the horse in the picture? How big do you estimate the horse is? Length? Width? Height?* Record children's answers on the board. Have them agree on the dimensions.	Accessing prior knowledge gets children to think about and engage with the topic. Children use estimation skills.

Children observe life in the fairgrounds throughout a year. They learn how event planners at the fair use cubic units and models to find volume. Children use math operations to solve real-world spatial problems.

During Reading

Investigation	Math Concepts
pp. 6–9: Invite a volunteer to read p. 6 and the top of p. 7 aloud. Ask: *Why is it useful to be able to find the volume of a space?* Record children's answers. Provide building blocks. Invite two volunteers to build a model that shows the problem on p. 7. Ask: *What is a rectangular prism?* Read p. 8 aloud. Show the formula for volume by working the problem on the board. Go back to the children's estimates of dimensions for the pony. Ask: *How can we use the formula for volume to find a trailer to fit the miniature horse?* Have children use the volume formula. Correct any errors. Read p. 9 aloud. Ask: *What if the blocks were 3 inches x 3 inches x 3 inches? How would you use addition to find the volume of the object? How would you use multiplication?*	Children recognize volume as an attribute of solid figures and understand concepts of volume measurement. They understand that a solid figure that can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. Children measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. Children relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. Children find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base.

During Reading (continued)

Investigation	Math Concepts
pp. 12–13: Read pp. 12–13 aloud. Ask: *Do you remember how to find the volume?* Write the formula on the board: *V = l x w x h*. Have children use the formula to find the volume of the hay bale and have them multiply to find the volume of the stack of hay bales.	Children use the formula for volume.
pp. 14–15: Invite a volunteer read p. 14 aloud. Ask: *How many cubic feet of corn stalks can the shed hold?* Children work alone using pencil and paper to find the answer. Demonstrate how to work the problem on the board after children have finished their attempt. Say: *Now what operation will you use to find out how many more cubic feet of corn stalks the shed can hold?* Read p. 15 aloud. Ask: *What do you do after you find the volume of one board? How do you find the volume of the entire stack of boards?*	Children use the formula for volume and choose the correct operations to complete the problems.
pp. 16–17: Read p. 17 aloud. Ask: *Will the wheelbarrow be able to carry the giant pumpkin?* Children work alone using pencil and paper to find the answer. Demonstrate how to work the problem on the board after children have finished their attempt.	Children use the formula for volume and choose the correct operations to complete the problems.
pp. 18–19: Read p. 18. Ask: *After you use the volume formula to find the volume of the hay truck, what will your next step be? Then, what operation will you choose to complete the problem?* Children work alone using pencil and paper to find the answer. Model how to work the problem after children have finished their attempt.	Children use the formula for volume and choose the correct operations to complete the problems.
pp. 20–21: Invite a volunteer to read pp. 20–21 aloud. Ask: *After you find the volume for one ice block, what do you do?* (Multiply by two.) Invite a volunteer to demonstrate how to work the problem on the board. Ask: *How would you feel about staying in an ice hotel? What would you wear?*	Children use the formula for volume and choose the correct operations to complete the problems.

During Reading (continued)

Investigation	Math Concepts
pp. 22–23: Invite children to read pp. 22–23 silently. Ask: *What does a vendor do?* Reread p. 22 aloud. Talk children through the problem on that page. Invite their input as you work the problem. Ask: *Why is being able to calculate volume so important to vendors and professional movers?*	Children relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 24–25: Read p. 24 aloud. Invite children to set up an equation to find the depth of the trench. Review their work. Write the equation and its solution on the board. Read p. 25 aloud. Ask: *What is the first step in solving this problem?* (Find the volume of the mold.) *What is the next step?* (Find the volume of a bar.) *What is the final step?* (Divide.)	Children relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 26–27: Have a volunteer read pp. 26–27 aloud. Let children work in pairs to solve the problem. Invite volunteers to share their work.	Children relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 28–29: Children continue to work in pairs. Read p. 28 aloud. Refer children back to pp. 6–9 if necessary. Invite a volunteer to read p. 29. Ask: *Do you have all the information you need to solve the problem?* Have pairs answer the questions. Invite them to volunteer answers.	Children find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Children relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 30–31: Read these pages aloud. Prompt discussion. Ask: *Why were state fairs important? Are they just as important today? What are some of the purposes of state fairs?*	Children learn the history of state fairs and their importance.

During Reading (continued)

Investigation	Math Concepts
pp. 32–35: Children work in small groups and collaborate on strategies to solve the problems on these pages. Children read these pages quietly as they progress through the problems. Have children show their work on paper. Each group should present the problems on at least one of these pages. Walk around the class and answer questions.	Children collaborate to find strategies to solve a variety of volume problems. They relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 36–41: Restructure groups. Children work in small groups and collaborate on strategies to solve the problems on these pages. Children read these pages quietly as they progress through the problems. Have children show their work on paper. Each group should present the problems on at least one of these pages.	Children collaborate to find strategies to solve a variety of volume problems. They relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
pp. 42–44: Read these pages aloud. Have volunteers take turns reading. Give children an appropriate time to solve the problems on each page. Invite different children to teach their strategy and solution to the class. Prompt students to discuss the values of different strategies.	Children collaborate to find strategies to solve a variety of volume problems. They relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. They use other operations to complete multi-step problems.
p. 45: Read p. 45 aloud together. Brainstorm different ideas with children. Provide paper and drawing materials.	Children use creative thinking to brainstorm ideas for their ride.

After Reading

Ask children to restate the key ideas in the book.

Investigation	Understanding Math
Have children choose an animal to raise for the state fair. Encourage them to design a stall for that animal and its needs. Children should show volume of the space.	Children use a real-world situation to learn the uses of finding volume.
Children design a game that involves finding the volume of different shapes.	Children use their knowledge of shapes and volume to design a game.