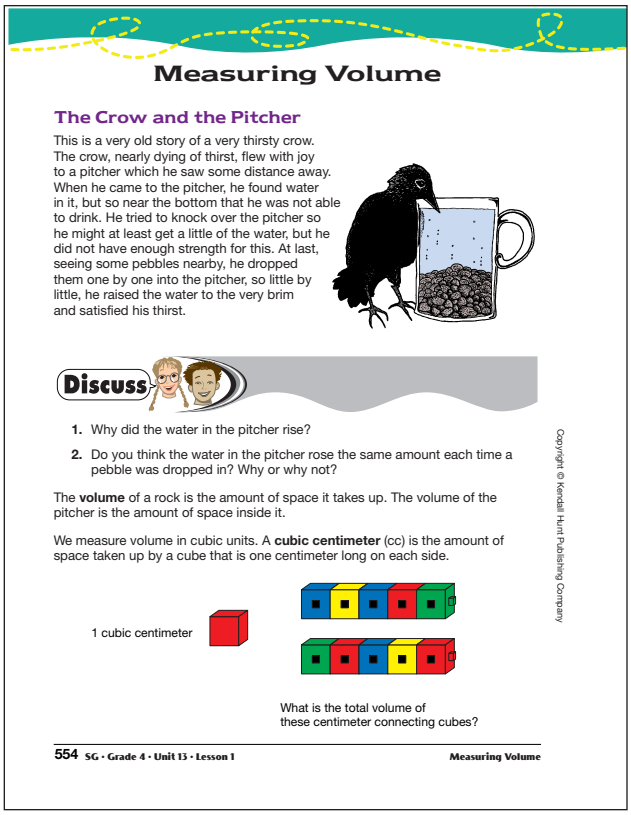


Measuring Volume

The Crow and the Pitcher

This is a very old story of a very thirsty crow. The crow, nearly dying of thirst, flew with joy to a pitcher which he saw some distance away. When he came to the pitcher, he found water in it, but so near the bottom that he was not able to drink. He tried to knock over the pitcher so he might at least get a little of the water, but he did not have enough strength for this. At last, seeing some pebbles nearby, he dropped them one by one into the pitcher, so little by little, he raised the water to the very brim and satisfied his thirst.

Discuss

1. Why did the water in the pitcher rise?
2. Do you think the water in the pitcher rose the same amount each time a pebble was dropped in? Why or why not?

The **volume** of a rock is the amount of space it takes up. The volume of the pitcher is the amount of space inside it.

We measure volume in cubic units. A **cubic centimeter** (cc) is the amount of space taken up by a cube that is one centimeter long on each side.

1 cubic centimeter

What is the total volume of these centimeter connecting cubes?

554 SG • Grade 4 • Unit 13 • Lesson 1 Measuring Volume

Student Guide - Page 554

Student Guide

Questions 1–6 (SG pp. 554–557)

1.* As the crow added pebbles to the pitcher, the water in the pitcher was displaced or pushed away by the pebbles, so the water level rose.

2.* No, each pebble took up a different amount of volume, so the water level rose a different amount each time.

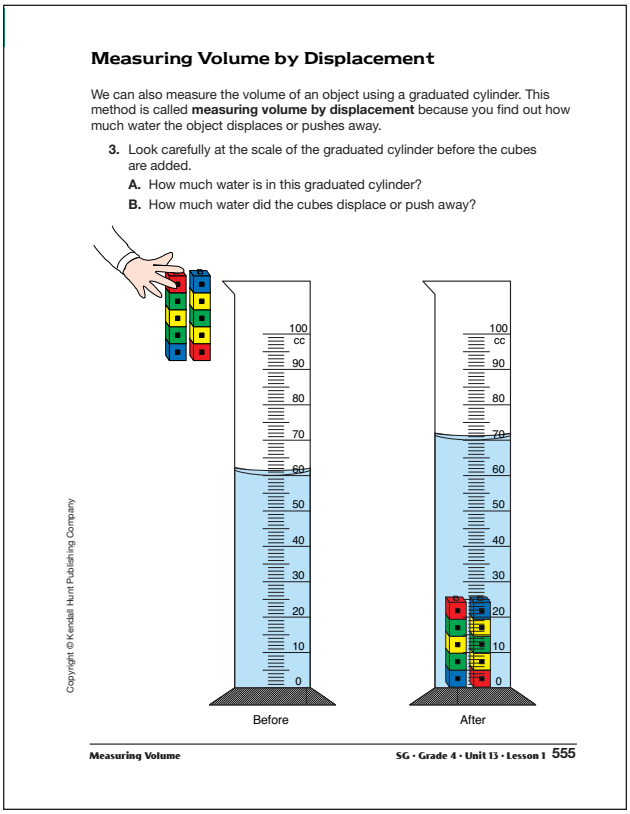
3. A.* 60 cc

   B.* 10 cc

4. About 11 cc

5. A.* Read at eye level, at the bottom of the meniscus, and holding the cylinder level.

   B.* Jerome should not look from above or below or tilt the cylinder.



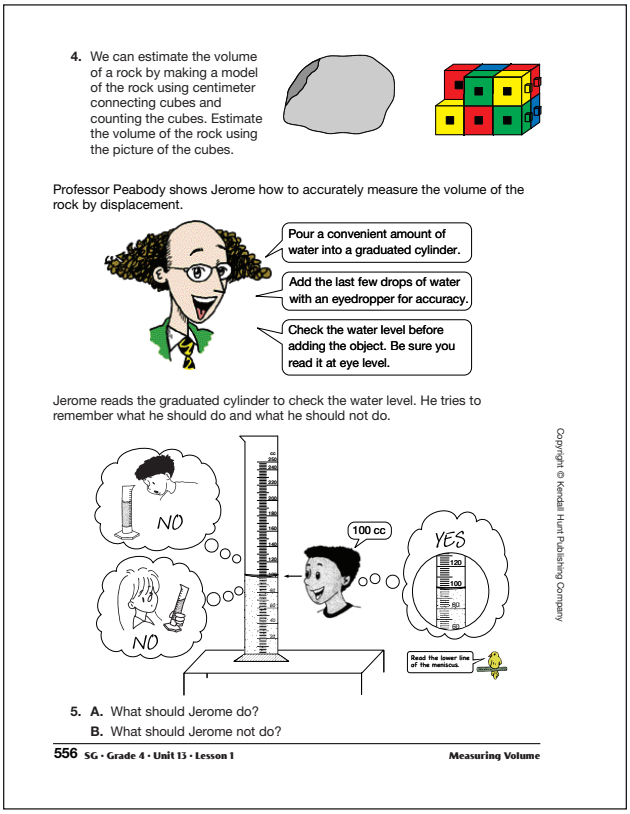
Measuring Volume by Displacement

We can also measure the volume of an object using a graduated cylinder. This method is called **measuring volume by displacement** because you find out how much water the object displaces or pushes away.

3. Look carefully at the scale of the graduated cylinder before the cubes are added.
   A. How much water is in this graduated cylinder?
   B. How much water did the cubes displace or push away?

Measuring Volume SG • Grade 4 • Unit 13 • Lesson 1 555

Student Guide - Page 555



4. We can estimate the volume of a rock by making a model of the rock using centimeter connecting cubes and counting the cubes. Estimate the volume of the rock using the picture of the cubes.

Professor Peabody shows Jerome how to accurately measure the volume of the rock by displacement.

Jerome reads the graduated cylinder to check the water level. He tries to remember what he should do and what he should not do.

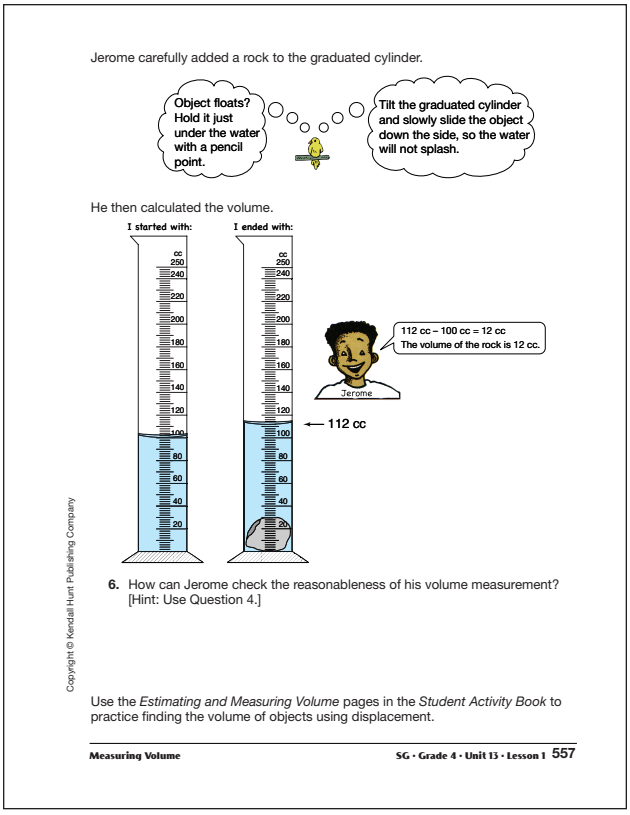
5. A. What should Jerome do?
   B. What should Jerome not do?

556 SG • Grade 4 • Unit 13 • Lesson 1 Measuring Volume

Student Guide - Page 556

*Answers and/or discussion are included in the lesson.

6. Jerome should compare his measurement to his estimate.


Jerome carefully added a rock to the graduated cylinder.

Object floats? Hold it just under the water with a pencil point.

Tilt the graduated cylinder and slowly slide the object down the side, so the water will not splash.

He then calculated the volume.

I started with: I ended with:

112 cc

112 cc – 100 cc = 12 cc
The volume of the rock is 12 cc.

Jerome

6. How can Jerome check the reasonableness of his volume measurement? [Hint: Use Question 4.]

Use the *Estimating and Measuring Volume* pages in the *Student Activity Book* to practice finding the volume of objects using displacement.

Measuring Volume SG • Grade 4 • Unit 13 • Lesson 1 557

***Student Guide* - Page 557**

Student Activity Book

Estimating and Measuring Volume (SAB pp. 541–542)

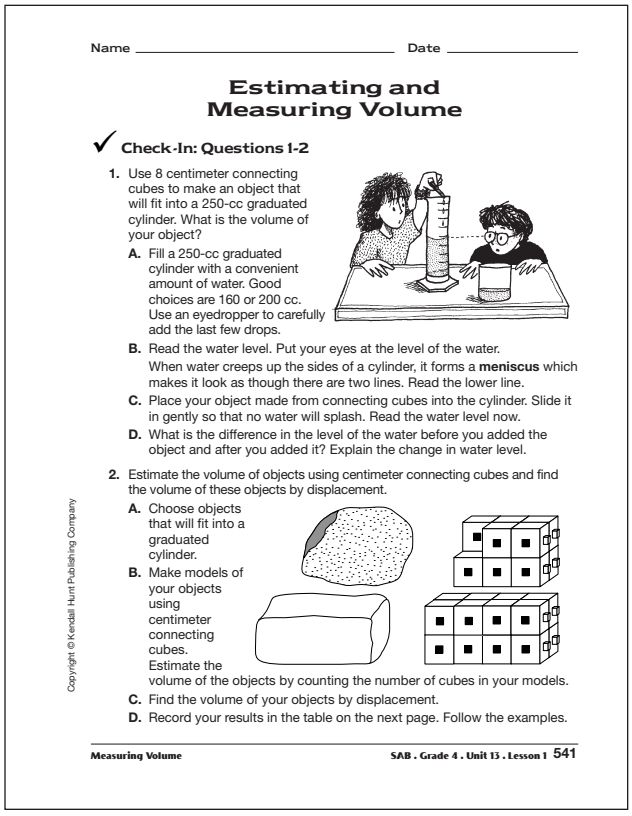
Questions 1–4

1. 8 cc

A–C. Observe students as they follow directions.

D.* 8 cc; The cubes displaced or pushed away 8 cc of water, so the water level went up.

2. Estimates and volumes will vary based on models made.


Name _____ Date _____

Estimating and Measuring Volume

✓ Check-In: Questions 1-2

1. Use 8 centimeter connecting cubes to make an object that will fit into a 250-cc graduated cylinder. What is the volume of your object?

A. Fill a 250-cc graduated cylinder with a convenient amount of water. Good choices are 160 or 200 cc. Use an eyedropper to carefully add the last few drops.

B. Read the water level. Put your eyes at the level of the water. When water creeps up the sides of a cylinder, it forms a **meniscus** which makes it look as though there are two lines. Read the lower line.

C. Place your object made from connecting cubes into the cylinder. Slide it in gently so that no water will splash. Read the water level now.

D. What is the difference in the level of the water before you added the object and after you added it? Explain the change in water level.

2. Estimate the volume of objects using centimeter connecting cubes and find the volume of these objects by displacement.

A. Choose objects that will fit into a graduated cylinder.

B. Make models of your objects using centimeter connecting cubes. Estimate the volume of the objects by counting the number of cubes in your models.

C. Find the volume of your objects by displacement.

D. Record your results in the table on the next page. Follow the examples.

Measuring Volume SAB • Grade 4 • Unit 13 • Lesson 1 541

***Student Activity Book* - Page 541**

***Answers and/or discussion are included in the lesson.**