

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 1 Activities 6 & 7

SC.A.1.1.2

The student recognizes that the same material can exist in different states.

SC.A.2.1.1

The student recognizes that many things are made of smaller pieces, different amounts, and various shapes.

SC.H.1.1.1

The student knows that in order to learn, it is important to observe the same things often and compare them.

SC.H.1.1.3

The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

SC.H.1.1.5

The student uses the senses, tools, and instruments to obtain information from his or her surroundings.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

- 1. Session I—Activity 6:** Have students name some solid objects they have used in class so far today. (Answers might include a pencil, a desk, and a book.) Ask, *How do you know these things are solids?* (They hold their shape and do not pour easily.)
- 2. Session II—Activity 7:** Ask students to identify two soft solid things in the classroom and explain how they would use the spoon test for softness. (Paper is soft; it can be marked or cut by the spoon. A foam cup is soft; it can be cut or marked easily by the harder spoon.) Then ask them to name two hard solid things and again explain how they would use the test. (The leg of my desk is hard; it cannot be marked or cut by the spoon. The tile floor is hard; it cannot be marked or cut by the spoon.)
3. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

Properties of Solids

OBJECTIVES

Students describe the properties of painted wood blocks and then decide which of those properties apply to solids in general. They then test an assortment of objects for hardness and arrange the objects according to increasing hardness.

The students

- ▶ describe properties of solids
- ▶ perform a simplified scratch test on various solids
- ▶ group objects according to how hard they are
- ▶ arrange a group of objects by increasing hardness

SCHEDULE

Session I—Activity 6 About 20 minutes

Session II—Activity 7 About 30 minutes

VOCABULARY

solid

MATERIALS

For each student

- 1 Activity Sheet 6
- 1 pair safety goggles*

For each team of two

- 1 block, any shape/color
- 1 candle, birthday
- 1 piece chalk
- 1 cork



- 1 cup, foam
- 1 pencil eraser, rubber
- 1 rock, smooth
- 1 spoon, plastic
- 1 tray, sorting

For the class

- 1 bag, plastic, resealable
- 1 chart, Describing Properties
- 1 stick clay
- 1 crayon
- 1 knife, dull*
- 1 marker, felt-tip*
- 1 pencil*
- 1 wood samples, p/16
Delta Science Reader, *Properties*

*provided by the teacher

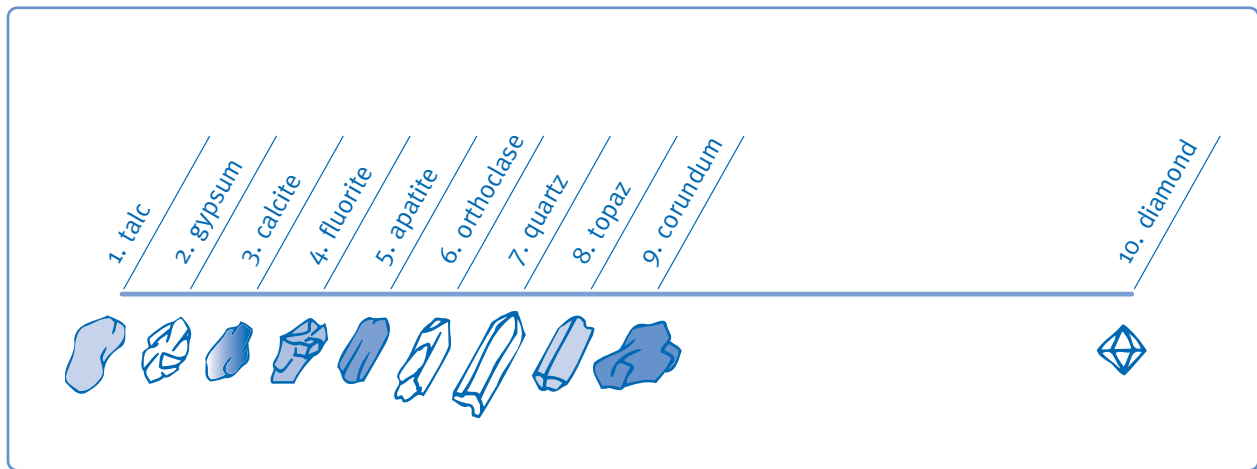
PREPARATION

Session I—Activity 6

- 1 Make a copy of Activity Sheet 6 for each student.
- 2 Each team of two will need a block and a foam cup.
- 3 You will need a crayon and a pencil for a class demonstration.

Session II—Activity 7

- 1 Using a dull knife, cut the clay into sixteen equal pieces.
- 2 Each student will need his or her copy of Activity Sheet 6.
- 3 Each team of two will need the following items on a sorting tray: a piece of clay, a birthday candle, a piece of chalk, a cork, a foam cup, a rubber pencil eraser, a plastic spoon, a smooth rock, and a wood sample (either light-colored or dark-colored).



▲ Figure 6-1. Mohs Scale of Hardness.

BACKGROUND INFORMATION

Matter commonly exists in one of three states: solid, liquid, or gas. In this activity, students study properties unique to solids.

Solids have a definite shape and volume. The volume of a solid (the amount of space it takes up) does not change if it is picked up or moved.

Solid objects can be described as relatively hard or relatively soft. Scientists classify the hardness of minerals according to a scale devised in 1812 by Austrian mineralogist Friedrich Mohs that is still used today. Mohs selected 10 minerals as standards and arranged them on a scale so that any mineral would scratch only those below it. Mohs scale ranges from 1 to 10, with talc being equal to 1 (the softest) and diamond being equal to 10 (the hardest) (see Figure 6-1). Common items can be ranked among the minerals in Mohs scale as well: a fingernail has a hardness of 2.5; glass has a hardness of approximately 5.5.

In this activity, students conduct a modified scratch test on solids other than minerals. The method students use to test for hardness is simplified in this activity to scratching several pairs of objects with a plastic spoon. However, students are also encouraged to scratch objects against one another to determine which is hardest. As a class, students then organize their results

by arranging their objects from softest to hardest. Students might require some assistance in arranging their objects.

▼ Activity Sheet 6

Properties of Solids

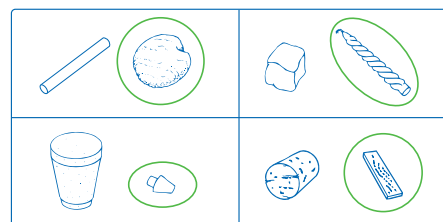
Session I—Activity 6

1. Circle the objects below that are solids.



Session II—Activity 7

2. Test each pair of objects. Then circle the harder object in each pair.



3. Draw a picture on the line below of each of your 8 objects. Draw them in order from softest to hardest.

Possible answer:
 clay/foam cup/birthday candle/chalk/
 cork/eraser/wood sample/rock

Softest

Hardest

Guiding the Activity

Additional Information

Session I—Activity 6

1 Distribute a block to each team. Allow students some time to examine their blocks.

Tell students that they are going to study the properties of blocks. Stimulate class discussion by asking, **What are some properties of your block?**

Record student responses on the board. Ask, **What does the block feel like?**

Ask, **Does the shape of the block stay the same or does it change while you hold it?**

2 Distribute a foam cup to each team. Ask, **Can you put your block in the foam cup? What happens to its shape when you do this?**

Ask, **Can you easily pour the block out of the cup? Does the block's shape change when you pour it out of the cup?**

Again, record any new descriptive words for the blocks on the board.

Ask, **What other objects can you think of that have a definite shape and that would keep their shape both in a cup and out of a cup?**

3 Write the word *solid* on the board. Tell students that a **solid** is matter that has a definite size and shape. Explain that the block, the pencil, and the piece of chalk are all examples of solid objects. Ask, **What other objects can you think of that are solids?**

The students should mention size, color, shape, texture, and weight (and/or mass).

Students should observe that their block feels dry and hard.

Students should observe that the shape of the block stays the same while they hold it.

Students should say that they can put their block in the foam cup and that the block's shape does not change when it is in the cup.

Students should observe that the block does not pour easily from the cup and that the shape of the block stays the same both in and out of the cup.

If students have trouble coming up with examples, ask them if a pencil and a piece of chalk have these properties. Students should conclude that the shape of a pencil and a piece of chalk would stay the same both in and out of a cup.

Answers will vary.

Guiding the Activity

Ask, **Based on your observations, what are some properties that all solids share?**

Add these observations to the Describing Properties chart under the heading *Properties of Solids*.

Additional Information

Students should respond that all solids do not pour easily and that they keep their shape no matter where they are.

4 Tell students that all objects are made of tiny pieces that are much too small to see, even with a magnifier. In solid objects, the pieces are packed tightly together. Add this property to the *Properties of Solids* column of the Describing Properties chart.

Hold up one of the teams' blocks and ask, **What would happen to this block if its pieces were not packed tightly together?**

Accept all answers that address the properties of a solid. For example, students might say that the block would not hold its shape, would melt into a puddle, and would not be hard.

5 Distribute a copy of **Activity Sheet 6** to each student and have students complete question 1 on their activity sheets. Go over student responses once they have finished.

Help students read the instructions on the activity sheet.

Have students return the blocks and foam cups to the kit. Collect the students' activity sheets and save them for use in Session II. Leave the chart on display.

Session II—Activity 7

6 Tell students that another property of a solid is its hardness or softness. Hold up a crayon and a pencil. Ask, **How can you tell which of these two objects is harder than the other?**

Invite a student volunteer to test the relative hardness of the crayon and the pencil by trying to put a dent in each one using a fingernail. Ask, **Which was harder to dent, the crayon or the pencil?**

Tell students that scientists compare the hardness of a group of solids by scratching them. Hold up a plastic spoon and show students how it easily scratches the crayon compared to the pencil. Show the students how you have to press harder to scratch the pencil.

Students might suggest trying to press their fingernail first into one and then the other to see which dents most easily.

The student volunteer should say that the pencil was harder to dent than the crayon.

Explain that, by doing this, scientists can say that the pencil is harder than the crayon.

Guiding the Activity

7 Distribute a sorting tray of objects to each team of two. Give each student his or her copy of **Activity Sheet 6**, which you collected at the end of Session I.

Give students ample time to first examine the objects on their trays.

Tell students that they are going to test the relative hardness of their objects by scratching their objects, in pairs, with a plastic spoon (see Figure 6-2). Tell students that the first pair of objects they will test is the piece of chalk and the smooth rock. Have students scratch both the chalk and the rock with the plastic spoon and compare the results.

Have students record their results in question 2 of their activity sheets by circling the harder object in the first pair.

8 In a similar manner, have students test the relative hardness of the remaining pairs of objects: the piece of clay and the birthday candle; the foam cup and the rubber pencil eraser; and the cork and the wood sample.

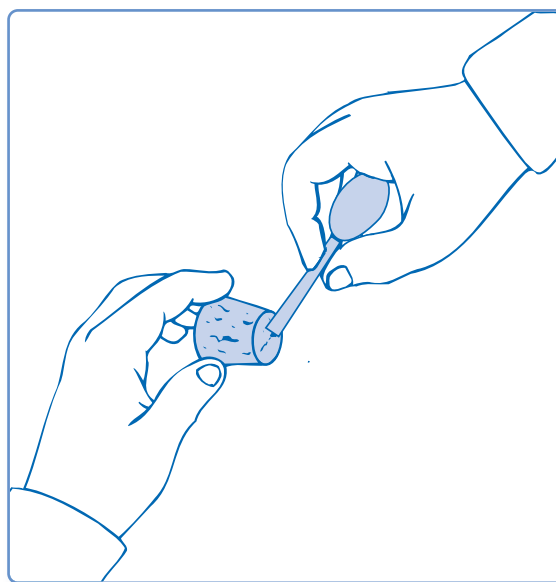
Ask, **Which object was harder, the piece of clay or the birthday candle?**

Ask, **Which object was harder, the foam cup or the rubber pencil eraser?**

Ask, **Which object was harder, the cork or the wood sample?**

Tell students to sort their objects according to how hard they are. Ask, **How many groups did you make when you sorted your objects according to hardness?**

Additional Information



▲ *Figure 6-2. Relative hardness can be measured by scratching various objects with a plastic spoon.*

Tell students to be aware of how hard they have to press in order to scratch each object. The harder they have to press, the harder the object.

Students should say that the birthday candle was harder than the piece of clay.

Students should say that the rubber pencil eraser was harder than the foam cup.

Students should say that the wood sample was harder than the cork.

Answers will vary.

Guiding the Activity

Ask, **Which objects did you put together and why?**

Additional Information

Again, answers will vary. Students might put together the most easily scratched objects (the chalk, birthday candle, clay, and foam cup) and the objects more resistant to scratching (the rock, rubber pencil eraser, cork, and wood sample). Or, students might put the rock and the wood sample together in their own group because they were the most resistant to scratching. Accept all justified groupings.

Students should say that the clay is the softest object while the rock is the hardest.

Although students should be able to identify the softest and the hardest objects, they might need guidance arranging their objects. Suggest that students try to scratch objects against one another to determine which one is harder. For example, the chalk will scratch the foam cup more easily than the foam cup will scratch the chalk. Therefore, the chalk is harder than the foam cup.

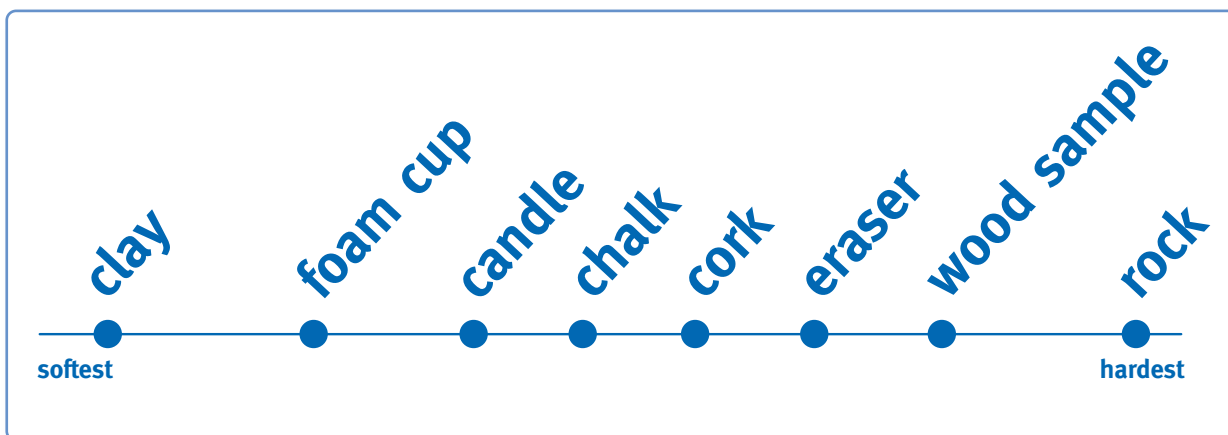
Due to the simplified nature of the scratch test, be aware that results will be somewhat subjective.

9 Stimulate class discussion by asking, **Which of the objects is softest? Which is hardest?**

Encourage students as a class to arrange their objects from softest to hardest.

Students should record the results in question 3 of their activity sheets. Tell students to draw a picture of each object along the line in order of increasing hardness (see Figure 6-3).

When students have finished, go over their results as a class. Reconcile any discrepancies among teams' data.



▲ **Figure 6-3.** One way to arrange objects from softest to hardest.

Guiding the Activity

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As appropriate, read or review pages 5–8 and 15 of the Delta Science Reader *Properties*.

Additional Information

REINFORCEMENT

Provide students with a variety of rock and mineral samples and have them test the relative hardness of the objects by scratching one against another.

Assessment Opportunity

This Reinforcement also may be used as an ongoing assessment of students' understanding of science concepts and skills.

SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

CLEANUP

Have students return the sorting trays, birthday candles, pieces of chalk, corks, foam cups, rubber pencil erasers, smooth rocks, plastic spoons, and wood samples to the kit. Store the pieces of clay in a resealable plastic bag for use in Activity 9. Leave the chart on display.

Connections

Science Challenge

Set up a learning center in the classroom with a variety of rock and mineral samples, each labeled with a different number. (You may be able to borrow a rock and mineral collection from an earth science or geology teacher.) Let teams take turns testing the samples' relative hardness by scratching one against another. Make sure students understand that if (for example) rock 1 leaves a mark on rock 5, rock 1 is harder than rock 5, and rock 5 is softer than rock 1. Instruct each team to write the rocks' numbers on a line to show their relative hardness, with the softest rock on the left and the hardest rock on the right. In a follow-up discussion, have teams compare their results.

Science Extension

Another property of solids is that they stay separate when they are mixed together, as demonstrated by the following activity. Give each team 10–15 red centimeter cubes and 10–15 blue centimeter cubes, and tell them to mix the cubes together in a container. Ask students whether the cubes have blended together or whether they are still separate. Then have students separate the red cubes from the blue cubes. Explain that when solids are mixed together, they stay separate and can be unmixed again.

Next, give each team a spoonful of sugar and a spoonful of granular instant coffee in separate cups. Have them put a small amount of each material on blue paper, examine it with a magnifier, and describe what they see. Ask them what they think will happen if they mix the two materials together. (Despite their experience with the cubes, some students may think that the tiny size of the grains will make the two materials join together in some way. Accept this response without comment.) Have students mix the sugar and coffee together in one cup and describe the mixture,

then examine a small amount of the mixture with a magnifier and again describe what they see. (With a magnifier, they should easily see separate sugar and coffee grains.) Encourage students to try to separate the grains, using a pencil point or toothpick.

Science and the Arts

Give each student a fist-sized lump of modeling clay, and let students experiment with molding and forming the clay into different shapes. Encourage students to try a variety of shaping techniques, such as flattening the clay by pressing it against the desktop with the heels of their hands, rolling it against the desktop with the palms of their hands, pinching it with their fingertips, squeezing it with their fists, and pushing their thumbs into it. When students have experimented freely for a time, ask them whether they think clay is a solid and to explain their answers. Students should agree that although its shape can be changed, clay holds whatever shape it is given, so it is a solid. Tell students to decide on something they would like to make with the clay—a small pot, a statue, a decorative wall tile, a candle holder, or whatever—and let each student make the item he or she has chosen. After letting the clay dry (or baking it according to instructions), let students decorate their items with paints. (Also see the first Science Challenge connection in Activity 8.)

Science and Math

Another property of solids is that their dimensions can be measured. Let each team use string to measure the length, height, and width of several square and rectangular objects in the classroom. For each object, students could tape the three strings on a large sheet of newsprint and print the object's name on the paper.