

Notes for the Teacher

Students explore tenths by estimating the location of an unlabeled point on a number line. After making their estimate, students magnify the interval of the number line that contains the point. The new number line that results is divided into tenths. Students identify the point's location, which is always an exact number of tenths, and develop and discuss strategies for estimating decimal locations.

Objectives:

- Students will use a number line model to explore place value, with a focus on tenths.
- Students will develop strategies for estimating the location of an unlabeled decimal-valued point (in tenths) on a number line.

Common Core Mathematical Practices: (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (5) Use appropriate tools strategically; (7) Look for and make use of structure.

Common Core State Content Standards: 4.NF6, 7; 6.NS6

Grade Range: Grades 3–6

Introduce:

Open **Zooming Decimals--Exploring Tenths.gsp**, and distribute the worksheet. Use a projector to show sketch page “Tenths.” Use the **Arrow** tool to drag the red point to a whole number, such as 5, 6, or 7. Ask, “What is the location of the point?” Students should be able to identify the point's location easily.

Now drag the point so that it's halfway between 5 and 6. Ask, “What is the location of the point now?” Students' responses may include the following:

- *It's somewhere between 5 and 6.*
- *It's in the middle.*
- *It's halfway to 6.*
- *It's $5\frac{1}{2}$.*
- *It's 5.5.*

Use the **Arrow** tool to press the *Zoom* button. A magnified portion of the number line between 5 and 6 on the Units line will be shown below, but now it is divided into tenths. Explain that the red point on the Units line is the same point as the one on the magnified Tenths number line. Ask, “Into how many equal parts is the segment from 5 to 6 divided?” (ten equal parts) “What are the names of each of the unlabeled tick marks between 5 and 6?” (Students may respond using decimals or fractions. Agree that, while either name is correct, the class will focus on decimal names for this lesson.) “What is the location of the red point?” (5.5) Use the **Arrow** tool to press the *Show Location* button to check; the answer will be given as a decimal. Take a moment to discuss whether $5\frac{1}{2}$ is a good answer, too. (Yes, it is the same as 5.5.)

Now use the **Arrow** tool to press the *Reset* button and drag the red point somewhere between 3 and 3.5. Ask, “What is the point’s location now?” Students’ answers may include the following:

- *It’s a little more than 3.*
- *It’s between 3 and $3\frac{1}{2}$.*
- *It’s about $3\frac{1}{4}$.*
- *It looks like 3.2 or 3.3.*

Use the **Arrow** tool to press the *Zoom* button, and have students identify the point’s location. Press *Show Location* to check. Ask students to explain why the magnified Tenths number line helps them improve the accuracy of their estimates.

Repeat the process of asking volunteers to drag the red point to new locations and having the class estimate the locations several times. This number-line model was designed so that the location of the point will always be precisely named in tenths regardless of where students drag the point.

Explore:

Assign students to partners and send them in pairs to the computers. Have students open **Zooming Decimals--Exploring Tenths.gsp** and go to page “Tenths.” Ask students in each pair to take turns either dragging the point to a new location or estimating the location of the point. Students should record their estimates and the exact locations on their worksheets. Make sure students understand how to record the results on the worksheet.

As you circulate, observe students as they work. What strategies do students use to estimate the point's location? Are students using language such as “a little more than” or “a little less than” or “about halfway”? Are students giving estimates as fractions or as decimals? Are these estimates in tenths? Listening to students as they estimate will give you insight into their understanding of how decimals are represented on a number line.

Discuss:

Call students together to discuss and summarize what they've learned. Discuss the different strategies students used to estimate the location of the red point on the number line. Here are some possible student strategies:

- *I used $\frac{1}{2}$ as my benchmark and determined whether the point was closer to a whole number or a point halfway between two whole numbers. For example, I said the location of the point was “a little more than 3” or “close to $3\frac{1}{2}$ ” or “about 4.”*
- *If I could see that the point was exactly halfway between the two whole numbers, I knew the decimal part of the answer was 5 tenths.*
- *If the point was more than halfway between the two whole numbers, I knew the decimal portion had to be greater than 5 tenths. And likewise, if the point was less than halfway between the two whole numbers, I knew the decimal portion had to be less than 5 tenths.*
- *If the point was a little more than the whole number, I added 2 tenths. If the point was a little less, I subtracted 2 tenths. For example, if the point was a little less than 7, I guessed it was 6.8.*

With the projector, open **Zooming Decimals--Exploring Tenths.gsp** and go to page “Tenths.” Use the **Arrow** tool to drag the red point to 2. Press the *Animate Point* button. Ask students to describe what they are seeing. Students may reply that the point is moving to the right on the number line. Press the *Animate Point* button again to stop the movement. Now press the *Zoom* button and then the *Animate Point* button again. Have students look at the point's location on both the Units number line and the Tenths number line as the red point moves. Ask students to describe what they are seeing now. Students should notice that each small movement of the red point shows an increase in its position by 0.1.

By understanding the relationship between the two number lines and the relationship between these two equivalent points, students will develop a better sense of how tenths are represented on the Units number line.

Related Activities:

- *Color Calculator—Decimal Representations of Fractions*
- *Zooming Integers—Hundreds, Thousands, and Beyond*
- *Zooming Decimals—Tenths, Hundredths, and Beyond*
- *Reach the Target—Decimals and Place Value*

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