

## Where Do They Lie?

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- Strand:** Number and Number Sense
- Topic:** Estimating and determining where a square root lies on a number line
- Primary SOL:** 8.3 The student will
- estimate and determine the two consecutive integers between which a square root lies;
  - determine both the positive and the negative square roots of a given perfect square.

**Related SOL:** 7.1d

### Materials

- Where Do They Lie? activity sheet (attached)
- Pictorial Perfect Squares Memory Match activity sheet (attached)
- I Have ... Who Has? Cards (attached)
- Glue
- Scissors

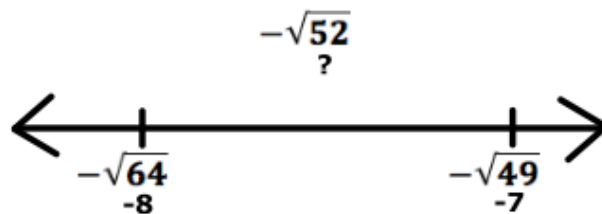
### Vocabulary

*integer, perfect square, square root* (earlier grades)

*consecutive numbers, irrational number, radical number* (8.3)

### Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Ask students to discuss and define a perfect square. Have students provide examples of perfect squares.
2. Write  $\sqrt{49}$  on the board. Ask students to identify the square root. Students should respond with 7. Then, write  $-\sqrt{64}$  on the board. Ask students to identify the square root. Students should respond with  $-8$ . Drill students on a few more known perfect squares, alternating between negative square roots and positive square roots.
3. Now, write  $-\sqrt{52}$  on the board. Discuss with students how we can use our knowledge of perfect squares to estimate where this square root would fall on a number line. Guide the discussion to help students to understand that the negative square root of 52 falls between  $-7$  and  $-8$ .



4. Help students to understand that  $-52$  falls between  $-49$  and  $-64$ . Therefore, the square root of  $-52$  must fall between the square roots of  $-49$  and  $-64$ .

## Mathematics Instructional Plan – Grade 8

5. Distribute the “Where Do They Lie?” number line template and square roots.
6. Have students work in pairs or small groups to create a number line ranging from –20 to 20.
7. Students will need scissors and glue. Have students cut out all of the square roots provided. Have students sort the square roots by creating a pile of perfect squares.
8. Next, have students place the perfect squares in their correct locations on the number line.
9. Have students glue all of their perfect squares above the number line.
10. Now, using their knowledge of perfect squares, have students estimate the locations of the remaining square roots.
11. Have students glue all of the nonperfect squares below the number line between the two consecutive integers in which they fall.

### Assessment

- **Questions**
  - When given a radical, how can you determine whether the square roots will be greater than or less than zero? When could the radical equal zero?
  - What is the difference between  $\sqrt{100}$  and  $-\sqrt{100}$ ?
  - Nonperfect squares are included in which categories of the real number system?
  - Which perfect square results in only one integer?
- **Journal/writing prompts**
  - Write to a younger student to explain what a square root is.
  - Explain in your own words how your knowledge of perfect squares can help to determine the two consecutive integers in which a nonperfect square would lie on a number line.
- **Other Assessments**
  - Copy and distribute the *I Have. Who Has? Cards* and complete a round or two with your class.
  - Copy and distribute the *Perfect Squares Memory Match* activity sheet. Have students pair up and play memory match.
  - Use the square roots provided in the *Where Do They Lie?* activity to conduct a “speed” sort for perfect and nonperfect squares.

### Extensions and Connections (for all students)

- Use the square roots provided in the *Where Do They Lie?* activity to conduct a speed sort for rational or irrational.

### Strategies for Differentiation

- Provide students with a numbered number line.
- Have students give examples of consecutive numbers before working on square roots to ensure they understand the vocabulary.
- Have students practice with *Perfect Squares Memory Match* before this lesson to practice identifying perfect squares.

*Mathematics Instructional Plan – Grade 8*

- Have students draw the perfect squares on graph paper.
- Display a multiplication table, and indicate by circling or shading the perfect squares.
- Ensure that each small group is comprised of students with varying abilities and that each student has a meaningful role within the group.
- Allow students to work in pairs during steps 1-5.
- Pre-teach essential vocabulary to certain students prior to the lesson introduction.

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

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## Where Do They Lie?

**Directions:**

- 1.) **Create a number line** using the arrows found below. You will need to tape the ends together to create a number line that is 3-4 pages long. The number line must range from -20 to 20.
- 2.) Cut out and sort the square roots given. **Identify all of the perfect squares** and place them in a separate pile from non-perfect squares.
- 3.) **Place your perfect squares in the correct location on the number line.** Glue each perfect square **above** the number line.
- 4.) **Estimate and determine where the remaining square roots lie on your number line.** Glue each square root **below** the number line between the two consecutive integers in which they fall.







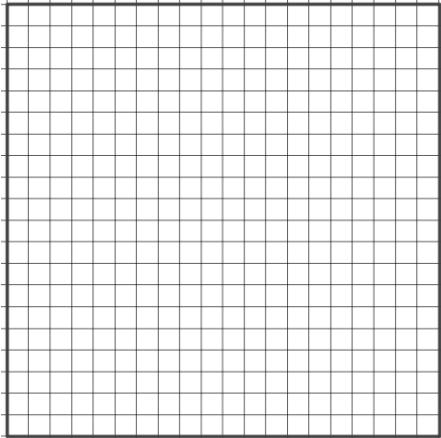
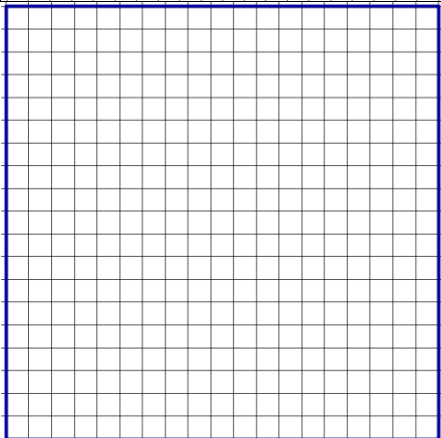
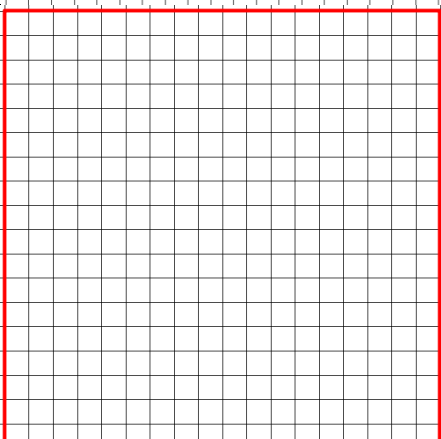


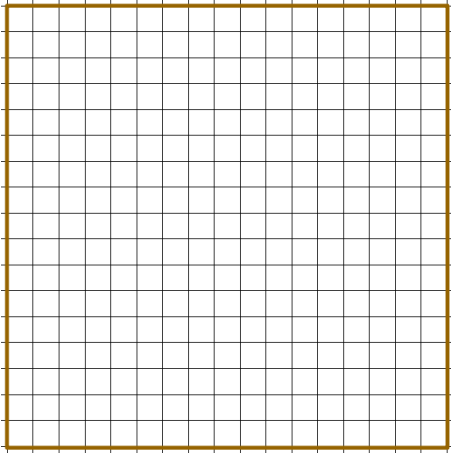
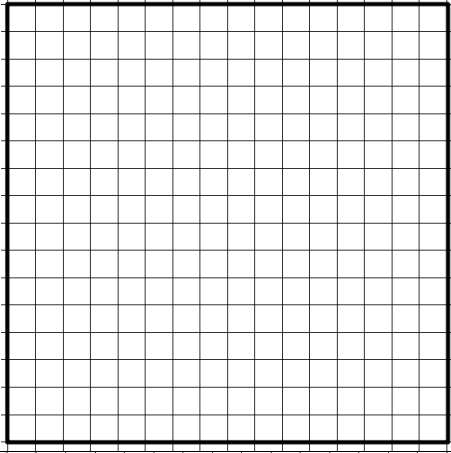
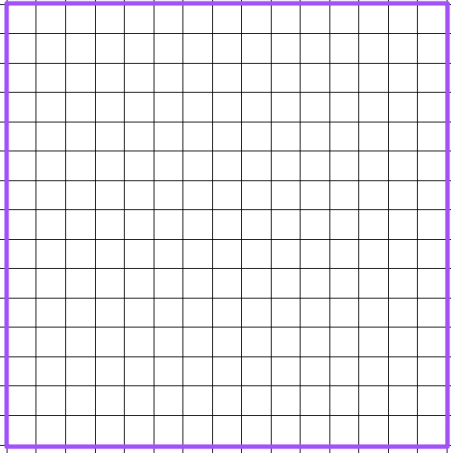
**Where Do They Lie? Square Roots**

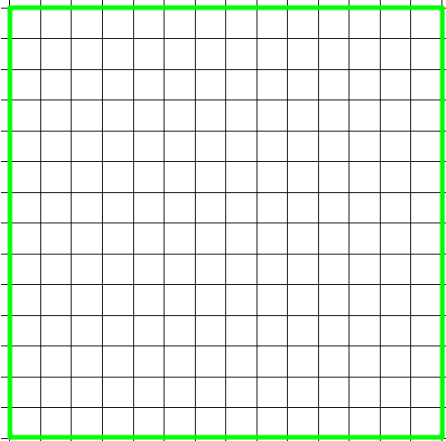
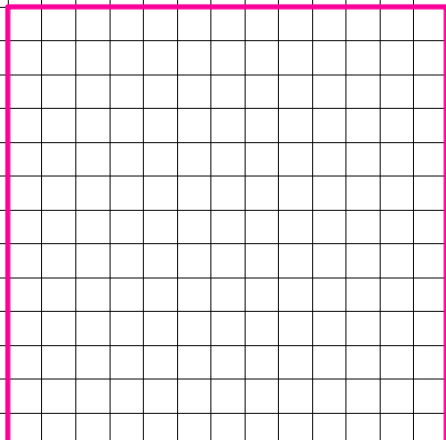
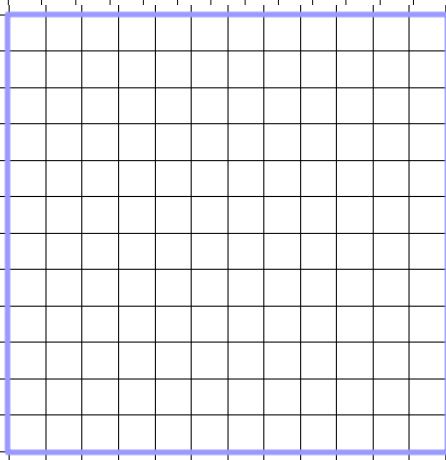
$\sqrt{196}$	$-\sqrt{196}$	$\sqrt{50}$	$-\sqrt{50}$	$\sqrt{250}$
$\sqrt{361}$	$-\sqrt{361}$	$\sqrt{49}$	$-\sqrt{49}$	$-\sqrt{250}$
$\sqrt{36}$	$-\sqrt{36}$	$\sqrt{72}$	$-\sqrt{72}$	$\sqrt{122}$
$\sqrt{300}$	$-\sqrt{300}$	$\sqrt{144}$	$-\sqrt{144}$	$-\sqrt{122}$
$\sqrt{2}$	$-\sqrt{2}$	$\sqrt{1}$	$-\sqrt{1}$	$\sqrt{9}$
$\sqrt{80}$	$-\sqrt{80}$	$\sqrt{12}$	$-\sqrt{12}$	$-\sqrt{9}$
$\sqrt{169}$	$-\sqrt{169}$	$\sqrt{100}$	$-\sqrt{100}$	$\sqrt{0}$

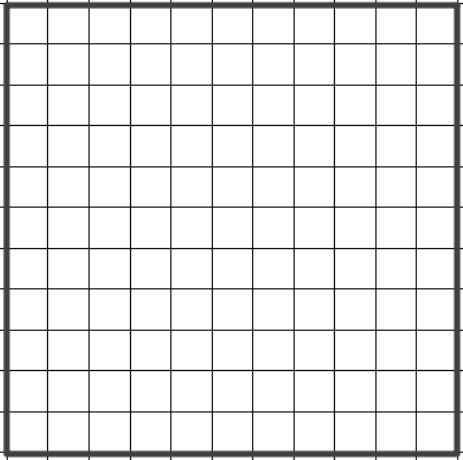
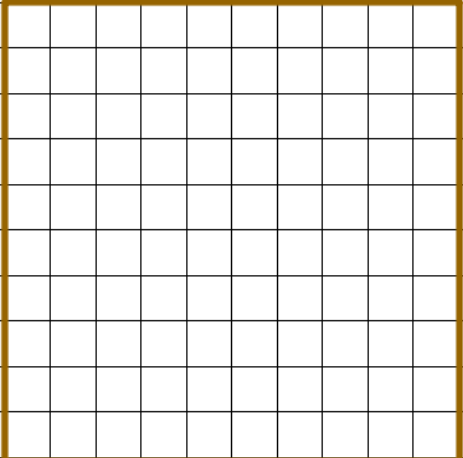
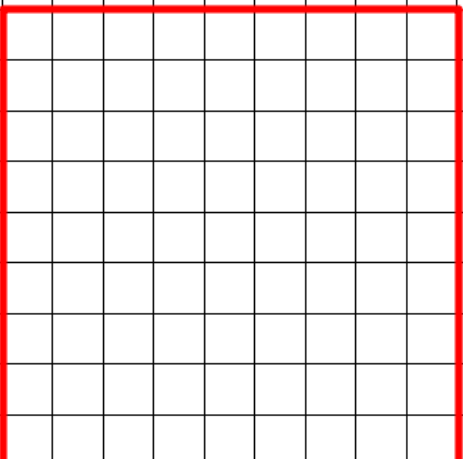


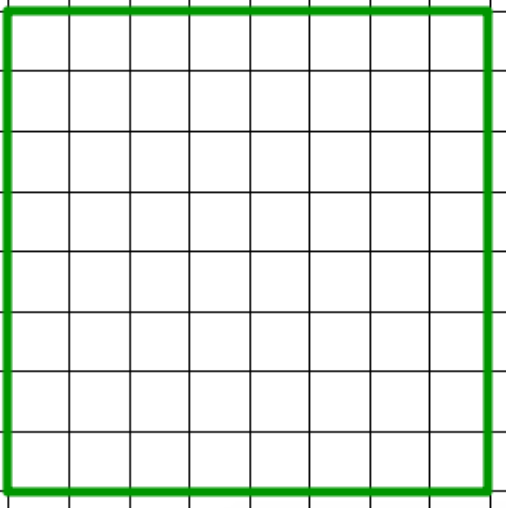
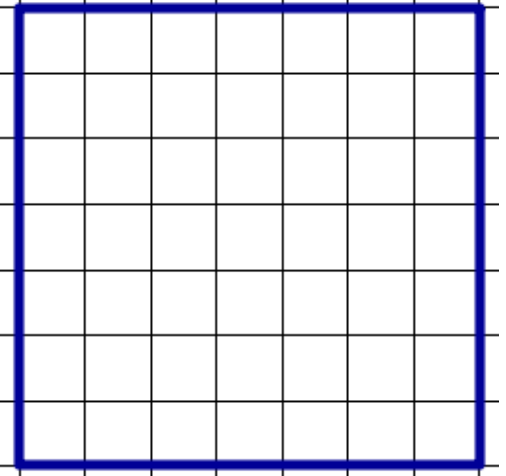
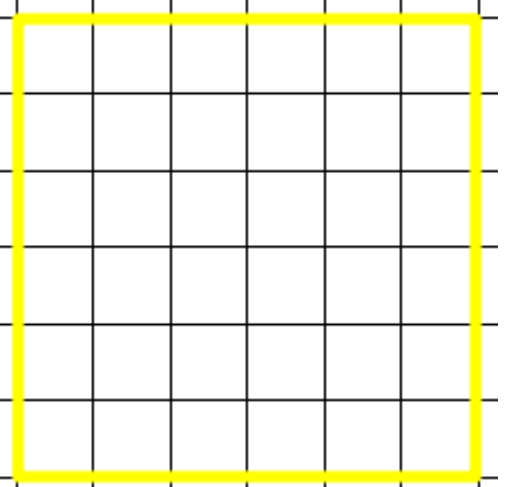
### Pictorial Perfect Squares Memory Match

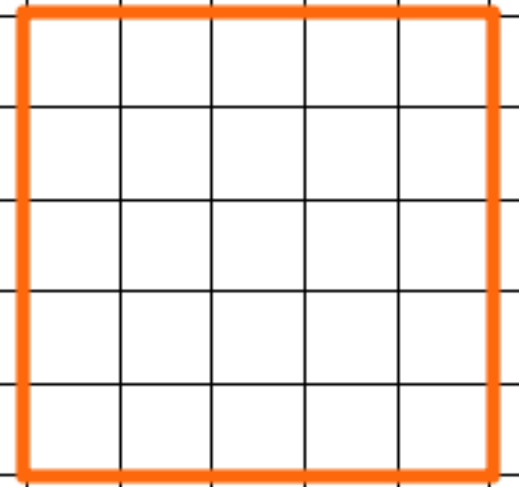
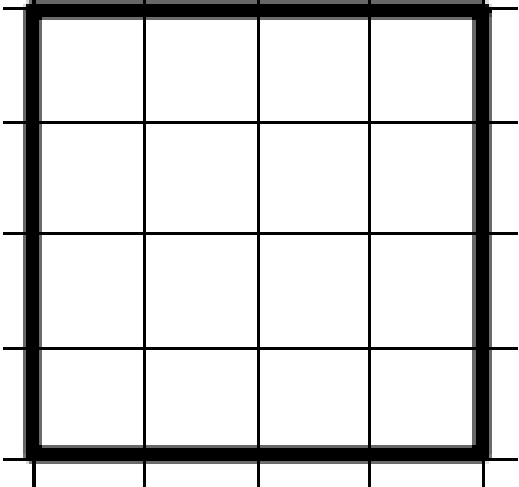
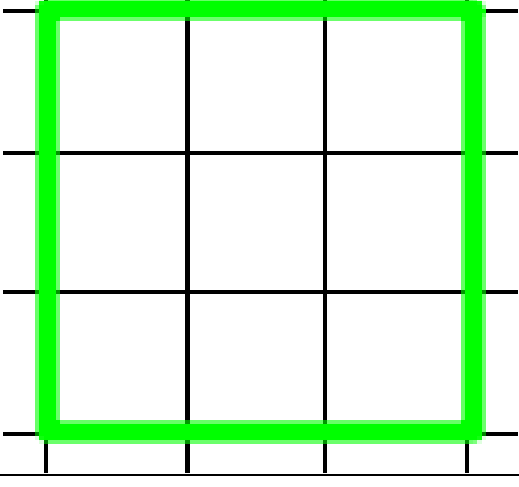
	$\sqrt{400}$
	$\sqrt{361}$
	$\sqrt{324}$

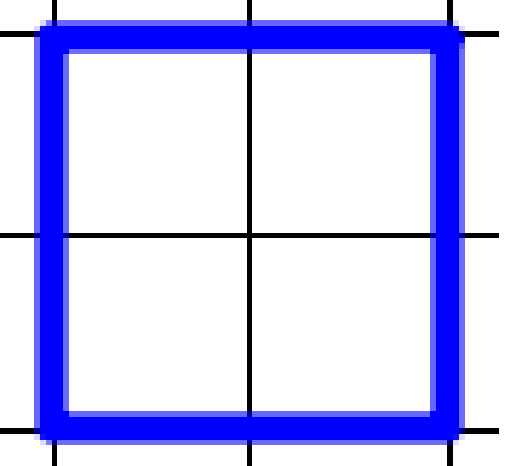
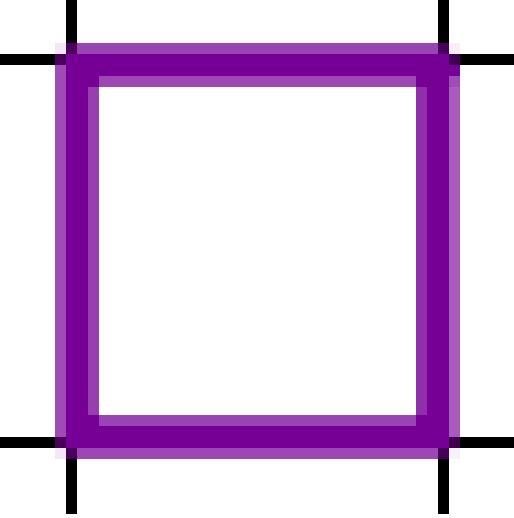
	$\sqrt{289}$
	$\sqrt{256}$
	$\sqrt{225}$

	$\sqrt{196}$
	$\sqrt{169}$
	$\sqrt{144}$

	$\sqrt{121}$
	$\sqrt{100}$
	$\sqrt{81}$

	$\sqrt{64}$
	$\sqrt{49}$
	$\sqrt{36}$

	$\sqrt{25}$
	$\sqrt{16}$
	$\sqrt{9}$

 A 2x2 grid of squares. A blue square outline is drawn around the four squares in the grid, representing a square with side length 2.	$\sqrt{4}$
 A 1x1 grid of a single square. A purple square outline is drawn around this square, representing a square with side length 1.	$\sqrt{1}$
	$\sqrt{0}$

## I Have ... Who Has? Cards

Copy cards on card stock and cut out.

I have 18.

Who has  $4^2$ ?

I have 16.

Who has my square root?

I have 4.

Who has the two consecutive numbers  
between which the  $\sqrt{29}$  lies?

I have 5 and 6.

Who has  $5^2$ ?

I have 25.

Who has the two consecutive numbers  
between which the  $\sqrt{45}$  lies?

I have 6 and 7.

Who has the square root of 169?

I have 13.

Who has the square root of 400?



I have 20.

Who has the area of a square with a side length of 7?

I have 49.

Who has the length of a side of a square with an area of 81?

I have 9.

Who has the two consecutive numbers between which the length of a side of a square with an area of 122 lies?

I have 10 and 11.

Who has  $12^2$ ?

I have 144.

Who has  $10^2$ ?

I have 100.

Who has the two consecutive numbers between which the square root of 74 lies?

I have 8 and 9.

Who has the area of a square with a side length of 15?

I have 225.

Who has the square root of 289?

I have 17.

Who has the two consecutive numbers between which the square root of 5 lies?

I have 2 and 3.

Who has the  $-\sqrt{36}$ ?

I have -6.

Who has the two consecutive numbers between which the  $-\sqrt{111}$  lies?

I have -10 and -11.

Who has the  $-\sqrt{256}$ ?

I have -16.

Who has the two consecutive numbers between which  $-\sqrt{300}$  lies?

I have -17 and -18.

Who has the square root of 324?