

Rational and Irrational Numbers – Grade 8, Level 2

Lesson Overview

In this lesson, students will review the definitions of rational and irrational numbers. They will work in pairs to place a series of rational and irrational numbers on a number line and explain their reasoning both in small groups and to the whole class.

Alignment

Standard/Indicator Addressed

Math (8.NS.2) Estimate and compare the value of irrational numbers by plotting them on a number line.

Standards for Mathematical Practice (as appropriate)

- 1: Make sense of problems and persevere in solving them.
 - a. Relate a problem to prior knowledge.
 - c. Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem.
- 3: Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.
 - a. construct and justify a solution to a problem.
 - b. compare and discuss the validity of various reasoning strategies.
 - d. reflect on and provide thoughtful responses to the reasoning of others.

Connections

Disciplinary Literacy Strategies (for Purposeful Reading, Meaningful Writing, and Productive Dialogue)

Think-Ink-Pair-Share

Give Me Five

Thumbs Up, Down, or Sideways

Lesson Plan

Time Required – (One 60 minute class period)

Disciplinary Vocabulary – rational numbers, irrational numbers, square root ($\sqrt{\quad}$), perfect square, terminating decimal, non-terminating decimal

Materials Needed:

- Access to YouTube
- Adding machine paper or sentence strips to use as number lines
- Number cards (collection of rational and irrational numbers)
- Calculators (at least 1 for each pair of students)
- Index cards or slips of paper for exit tickets
- Pencils
- Math notebooks

Formative Assessment Strategies: Student dialogue, Give Me Five, Thumbs Up, Down, or Sideways, Exit Ticket

Prior knowledge:

- 6.NS.6: Fluent with the subsets of the number system (real, natural, whole, integers, and rational)
- 6.NS.8: Fluent with plotting points on a number line (horizontal and vertical)
- 6.NS.9, 7.NS.5: Convert rational numbers to decimals using long division (terminating and repeating)
- 6.NS.9, 7.NS.5: Translate among multiple representations of rational numbers, including repeating decimals to fractions

Misconceptions:

- Students may think that non-terminating, repeating decimals are irrational.

Engage

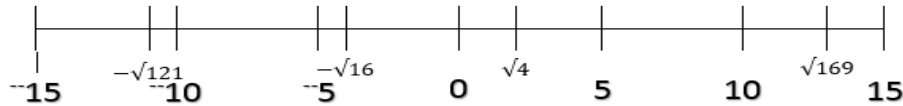
- Video: Rational and Irrational Numbers
<https://www.youtube.com/watch?v=QtemVfzSGBA>
- Ask students to listen for the definitions of and examples for rational and irrational numbers.
- After the video:
 - Students THINK and INK the definitions and at least one example of each.
http://www.s2temsc.org/uploads/1/8/8/7/18873120/think_pair_share_strategy_and_variations.pdf
 - Students PAIR and SHARE their work.
- Use Give Me Five to lead a short whole group discussion to check for understanding.
http://www.s2temsc.org/uploads/1/8/8/7/18873120/give_me_five_strategy.pdf
- Finally, use Thumbs Up, Down, or Sideways to make sure everyone is ready to move on.

http://www.s2temsc.org/uploads/1/8/8/7/18873120/thumbs_up_thumbs_down_strategy.pdf

Explore

NOTE: Calculators may be provided for students to check their work.

- Give each pair of students a set of number cards and a piece of adding machine paper (or some sentence strips) to serve as a number line that ranges from -15 to 15 .



- Display a matching number line in an easy to see location in the room.
- Tell the students they have 15 minutes to work with their partners to place the cards on the number line.
- Circulate as students work, asking questions to gauge student understanding and provide guidance for those who may be stuck.
- Tell students they may visit other partners to discuss how they are deciding to place their cards.
- At the end of 15 minutes, have students record their work in their math notebooks.

Explain

- Randomly select pairs of students to come and place two of their cards on the number line and explain the placements. You may use Popsicle sticks to pull one student's name; that student is accompanied by their partner.
- Check in with the rest of the class regarding the placement of each card. Ask for explanations and justification of responses.
- Continue until all cards have been placed and the reasoning for each placement explained.
- When all cards are placed correctly, have students check their work by adding the displayed number line to their math notebooks and comparing it to the one they recorded after completing partner work earlier.
- Have each student pick at least one error and write an explanation for why the card needs to be moved to the correct location.

Exit Ticket: How Close is Close

http://www.s2temsc.org/uploads/1/8/8/7/18873120/exit_slips_or_exit_tickets_strategy.pdf

- Give each student an index card or a slip of paper.
- Ask them to sketch two number lines. On one, they record two fractions they think are really close. On the other, two decimals. It doesn't matter which fractions or decimals they choose – or how close they are.
- Challenge them to find at least 3 fractions between the two they chose and place them on the number line.
- Challenge them to find at least 3 decimals between the two decimals they chose and place them on the number line.
- Take up the exit tickets to check for student understanding.

Adapted from: Van de Walle, John A., et. al, 2014. *Volume III: Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades 6 – 8.*

Number Cards

Run on cardstock and cut apart.

$4\frac{2}{3}$	$\frac{1}{4}$	$-\frac{7}{8}$	$\frac{17}{3}$
$\frac{20}{5}$	-10.3	$1.21221222\dots$	13.64
$0.\overline{5}$	π	$0.\overline{83}$	$9.87\overline{5}$
0	$\frac{-2}{3}$	$\frac{6}{-1}$	$\frac{-1}{-1}$

$\sqrt{25}$	$\sqrt{144}$	$\sqrt{26}$	$-\sqrt{81}$
$\sqrt{100}$	$\sqrt{50}$	$\sqrt{17}$	$-\sqrt{56}$
$\sqrt{1}$	$\sqrt{2}$	$\sqrt{\frac{4}{9}}$	$-\sqrt{25}$

Other information on this indicator(s) can be found in the support documents/resources on the SC State Department website.

www.ed.sc.gov (*Instruction → Standards and Learning → Mathematics or Science → Support Documents and Resources*)

Content Area (Disciplinary) Literacy strategies and descriptions can be found on the S2TEM Centers SC website:

s2temsc.org (*Resources → Disciplinary Literacy Virtual Library → Strategy Warehouse*)

Computational Thinking Reference:

<https://csta.acm.org/Curriculum/sub/CurrFiles/CompThinkingFlyer.pdf>

<https://csta.acm.org/Curriculum/sub/CompThinking.html>

Additional Information

Level 1 lessons contain a realignment to the 2014 Science and/or the 2015 Mathematics Standards.

Level 2 lessons contain Level 1 information and Content Area Literacy and Disciplinary Literacy Strategies.

Level 3 lessons contain Level 1 and 2 information and Computational Thinking Connections.

Level 4 lessons contain Level 1, 2, and 3 and integration of at least 2 content areas.