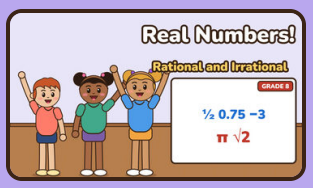
HAKILLO KIDS · TEACHER GUIDE · COMMON CORE EDITION · GRADE 8 · LESSON 1

The Real Numbers



COMMON CORE
8.NS.A.1, 8.NS.A.2

VIDEO LENGTH
4:52 · Virginia SOL edition also available

WATCH THE LESSON FREE
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PRACTICE ONLINE
learn.hakillokids.org · videos stop for each question, scored automatically

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

Materials: Number lines, calculators, a real-number Venn diagram.

Students will

- Classify real numbers as rational or irrational.
- Know that terminating and repeating decimals are rational.
- Know that irrational decimals never end and never repeat (π, √2).
- Compare and order real numbers using decimal approximations.

Key words

real numbers	all the numbers on the number line
rational number	can be written as a fraction of integers
irrational number	cannot be written as a fraction; its decimal never ends or repeats
repeating decimal	a decimal with a digit pattern that repeats forever (0.333…)

Before the video 2 minutes

Ask: “Can every number be written as a fraction? What about π or √2?”

What happens in the video

0:00	Welcome to eighth grade and today's goal: the real numbers
0:19	Rational and irrational numbers
0:43	Terminating, repeating, and never-ending non-repeating decimals
1:07	Ordering 1/2, √2, 2 1/4 and π
1:29	Spot the mistake: repeating decimals are rational
1:51	Your turn! Students answer during each pause (see below)
4:31	Recap and goodbye

Spot the mistake at 1:29

> **Sam:** Zero point three three three goes on forever, so it's irrational!
> **Ivy:** Hmm... do the digits repeat?
> **Mia:** They repeat! Zero point three repeating is one third, a fraction. So it is rational.
> **Sam:** Oops! Repeating decimals are rational.

- Ask: “Do the digits of 0.333... repeat?” (Yes.)
- Divide 1 by 3 on a calculator to show 0.333...
- Conclude: 0.333... = 1/3, so it is rational.

Your-turn pauses students answer out loud, then the characters give the answer

TIME	QUESTION	ANSWER IN THE VIDEO
1:52	Is pi rational or irrational?	Irrational! It never ends and never repeats.
2:07	Is one fourth rational or irrational?	Rational! It's a fraction.
2:21	Is the square root of nine rational or irrational?	Rational! The square root of nine is three.
2:37	Is the square root of five rational or irrational?	Irrational! Five is not a perfect square.
2:53	Which is greater, pi or three point two?	Three point two! Pi is about three point one four.
3:09	Which is greater, the square root of two or one point five?	One point five! The square root of two is about one point four one.
3:27	Is negative seven rational or irrational?	Rational! It's an integer, negative seven over one.
3:44	Zero point six repeating. What fraction is it?	Two thirds! So it's rational.
3:59	Which is less, negative one half or negative one third?	Negative one half! It's farther left.
4:15	Three, pi, and the square root of ten. Which is the greatest?	The square root of ten! It's about three point one six.

Tip: pause the video a little longer on any question your class finds hard, and ask a student to explain how they know.

After the video: talk about it

1. How can you tell if a square root is rational?
2. Is every integer a rational number? Why?
3. Order √10, 3.1 and π.

Go further

Number family tree: students make a poster showing natural, whole, integer, rational and irrational numbers with examples.

Answer key for the practice page

1. Rational (7)
2. Irrational
3. Rational (repeating)
4. 4/9
5. 1.5, √3, 7/4 (1.5, about 1.73, 1.75)
6. From left: -1.5, 2/3, √5 (≈2.24), π (≈3.14)

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HAKILLO KIDS · GRADE 8 · LESSON 1 · PRACTICE

The Real Numbers

Name: _____ **Date:** _____

1. **Is √49 rational or irrational?**

   Answer: _____

2. **Is √7 rational or irrational?**

   Answer: _____

3. **Is 0.121212... rational or irrational?**

   Answer: _____

4. **Write 0.444... as a fraction.**

   Answer: _____

5. **Order from least to greatest: √3, 1.5, 7/4**

   Answer: _____

6. **Place π, √5, -1.5 and 2/3 on a number line.**

   Answer: _____

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