# Presentation Script: Classifying Real Numbers as Rational and Irrational

**Grade 10 Mathematics | 40-Minute Lesson**

## Before Class Begins

**Preparation Checklist:**

- Arrange Learners into groups of 4-5
- Ensure each group has access to calculators
- Prepare exit tickets for distribution
- Set timer for phase transitions
- For struggling learners: Prepare reference charts with examples
- Write key definitions on the board (covered until Phase 2)

## PHASE 1: Problem-Solving and Discovery (15 Minutes)

### Opening (2 minutes)

**[SAY]:**

*"Good morning/afternoon, class! Today we're going to explore the fascinating world of real numbers. By the end of this lesson, you'll be able to look at any number and tell whether it's rational or irrational."*

**[SAY]:**

*"Here's our key question: How do we use real numbers in day-to-day activities? Keep this in mind as we explore."*

### Anchor Activity Introduction (2 minutes)

**[SAY]:**

*"Today you're going to be mathematical detectives. I want you to discover patterns in numbers that mathematicians have studied for centuries."*

**[ASK]:**

*"Can someone give me an example of a fraction?"*

**[WAIT for responses, acknowledge answers]**

## Group Work Instructions (1 minute)

**[SAY - Read slowly and clearly]:**

*"In your groups, I want you to:*
*Step 1: Choose natural numbers between 1 and 10. Create one proper fraction and one improper fraction.*
*Step 2: Use your calculator to convert each fraction to a decimal. Write down what you see.*
*Step 3: Now choose numbers between 1 and 20 and find their square roots.*
*Step 4: Try to classify each number as rational or irrational.*
*Step 5: Look for patterns in the decimals.*

*You have 10 minutes. Begin!"*

## Circulation and Probing (8 minutes)

**[DO]:** Walk around the room, observing each group's progress.

**[ASK probing questions as you circulate]:**

- "What happens when you divide 1 by 3 on your calculator?"
- "Do you notice anything about the decimal for √4 versus √5?"
- "Does the decimal stop or keep going?"
- "Do you see any repeating patterns?"
- "Why do you think some square roots give whole numbers?"

**[TIME CHECK]:** At 8 minutes, announce: "Two more minutes to finalize your observations!"

## Group Sharing (2 minutes)

**[SAY]:**

*"Time's up! Let's hear from some groups. [Group name], what patterns did you notice in the decimals?"*

**[LISTEN, then ask another group]:**

*"[Group name], which square roots gave you whole numbers and which didn't?"*

**[TRANSITION]:**

*"Excellent observations! Now let's give names to what you've discovered."*

## PHASE 2: Structured Instruction (10 Minutes)

### Defining Rational Numbers (3 minutes)

**[SAY]:**

*"Many of you noticed that some decimals stopped or repeated. These numbers have a special name—RATIONAL NUMBERS."*

**[WRITE on board]:**

**Rational Number:** Any number that can be written as a fraction p/q where p and q are integers and $q \neq 0$.

**[SAY]:**

*"Examples: 2/3, −3, 4, 0.5, 0.333... All of these are rational because they can be written as fractions."*

**[ASK]:**

*"Can the number 5 be written as a fraction?"*

**[Expected answer]:** "Yes, 5/1"

**[SAY]:**

*"Exactly! All integers are rational numbers because they can be written with denominator 1."*

### Defining Irrational Numbers (3 minutes)

**[SAY]:**

*"Now, what about those decimals that kept going without any pattern? These are called IRRATIONAL NUMBERS."*

**[WRITE on board]:**

**Irrational Number:** Any number that CANNOT be expressed as a fraction of two integers.

**[SAY]:**

*"Examples: √2, √7, π. These decimals go on forever without repeating!"*

### The Four Rules (4 minutes)

**[SAY while writing]:**

*"Here are four rules to help you classify any number:*

*Rule 1: If it's an integer or a simple fraction—RATIONAL.*
*Rule 2: If the decimal STOPS—RATIONAL. Example: 3.25*
*Rule 3: If the decimal REPEATS with a pattern—RATIONAL. Example: 0.666...*
*If the decimal continues WITHOUT a pattern—IRRATIONAL. Example: 0.1010010001...*
*Rule 4: Perfect square roots are RATIONAL. Example: √49 = 7*
*Imperfect square roots are IRRATIONAL. Example: √2 ≈ 1.414..."*

**[TRANSITION]:**

*"Now let's practice using these rules!"*

## PHASE 3: Practice and Application (15 Minutes)

### Direct Classification (6 minutes)

**[SAY]:**

*"Let's classify some numbers together. Tell me—rational or irrational—and explain which rule you used."*

**[ASK]:** "π—rational or irrational?"

**[Expected answer]:** "Irrational—the decimal 3.14159... continues without a pattern"

**[ASK]:** "2/3—rational or irrational?"

**[Expected answer]:** "Rational—it's a fraction with integers"

**[ASK]:** "3.75—rational or irrational?"

**[Expected answer]:** "Rational—the decimal terminates"

**[ASK]:** "√20—rational or irrational?"

**[Expected answer]:** "Irrational—20 is not a perfect square, decimal continues without pattern"

**[ASK]:** "√9/√16—rational or irrational?"

**[Expected answer]:** "Rational—it equals 3/4, a fraction with integers"

### Partner Practice (6 minutes)

**[SAY]:**

*"Now work with your partner. Classify these numbers and be ready to explain your reasoning:*
*• 0.121221222...*

• *√5*
• *−9*
• *3√7"*

**[GIVE 4 minutes, then review]:**

*"Let's check:*
• *0.121221222... is IRRATIONAL—no repeating pattern*
• *√5 is IRRATIONAL—5 is not a perfect square*
• *−9 is RATIONAL—it's an integer (−9/1)*
• *3√7 is IRRATIONAL—since √7 is irrational, multiplying by 3 keeps it irrational"*

### Quick Check (3 minutes)

**[ASK]:**

*"Quick question: Is 0.666... rational or irrational?"*

**[Expected answer]:** "Rational—it has a repeating pattern (the 6 repeats)"

**[TRANSITION]:**

*"Excellent! Now I want to see what each of you has learned."*

## PHASE 4: Assessment / Checkpoint (8 Minutes)

### Checkpoint exploration (5 minutes)

**[DO]** Project the digital textbook on the screen. Navigate to the "Checkpoint" section.

**[SAY]** "This is our digital mathematics textbook. It has something special called checkpoints. Watch what happens when I click this button..."

**[DO]** Click "Show new example question" on Checkpoint

**[SAY]** "See? A new number appeared! And if I click again..."

**[DO]** Click the button again to show randomization

**[SAY]** "A different number! This means you can practice with hundreds of different examples. The computer never runs out of problems to give you."

**[SAY]** "Now it's your turn. With your partner, open the digital textbook and find the checkpoint.

**[SAY]** Click “Show new example question” to load the problem

**[SAY]** Solve the displayed question

**[SAY]** Click “submit” to check your answer

**[SAY]** If incorrect, carefully read the feedback and analyse the error before trying a new question. The immediate feedback from checkpoint submissions allows Learners to identify and correct errors in real-time.

**[SAY]** Complete at least 5 questions

**[DO]** Circulate among pairs. Ask probing questions, for example, what patterns do you notice?

## Independent Work (5 minutes)

**[DISPLAY questions]:**

*"Question 1: Which are irrational? Select all that apply.*
*(1) 0.121221222...  (2) 5  (3) √5  (4) −9  (5) 5*

*Question 2: Which are rational? Select all that apply.*
*(1) −9  (2) √5  (3) 3√7  (4) 5  (5) 0.121221222..."*

**[SAY]:**

*"You have 5 minutes. Begin."*

## Collection and Closure (2 minutes)

**[SAY]:**

*"Time's up. Please pass your exit tickets forward."*

**[COLLECT all tickets]**

**[SAY]:**

*"Today you learned to classify real numbers as rational or irrational. Remember: rational numbers can be written as fractions and have decimals that terminate or repeat. Irrational numbers cannot be written as fractions and have decimals that go on forever without a pattern."*

**[ASK]:**

*"Returning to our key question: How do we use real numbers in day-to-day activities? Can anyone give an example?"*

**[ACCEPT 2-3 responses - examples: measuring, calculating areas with π, construction]**

**[SAY]:**

*"Great work today! For homework, find three real-world examples of rational numbers and three examples of irrational numbers."*

## Differentiation Notes

**For Struggling Learners:**

- Provide a reference chart with examples of each type
- Use calculators to visualize decimal patterns
- Pair with supportive peers
- Work directly with this group during anchor activity

**For Advanced Learners:**

**[GIVE this extension]:**

*"Iregi measured a triangular shelf with sides √12 m, √27 m, and 5 m. Is the perimeter rational or irrational?"*

**[Solution]:** √12 = 2√3, √27 = 3√3. Perimeter = 2√3 + 3√3 + 5 = 5√3 + 5. Since √3 is irrational, the perimeter is irrational.

## Answer Key

**Question 1 (Irrational numbers):** (1) and (3)

**Question 2 (Rational numbers):** (1) and (4)

## Post-Lesson Reflection Prompts

**1. What went well?** Which activities generated the most engagement?

**2. What would I change?** Were the time allocations appropriate?

**3. Learner Understanding:** What did the exit tickets reveal?

**4. Next Steps:** Which Learners need additional support?