I. Lesson Overview

Lesson Title:	Classifying Real Numbers as Rational and Irrational
Strand:	Numbers and Algebra
Sub-Strand:	Real Numbers
Grade Level:	10
Estimated Duration:	40 minutes

Key Inquiry Question

How do we use real numbers in day-to-day activities?

II. Learning Objectives & Standards

Learning Objectives

Upon completion of this lesson, learners will be able to:

1. **Know (Conceptual Understanding):** Understand the definitions and properties of rational and irrational numbers, including their decimal representations.
2. **Do (Procedural Skill):** Classify real numbers as rational or irrational in different situations using appropriate rules.
3. **Apply (Application/Problem-Solving):** Use the properties of rational and irrational numbers to solve real-world problems.

Curriculum Alignment

Strand:	Numbers and Algebra
Sub-Strand:	Real Numbers
Specific Learning Outcome:	Classifying real numbers as rational and irrational in different situations.

III. Materials & Resources

Textbooks:	CBC Grade 10 Mathematics Learner's Book CBC Grade 10 Mathematics Teacher's Book

IV. Lesson Procedure

Phase 1: Problem-Solving and Discovery / Engage & Explore (15 minutes)

Objective: To activate prior knowledge about number types through a collaborative, open-ended task.

Anchor Activity:

Group Work:

- Working in groups, choose any set of natural numbers between 1 and 10. Use these numbers to create at least two fractions: one proper fraction (e.g., 3/5) and one improper fraction (e.g., 7/4).

Calculator Exploration:

- Use a calculator to divide each of your fractions. Write down the decimal value of each. Example: 7 ÷ 4 = 1.75.

Square Root Investigation:

- Choose any set of natural numbers between 1 and 20. Write each number as a square root. Example: √9 = 3 (rational), √2 = 1.414... (irrational).

Classification:

- Classify each number you have created (fractions, decimals, and square roots) as either rational or irrational.

Pattern Recognition:

- What do you notice about the decimal form of rational numbers compared to irrational numbers? Are there any patterns?

Sharing:

Discuss your observations with your fellow learners.

Teacher's Role: The teacher circulates among the groups, listening to their discussions and observing their classification attempts. The teacher asks probing questions to guide discovery without giving direct answers (e.g., "What happens when you divide these numbers?", "Do you see any pattern in the decimals?"). The teacher will then select a few groups to share their findings.

Phase 2: Structured Instruction / Explain (10 minutes)

Objective: To formalize the concepts and properties learners discovered in the anchor task.

Key Takeaways & Teacher Connection:

Rational Numbers (Q): A rational number is any number that can be written as a fraction p/q where p and q are integers and q ≠ 0. Examples: 2/3, −3, 4, 0.5, 0.333...

Irrational Numbers: An irrational number is any number that cannot be expressed as a fraction of two integers. Examples: √7, √2, π

Decimal Representations:

- Rational numbers: The decimal either terminates (stops) or repeats (has a repeating pattern). Examples: 0.375 (terminates), 3.454545... (repeats)
- Irrational numbers: The decimal neither terminates nor repeats. Examples: 3.14159265..., 1.41421356...

Square Roots:

- The square root of a perfect square is a rational number. Example: √16 = 4
- The square root of an imperfect square is an irrational number. Example: √2 = 1.41421356...

How to Determine if a Number is Rational or Irrational:

- Rule 1 (Integers/Fractions): Check if the number is an integer or a fraction with integers. If yes, it is rational. Example: 7 or 4/5
- Rule 2 (Terminating Decimals): If the decimal stops, the number is rational. Example: 3.25
- Rule 3 (Repeating vs Non-repeating): If the decimal continues with a repeated pattern, it is rational. Without a pattern, it is irrational. Rational: 0.666... Irrational: 0.1010010001...
- Rule 4 (Square Roots): If the square root results in a whole number (perfect square), it is rational. Otherwise, it is irrational. Rational: √49 = 7 Irrational: √2 ≈ 1.414...

Phase 3: Practice and Application / Elaborate (15 minutes)

Objective: To apply the learned concepts and procedures to solve varied problems.

Varied Problems:

Direct Classification: Identify if the following numbers are rational or irrational:

a) π
b) 2/3
c) 3.75
d) √20
e) √9/√16

Solutions:

a) π is irrational — The decimal 3.1415926... continues without a repeated pattern.

b) 2/3 is rational — It is a fraction with integers and denominator ≠ 0.

c) 3.75 is rational — The decimal terminates.

d) √20 is irrational — √20 = 4.472135... continues without a repeated pattern.

e) √9/√16 is rational — √9/√16 = 3/4, a fraction with integers.

Phase 4: Assessment / Evaluate (Exit Ticket)

Objective: To formatively assess individual student understanding.

Question 1: Classifying Irrational Numbers

Which of the following numbers are irrational? Select all that apply.

(1) 0.121221222...

(2) 5

(3) √5

(4) −9

(5) 5

Answer: (1) and (3)

Question 2: Classifying Rational Numbers

A Grade 10 maths teacher has a magical number sorter that only accepts rational numbers. Which will be accepted?

(1) −9

(2) √5

(3) 3√7

(4) 5

(5) 0.121221222...

Answer: (1) and (4)

V. Differentiation

Student Group	Strategy & Activity
Struggling Learners (Support)	Scaffolding: Provide a reference chart showing examples of rational and irrational numbers. Use calculators to help visualize decimal patterns. Work with this group during the anchor task.
On-Level Learners (Core)	The core lesson activities as described above.

Advanced Learners (Challenge)	Extension Activity: Iregi measured a triangular shelf with sides √12 m, √27 m, and 5 m. Find if the perimeter is rational or irrational. Solution: √12 = 2√3, √27 = 3√3. Perimeter = 5√3 + 5, which is irrational since √3 is irrational.

VI. Assessment

Type	Method	Purpose
Formative (During Lesson)	- Observation during anchor task - Questioning to check understanding - Exit Ticket	To monitor progress and adjust instruction.
Summative (After Lesson)	- Homework assignment - Future quiz/test questions	To evaluate mastery of learning objectives.

Checkpoint Integration

Pre-class Preparation list:

1. Test internet connectivity and access to https://innodems.github.io/CBC-Grade-10-Maths/
2. Ensure all student devices can access the digital textbook
3. Pre-load the checkpoint page on the teacher's display device
4. Have backup printed worksheets in case of technical issues
5. Arrange seating for pair work and station rotations

Checkpoint protocol for Learners:

1. Click “Show new example question” to load the problem
2. Solve the displayed question
3. Click “submit” to check your answer
4. 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.
5. Complete at least 5 questions before rotating
6. Pair learners strategically so stronger learners can explain reasoning to peers.

VII. Teacher Reflection

To be completed after the lesson.

1. What went well?

2. What would I change?

3. Student Understanding: What did the exit tickets reveal?

4. Next Steps: Based on assessment data, what is the plan for the next lesson?