

I. Lesson Overview

Lesson Title:	Finding Reciprocals of Real Numbers Using Division
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, students will be able to:

1. **Know (Conceptual Understanding):** Understand that the reciprocal of a number x is $1/x$, and when multiplied by the original number, the product is 1.
2. **Do (Procedural Skill):** Find reciprocals of real numbers using division ($1 \div x$).
3. **Apply (Application/Problem-Solving):** Apply reciprocals to solve real-world problems involving rates, distances, and time.

Curriculum Alignment

Strand:	Numbers and Algebra
Sub-Strand:	Real Numbers
Specific Learning Outcome:	Finding reciprocals of real numbers using division.

III. Materials & Resources

Textbooks:	CBC Grade 10 Mathematics Learner's Book CBC Grade 10 Mathematics Teacher's Book
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IV. Lesson Procedure

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

Objective: To activate prior knowledge about fractions and division through a collaborative, hands-on task.

Anchor Activity:

Group Formation:

- In groups of 5, write down numbers from 2 to 15 in ascending order (2, 3, 4, ..., 15). Label this as the First List.

Second List:

- Rearrange the numbers from 15 to 2 in descending order (15, 14, 13, ..., 2). Label this as the Second List.

Fraction Creation:

- In turns, each group member creates a fraction by using the first number from the First List as the numerator and the first number from the Second List as the denominator. Continue with remaining numbers.

Finding Reciprocals:

- Find the reciprocals of the fractions you have formed using division. For example: If the fraction is $\frac{2}{15}$, the reciprocal using division is $15 \div 2$.

Whole Number Reciprocals:

- From the whole numbers 2 to 15, pick any 3 numbers and find their reciprocals using division.

Discussion:

- Discuss your work with fellow learners.

Teacher's Role: The teacher circulates among the groups, listening to their discussions and observing their methods for finding reciprocals. The teacher asks probing questions to guide discovery (e.g., "What happens when you multiply a number by its reciprocal?", "How can you check if your answer is correct?", "What do you notice about the reciprocal of a fraction?"). The teacher will then select a few groups to share their findings.

Phase 2: Structured Instruction / Explain (10 minutes)

Objective: To formalize the concept of reciprocals and the division method.

Key Takeaways & Teacher Connection:

Definition of Reciprocal: The reciprocal of a number is the number that, when multiplied by the original number, gives a product of 1. The reciprocal of a real number x is $\frac{1}{x}$, except when $x = 0$ (division by zero is undefined).

Key Property: $x \times (\frac{1}{x}) = 1$

Finding Reciprocals Using Division:

Step 1: Understand that the reciprocal of x is $1/x$.

Step 2: Use division to find the reciprocal: $1 \div x$.

Examples:

- The reciprocal of 2 is $1/2$. Using division: $1 \div 2 = 0.5$
- The reciprocal of 5 is $1/5$. Using division: $1 \div 5 = 0.2$
- The reciprocal of -3 is $1/(-3) = -1/3$. Using division: $1 \div (-3) = -0.333...$ or $-0.\overline{3}$
- The reciprocal of 0.25 is $1/0.25$. Using division: $1 \div 0.25 = 4$
- The reciprocal of $3/5$ is found by: $1 \div (3/5) = 1 \times (5/3) = 5/3$

Addressing Misconceptions: "Remember: Zero has no reciprocal because division by zero is undefined. Also, the reciprocal of a negative number is also negative."

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

Objective: To apply the division method to find reciprocals and solve real-world problems.

Varied Problems:

1. Direct Calculation: Find the reciprocal of the following numbers using division:

- a) 256
- b) 4.2

Solutions:

a) Reciprocal of 256: $1 \div 256 = 0.00390625$

b) Reciprocal of 4.2: $1 \div 4.2 = 0.2381$ (to 4 decimal places). Alternatively: $1/4.2 = 10/42 = 5/21$

2. Word Problems:

1. A cyclist covers a distance of 12 km in 1 hour. Using division to find reciprocals, determine the time taken to cover 1 km at the same speed.
2. A factory machine produces $5/8$ of a widget every minute. How long will it take the machine to produce 40 widgets?
3. A typist can type $4/7$ of a page in 8 minutes. At this rate, how long will it take to type a full 25-page document?

Teacher's Role: The teacher monitors students as they work, providing support where needed and encouraging students to verify their answers by multiplying the number by its reciprocal to check if the product equals 1.

Phase 4: Assessment / Evaluate (Exit Ticket)

Objective: To formatively assess individual student understanding.

Exit Ticket Questions:

1. If the reciprocal of x is $\frac{1}{6}$, find the value of x .
2. Movin, a Grade 10 learner, covers $\frac{1}{x}$ km from home to school. If the distance he covers each day is 0.2 km, find the value of x .

Answer Key:

1. If the reciprocal of x is $\frac{1}{6}$, then $x = 6$.
2. If $\frac{1}{x} = 0.2$, then $x = 1 \div 0.2 = 5$.

Teacher's Role: Collect and review the exit tickets to gauge student understanding and identify misconceptions.

V. Differentiation

Student Group	Strategy & Activity
Struggling Learners (Support)	Scaffolding: Provide a step-by-step guide for finding reciprocals. Use calculators to verify division. Start with simple whole numbers before moving to decimals and fractions. Work with this group during the anchor task.
On-Level Learners (Core)	The core lesson activities as described above.
Advanced Learners (Challenge)	Extension Activity: A cyclist covers 12 km in 1 hour. A factory machine produces $\frac{5}{8}$ of a widget per minute. A typist types $\frac{4}{7}$ of a page in 8 minutes. Solve all three word problems and create your own real-world problem involving reciprocals.

VI. Assessment

Type	Method	Purpose
Formative (During Lesson)	<ul style="list-style-type: none">- 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.
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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 students to identify and correct errors in real-time.
5. Complete at least 5 questions before rotating
6. Pair students strategically so stronger learners can explain reasoning to peers.

Teacher's Role: Collect and review the exit tickets to gauge student understanding and identify any common misconceptions that need to be addressed in the next lesson.

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?