Step by step guide: Finding Reciprocals Using Mathematical Tables and Calculators

Grade 10 Mathematics | 40-Minute Lesson

Before Class Begins

Preparation Checklist:

- Test internet connectivity and access to https://innodems.github.io/CBC-Grade-10-Maths/
- Ensure all Learner devices can access the digital textbook
- Pre-load the checkpoint page on the teacher's display device
- Have backup printed worksheets in case of technical issues
- Arrange seating for pair work, in groups, or station rotations
- Prepare number charts (1-100) for each group
- Set timer for phase transitions
- Prepare a large reciprocal table chart for demonstration (or projector)

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

Opening (2 minutes)

[SAY]:

"Good morning/afternoon, class! In our previous lesson, we learned to find reciprocals using division. Today, we're going to learn a faster method—using mathematical tables and calculators."

[SAY]:

"Here's our key question: How do we use real numbers in day-to-day activities? Mathematical tables have been used for centuries to make calculations faster."

Anchor Activity Introduction (2 minutes)

[SAY]:

"Each group has a mathematical table. Today you're going to explore how to use the reciprocal section of these tables."

[HOLD UP a mathematical table]:

"This is a reciprocal table. It contains pre-calculated reciprocals for numbers. Your task is to figure out how to use it."

Group Work Instructions (1 minute)
[SAY - Read slowly and clearly]:

"In your groups, I want you to:
Step 1: Look at these numbers: 3/4, 1/3, 6, and 0.4167
Step 2: Try to find the reciprocal of each number using the table
Step 3: Discuss how you navigated the table
Step 4: Write down what you realized about using the tables

You have 10 minutes. Begin!"

Circulation and Probing (8 minutes)
[DO]: Walk around the room, observing how Learners navigate the tables.

[ASK probing questions as you circulate]:

- "How did you locate the number in the table?"
- "Which row and column did you use?"
- "What do you do if your exact number isn't in the table?"
- "Did you notice the SUBTRACT columns? What are they for?"
- "How would you handle a number like 6 that's larger than what's in the table?"

[OBSERVE]: Note which groups understand the row/column system. Watch for confusion about the subtract columns.

[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], how did you find the reciprocal of 0.4167?"

[LISTEN, then ask]:

"[Group name], what challenges did you face with the number 6?"

[TRANSITION]:

"Great observations! Now let me show you the formal procedure for using these tables."

PHASE 2: Structured Instruction (10 Minutes)

Demonstrating the Procedure (6 minutes)
[SAY]:

"Let me show you step-by-step how to find the reciprocal of a large number like 1252."

[WRITE on board while explaining]:

"Step 1: Express in standard form.
1252 = 1.252 × 10³

Step 2: Find the reciprocal of 1.252 from the table.
• Find 1.2 in the x column
• Move right to column headed 5
• Read: 0.8000
• Move to SUBTRACT column 2
• Read: 13
• Subtract: 0.8000 − 0.013 = 0.787

Step 3: Find reciprocal of 10³
Reciprocal of 1000 = 1/1000 = 0.001

Step 4: Multiply
0.787 × 0.001 = 0.000787

The reciprocal of 1252 is 0.000787"

Key Points (2 minutes)
[SAY]:

"Remember these key points:
• Always convert to standard form first
• The table gives reciprocals for numbers between 1 and 10
• Use the SUBTRACT columns for the third digit
• Don't forget to multiply by the reciprocal of the power of 10"

Using Calculators (2 minutes)
[SAY]:

"You can also use calculators. Most scientific calculators have a reciprocal button, often labeled 1/x or x^{-1}. Simply enter the number and press this button."

[DEMONSTRATE on calculator]:

"Enter 1252, press 1/x, and you get 0.0007987... Very close to our table answer!"

[TRANSITION]:

"Now let's practice using the tables!"

PHASE 3: Practice and Application (15 Minutes)

Guided Practice (5 minutes)
[SAY]:

"Let's find the reciprocal of 0.154 together using tables."

[ASK]:

"First, how do we express 0.154 in standard form?"

[Expected answer]: "1.54×10^{-1}"

[SAY]:

"Good! Now find the reciprocal of 1.54 in your tables. What do you get?"

[WAIT, then confirm]:

*"You should get approximately 0.6494. Now multiply by 10^1 = 10.
0.6494 × 10 = 6.494
So the reciprocal of 0.154 is approximately 6.494."*

Word Problem (7 minutes)
[SAY]:

"Now let's solve a real-world problem. Work with your partner."

[READ the problem]:

"Murunga's car consumes 1/8 liters of fuel per kilometer. Use tables to find how far Murunga can drive with 1 liter."

[GIVE 4 minutes, then solve together]:

"Let's solve this step by step:
- *If 1/8 liters = 1 km, then 1 liter = ? km*
- *We need the reciprocal of 1/8*
- *Convert: 1/8 = 0.125 = 1.25 × 10^{-1}*
- *Reciprocal of 1.25 from tables: 0.8000*
- *Multiply by 10: 0.8000 × 10 = 8*
- *Murunga can drive 8 km with 1 liter!"*

Quick Practice (3 minutes)

[SAY]:

"Quick check: A farmer plants 0.85 acres per day. How many days to plant 1 acre?"

[WAIT, then reveal]:

"We need the reciprocal of 0.85.
0.85 = 8.5 × 10^{-1}
Reciprocal of 8.5 ≈ 0.1176
Multiply by 10: 1.176 days"

[TRANSITION]:

"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]:

"1. Find the reciprocal of 4286 using tables.

2. Maria found that 0.6 of Learners preferred football. Find the reciprocal of 0.6.

3. A shopkeeper packs 96 apples in groups of 8. What is the reciprocal of 8?"

[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 find reciprocals using mathematical tables and calculators. Remember: convert to standard form, use the table for numbers between 1 and 10, and adjust for the power of 10."

[ASK]:

"When might using tables be more practical than a calculator?"

[ACCEPT responses - examples: no calculator available, exam conditions, understanding the process]

[SAY]:

"Great work today! For homework, find the reciprocals of 5 numbers using both tables and calculators, and compare your answers."

Differentiation Notes

For Struggling Learners:

- Provide a step-by-step guide for reading reciprocal tables
- Highlight rows and columns on the table with colored markers
- Use calculators to verify answers from tables
- Work directly with this group during anchor activity

For Advanced Learners:

[GIVE this extension]:

"Compare the accuracy of reciprocals found using tables versus calculators. For which types of numbers do tables give slightly different answers? Why might this happen?"

Answer Key

Exit Ticket Answers:

1. Reciprocal of 4286: $4286 = 4.286 \times 10^3 \rightarrow$ Reciprocal ≈ 0.000233

2. Reciprocal of 0.6: $0.6 = 6 \times 10^{-1} \rightarrow$ Reciprocal ≈ 1.667

3. Reciprocal of 8: $8 = 8 \times 10^0 \rightarrow$ Reciprocal $= 0.125$

Post-Lesson Reflection Prompts

1. What went well? Did Learners successfully navigate the tables?

2. What would I change? Was enough time given for table exploration?

3. Learner Understanding: What did the exit tickets reveal about table usage?

4. Next Steps: Which Learners need more practice with standard form?