I. Lesson Overview

Lesson Title:	Determining Common Logarithms Using Mathematical Tables and Calculators
Strand:	Numbers and Algebra
Sub-Strand:	Indices and Logarithms
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 the structure of logarithm tables, including characteristic, mantissa, and mean difference columns.
2. **Do (Procedural Skill):** Use logarithm tables and calculators to find common logarithms (base 10) of numbers greater than 1 and less than 1.
3. **Apply (Application/Problem-Solving):** Apply logarithm skills to solve real-world problems involving large and small numbers.

Curriculum Alignment

Strand:	Numbers and Algebra
Sub-Strand:	Indices and Logarithms
Specific Learning Outcome:	Determining Common Logarithms Using Mathematical Tables and Calculators.

III. Materials & Resources

Textbooks:	CBC Grade 10 Mathematics Learner's Book CBC Grade 10 Mathematics Teacher's Book
Equipment:	Scientific calculators, Logarithm tables (one per student or pair)
Visual Aids:	Sample logarithm table displayed on board or projector

IV. Lesson Procedure

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

Objective: To explore logarithm tables and discover patterns in finding logarithms.

Anchor Activity: Exploring Logarithm Tables

Work in groups with logarithm tables to explore the following:

Part A: Understanding the Table Structure

1. Examine your logarithm table. What do you notice about its structure?

2. Identify the following parts:

  • The first column (numbers 10-99)

  • The columns labeled 0-9

  • The "Mean Difference" columns

3. What do you think each part represents?

Part B: Finding Logarithms

Try to find the logarithms of these numbers using the table:

(i) log(47)

(ii) log(473)

(iii) log(4.73)

(iv) log(0.0473)

Discussion Questions:

● How does the position of the decimal point affect the logarithm?
● What pattern do you notice between log(47), log(473), and log(4.73)?
● How do you handle numbers less than 1?
● Why do we need the "Mean Difference" columns?

Teacher's Role: The teacher circulates among groups, asking probing questions (e.g., "What happens to the characteristic when you multiply by 10?", "How do you read the mantissa for a 3-digit number?"). The teacher uses student discoveries to bridge to formal instruction.

Phase 2: Structured Instruction / Explain (10 minutes)

Objective: To formalize the procedure for finding common logarithms.

Key Takeaways:

Structure of a Common Logarithm:

Every common logarithm has two parts:

• Characteristic: The integer part (determined by the position of the decimal point)

• Mantissa: The decimal part (found from the logarithm table)

Finding the Characteristic:

Number Type	Rule	Example
Numbers ≥ 1	Characteristic = (digits before decimal) − 1	472.8 → Char = 3 − 1 = 2
Numbers < 1	Characteristic = −(zeros after decimal + 1)	0.00534 → Char = −(2 + 1) = −3 (written as $\bar{3}$)

Finding the Mantissa (5-Step Process):

Step 1: Write the number in standard form (A × 10^n where 1 ≤ A < 10)

Step 2: Locate the first two digits in the first column of the log table

Step 3: Move across to the column for the third digit

Step 4: Add the mean difference for the fourth digit (if applicable)

Step 5: Combine characteristic + mantissa

Bar Notation for Negative Characteristics:

When the characteristic is negative, we write it with a bar over the number:

• $\bar{3}$.7272 means −3 + 0.7272 = −2.2728

• The bar only applies to the characteristic, NOT the mantissa

Addressing Misconceptions: "Remember: The mantissa is ALWAYS positive. Only the characteristic can be negative. Also, always verify your table reading with a calculator when possible."

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

Objective: To apply logarithm table skills to find common logarithms.

Worked Example 1: Finding log(472.8)

Solution using a logarithm table:

a) Identify the characteristic:

  • Write 472.8 in standard form: 4.728×10^2

  • The characteristic is 2 (since $10^2 \leq 472.8 < 10^3$)

b) Find the mantissa from the log table:

  • Locate 47 in the first column

  • Move to the column labeled 2

  • Read the value: 0.6749

c) Apply the mean difference for 8:

  • From the table, the mean difference for 8 is 0.0007

  • Add this to the mantissa: 0.6749 + 0.0007 = 0.6756

d) Combine with the characteristic:

Therefore: log(472.8) = 2.6756

Verification: Using a calculator, log(472.8) ≈ 2.6746 ✓

Worked Example 2: Finding log(0.00534)

Solution:

a) Write in standard form: 5.34×10^{-3}

b) The characteristic is −3 (negative because number < 1)

c) Find the mantissa:

  • Locate 53 in the first column

  • Move to the column labeled 4

  • Read the value: 0.7275

d) Apply the logarithm property:

  • $\log(0.00534) = \log(5.34) + \log(10^{-3})$

  • $\log(0.00534) = 0.7275 + (-3)$

Therefore: log(0.00534) = $\bar{3}$.7275

Note: The bar over 3 represents a negative characteristic.

Teacher's Role: The teacher monitors students, emphasizing the importance of correctly identifying the characteristic and reading the table accurately.

Phase 4: Assessment / Evaluate (Exit Ticket)

Objective: To formatively assess individual student understanding.

Exit Ticket Questions:

1. Express the following numbers in standard form:

  a) 4820

  b) 37.6

  c) 672000

  d) 321000

  e) 0.000485

  f) 91800

  g) 5.27×10^5

  h) 0.000672

2. Use a logarithm table to find the logarithm of the following numbers:

  a) 0.00893

  b) 0.000245

  c) 3140

  d) 6.42×10^3

  e) 52.7

  f) 78900

  g) 0.000978

Answer Key:

1. Standard Form:

  a) $4820 = 4.82 \times 10^3$

b) $37.6 = 3.76 \times 10^1$

c) $672000 = 6.72 \times 10^5$

d) $321000 = 3.21 \times 10^5$

e) $0.000485 = 4.85 \times 10^{-4}$

f) $91800 = 9.18 \times 10^4$

g) 5.27×10^5 (already in standard form)

h) $0.000672 = 6.72 \times 10^{-4}$

2. Logarithms:

a) $\log(0.00893) = \bar{3}.9509$

b) $\log(0.000245) = \bar{4}.3892$

c) $\log(3140) = 3.4969$

d) $\log(6.42 \times 10^3) = \log(6420) = 3.8075$

e) $\log(52.7) = 1.7218$

f) $\log(78900) = 4.8971$

g) $\log(0.000978) = \bar{4}.9903$

V. Differentiation

Student Group	Strategy & Activity
Struggling Learners (Support)	Scaffolding: Provide step-by-step guides with the 5-step process. Use highlighted logarithm tables. Allow calculator verification. Pair with stronger students.
On-Level Learners (Core)	The core lesson activities as described above.
Advanced Learners (Challenge)	Extension Activity: 1) Find $\log(0.000003456)$ and verify with calculator 2) If $\log(x) = 2.5453$, find x using antilogarithms 3) Use logarithms to calculate: $(472.8 \times 0.00534) \div 3140$ 4) Research: How are logarithms used in

	measuring earthquake intensity (Richter scale)?

VI. Assessment

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

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 about student mastery of logarithm tables?

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