Step by step guide: Antilogarithms

Grade 10 Mathematics | 40-Minute Lesson

Before Class Begins

Preparation Checklist:

- Distribute antilogarithm tables to each student or pair
- Ensure scientific calculators are available
- Display a sample antilogarithm table on the board/projector
- Write the key relationship: log(x) = y means antilog(y) = x = 10^y
- Prepare exit tickets for distribution
- Set timer for phase transitions

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

Opening (2 minutes)

[SAY]:

"Good morning/afternoon, class! Last lesson we learned how to find logarithms. Today we're going to learn the REVERSE - how to find ANTILOGARITHMS. This is like learning subtraction after addition!"

[SAY]:

"Here's our key question: How do we use real numbers in day-to-day activities? Antilogarithms help us reverse logarithmic calculations."

Anchor Activity Introduction (3 minutes)

[SAY]:

"Let's think about inverse operations. In your groups, discuss:

Part A: Inverse Operations
- Addition and subtraction are inverses: 5 + 3 = 8, so 8 - 3 = 5
- Multiplication and division are inverses: 4 x 6 = 24, so 24 / 6 = 4
- What is the inverse of taking a logarithm?

Part B: Complete this table and find the pattern"

[WRITE on board]:

"log(100) = 2 -> If log(x) = 2, then x = ?
log(1000) = 3 -> If log(x) = 3, then x = ?
log(47.3) = 1.67 -> If log(x) = 1.67, then x = ?"

Group Work (7 minutes)

[SAY]:

"As you work, discuss:
- What pattern do you notice?
- How can you undo a logarithm?
- What is the relationship between log(x) = y and x = 10^y?

You have 6 minutes. Begin!"

[DO]: Walk around the room, observing group discussions.

[ASK probing questions as you circulate]:

- "If log(100) = 2, what operation gives you back 100?"
- "How is 10^2 related to log(100) = 2?"
- "Can you use the log table backwards?"
- "What do you think antilog means?"

[TIME CHECK]: At 5 minutes, announce: "One more minute!"

Class Discussion (3 minutes)

[SAY]:

"Let's share what you discovered. If log(100) = 2, what is x when log(x) = 2?"

[Expected answer]: "x = 100, because 10^2 = 100!"

[ASK]:

"So what operation undoes a logarithm?"

[Expected answer]: "Raising 10 to that power!"

[TRANSITION]:

"Excellent! This operation is called the ANTILOGARITHM. Let me formalize this."

PHASE 2: Structured Instruction (10 Minutes)

Definition (3 minutes)

[SAY]:

"The ANTILOGARITHM is the INVERSE operation of the logarithm."

[WRITE on board]:

"If log(x) = y, then antilog(y) = x

In other words: antilog(y) = 10^y"

[SAY]:

"Think of it this way:
- Logarithm asks: What power gives me this number?
- Antilogarithm asks: What number does this power give me?"

Procedure Using Tables (4 minutes)

[SAY]:

"To find antilogarithms using tables, follow THREE steps:

Step 1: SEPARATE the characteristic and mantissa
Example: 2.6756 = 2 + 0.6756

Step 2: FIND the antilog of the mantissa from the table
Look up 0.6756 in the antilog table

Step 3: MULTIPLY by 10^(characteristic)
Multiply by 10^2 = 100"

Inverse Properties (2 minutes)

[SAY]:

"Here are two IMPORTANT inverse properties:

1. log_a(a^x) = x - Taking log undoes the exponent
Example: log_5(5^4) = 4

2. a^(log_a(x)) = x - Raising to power undoes the log
Example: 5^(log_5(22)) = 22"

[SAY - IMPORTANT]:

"Remember: Antilog is NOT the same as negative log! It's the inverse operation - like how division is the inverse of multiplication."

[TRANSITION]:

"Now let's practice finding antilogarithms!"

PHASE 3: Practice and Application (15 Minutes)

Worked Example (5 minutes)

[SAY]:

"Let's find antilog(2.6756) using the antilogarithm table."

[WRITE step by step]:

"Step 1: Separate characteristic and mantissa
2.6756 = 2 + 0.6756
Characteristic = 2, Mantissa = 0.6756

Step 2: Find antilog of mantissa from table
- Locate 0.67 in the first column
- Move to column 5
- Read: 4.732
- Add mean difference for 6: +0.003
- Antilog(0.6756) = 4.735

Step 3: Apply the characteristic
4.735 x 10^2 = 4.735 x 100 = 473.5"

[SAY]:

"Therefore, antilog(2.6756) = 473.5

Let's verify: log(473.5) = 2.675 (correct!)"

Inverse Properties Examples (3 minutes)

[SAY]:

"Let's practice the inverse properties:

a) Find log_5(625)
625 = 5^4
log_5(625) = log_5(5^4) = 4

b) Find 5^(log_5(22))
Since raising to power undoes the log:
5^(log_5(22)) = 22"

Guided Practice (5 minutes)

[SAY]:

"Try these with your partner:
1. Find antilog(1.3562) using tables
2. Find 10^(2.1457) using a calculator"

[GIVE 4 minutes, then review]:

"1. antilog(1.3562):
- Characteristic = 1, Mantissa = 0.3562
- antilog(0.3562) = 2.271
- 2.271 x 10^1 = 22.71

2. 10^(2.1457) = 139.9 (approximately 140)"

[TRANSITION]:

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

PHASE 4: Assessment / Checkpoint (8 Minutes)

Independent Work (5 minutes)

[DISPLAY questions]:

"1. Using tables, find antilog(3.4821)
2. Using calculator, find 10^(0.8743)"

[SAY]:

"You have 5 minutes. Show your work. Begin."

Collection and Closure (2 minutes)

[SAY]:

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

[COLLECT all tickets]

[SAY]:

"Today you learned about ANTILOGARITHMS:
- Antilog is the INVERSE of logarithm
- If log(x) = y, then antilog(y) = x = 10^y
- To find antilog using tables: separate, look up mantissa, multiply by 10^characteristic
- Key property: a^(log_a(x)) = x

Great work today!"

Differentiation Notes

For Struggling Learners:

- Provide step-by-step guides
- Use color coding: characteristic (blue), mantissa (green)
- Allow calculator verification
- Focus on whole number characteristics first

For Advanced Learners:

[GIVE these extensions]:

- Find antilog(bar 3.7275) - negative characteristic -> 0.00534
- If log(x) = 2.5 and log(y) = 1.5, find xy -> 10,000
- Solve: 10^(2x-1) = 500 -> x = 1.85

Answer Key

Exit Ticket Answers:

Using Tables:

i) P = antilog(1.3562): 22.71

ii) Q = antilog(3.4821): 3035

iii) R = antilog(0.7294): 5.363

iv) S = antilog(4.2187): 16540

Using Calculator:

i) a = 10^(2.1457): 140

ii) b = 10^(0.8743): 7.484

iii) c = 10^(3.5961): 3947

iv) d = 10^(1.9999): 100

Post-Lesson Reflection Prompts

1. What went well? Did students understand the inverse relationship?

2. What would I change? Was the table reading clear?

3. Student Understanding: Could students separate characteristic and mantissa correctly?

4. Next Steps: Which students need more practice?