

Logarithms Lesson 2:

Calculating Logarithms to Solve Equations

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Examples with Step-by-Step Solutions and Practice Problems, ideal for a projector:

- Calculating logarithms, including common logarithms and natural logarithms
- Calculating logarithms to solve multi-step equations

Quiz with Answer Key

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Click **LOGARITHM BINGO** to preview a fun calculator activity to go with this lesson.

Calculating Logarithms

TI-84+ Calculator

Find the

LOG and **LN**

buttons

on your

calculator.



LOG

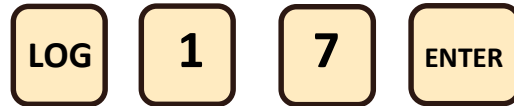
LN

A closer look at the TI-84+ Graphing Calculator...



Example One:

Calculate **log 17** by typing:



Answer: **1.23**

Example Two:

Calculate **ln 8** by typing:



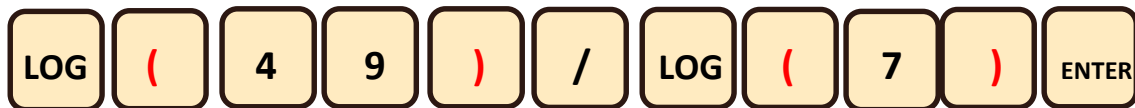
Answer: **2.08**

Example Three:

If the logarithm is not a natural log or a logarithm in base 10, we'll need to do a few extra steps.

Calculate **log** **7** **49** by entering:

$$\log (49) \div \log (7)$$



Don't forget the **parentheses**.
Your answer will be incorrect without them.

Answer: 2

LET'S LOOK AT ANOTHER EXAMPLE

$$\log_{12} 3$$


Enter
this
number
FIRST

Enter the base
LAST

$$\log(3) \div \log(12)$$

Answer: **.442**

Why do we divide the logs? We'll learn that in Lesson 4, when we expand and condense logs.

How do we find the value of “e” on a TI graphing calculator?

e^1 → 2ND LN 1 ENTER

e^2 → 2ND LN 2 ENTER

e^3 → 2ND LN 3 ENTER

Practice Problems to Calculate:

1) $\log_5 2$

2) $\log_2 5$

3) $\log 9$

4) $\ln \pi$

5) $\log e$

6) $\ln 1$

7) $\log_2 1$

8) $\log_{21} 4$

ANSWERS

1) $\log_5 2$

.43

2) $\log_2 5$

2.32

3) $\log 9$

.95

4) $\ln \pi$

1.14

5) $\log e$

.43

6) $\ln 1$

0

7) $\log_2 1$

0

8) $\log_{21} 4$

.46

Examples and Solutions

Challenge Problems

Example One: $\log_5 2 = x + 3$

SOLUTION:

$$\log_5 2 = x + 3$$



Calculate $\log_5 2$



$$\log(2) \div \log(5) = .43$$



$$.43 = x + 3$$

$$\underline{-3} \quad \underline{-3}$$

Subtract 3 from both sides

$$-2.57 = x \text{ or } x = -2.57$$

Example Two: $7^{2x} = 3$

SOLUTION:

$$7^{2x} = 3$$

Rewrite as a logarithm (Lesson 1)

$$\log_7 3 = 2x$$

Calculate $\log_7 3$

$$.56 = 2x$$

Divide both sides by 2

$$.28 = x \text{ or } x = .28$$

Example Three: $3^{4x-5} = 11$

SOLUTION:

$$3^{4x-5} = 11$$

Rewrite as a logarithm

$$\log_3 11 = 4x - 5$$

Calculate $\log_3 11$

$$2.18 = 4x - 5$$

Add 5 to both sides

$$7.18 = 4x$$

Divide both sides by 4

$$1.80 = x \text{ or } x = 1.8$$

Example Four: $2^{\log_2 7} = ?$

Solution: No need to use a calculator. Look for a **pattern**.

$$3^{\log_3 5} = 5$$

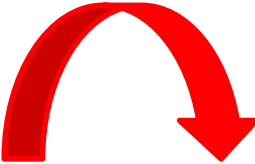
$$5^{\log_5 4} = 4$$

$$11^{\log_{11} 3} = 3$$

What two numbers must be the same?

Both bases.

Answer for Example Four:


$$2^{\log_2 7} = 7$$

Practice Challenge Problems:

$$8^{x+1} = 7$$

$$10^{2x} = 50$$

$$e^{x-3} = 11$$

$$2^{3x+4} = 12$$

$$15^{x-7} = 3$$

$$7^{\frac{x}{2}} = 9$$

$$4^{\log_4 9} = x$$

$$\log_8 4 = 2x - 3$$

ANSWER KEY

$$8^{x+1} = 7$$

$$x = -.06$$

$$10^{2x} = 50$$

$$x = .85$$

$$e^{x-3} = 11$$

$$x = 5.40$$

$$2^{3x+4} = 12$$

$$x = -.14$$

$$15^{x-7} = 3$$

$$x = 7.41$$

$$7^{\frac{x}{2}} = 9$$

$$x = 2.26$$

$$4^{\log_4 9} = x$$

$$x = 9$$

$$\log_8 4 = 2x - 3$$

$$x = 1.83$$

QUIZ

Name _____

Solve with a calculator. Round to the hundredth's place:

1) $\log_5 7 =$

2) $\ln 4 =$

3) $\log e =$

Solve for x. Round to the hundredth's place:

4) $8^x = 32$

5) $4^{x-2} = 8.7$

6) $\log_7 41 = 3x + 2$

7) $6^{2x+5} = 11$

8) $5^{\log_5 9} = x$

QUIZ, Lesson 2

ANSWER KEY

Solve with a calculator. Round to the hundredth's place:

1) $\log_5 7 =$

1.21

2) $\ln 4 =$

1.39

3) $\log e =$

.43

Solve for x. Round to the hundredth's place:

4) $8^x = 32$

1.67

5) $4^{x-2} = 8.7$

3.56

6) $\log_7 41 = 3x + 2$

- 2.03

7) $6^{2x+5} = 11$

- 1.83

8) $5^{\log_5 9} = x$

9

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