Logarithmic Functions and Equations

Log functions, properties of logarithms, inverse relationships, and solving equations.

Name _____ Date _____

32 main · 2-up grid · 11 pages · visible side quests

Completion Reward

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1. What does log_b(a) ask for?

base	exponent	result
2	3	8
10	2	100

log_b(a) asks what exponent on base b produces a.

A. The coefficient on b
B. The square root of a
C. The exponent on b that gives a
D. The remainder after dividing a by b

1.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of b + a
C. the reciprocal of a
D. the slope of a graph

1.2. Which exponential equation matches log_2(8) = 3?

A. 2^3 = 8
B. 3^2 = 8
C. 8^2 = 3
D. 2^8 = 3

1.3. log(xy) can be rewritten as:

A. log(x)log(y)
B. log(x) + log(y)
C. log(x) - log(y)
D. log(x/y)

1.4. log(x / y) can be rewritten as:

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

1.5. log_b(b^x) simplifies to:

A. b
B. x
C. 1
D. x^b

2. Which expression equals log(xy)?

A. log(x) - log(y)
B. log(xy)^2
C. log(x) + log(y)
D. log(x)log(y)

2.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

2.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

2.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

2.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

2.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

3. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(xy)
C. log(x) - log(y)
D. log(y) - log(x)

3.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

3.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

3.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

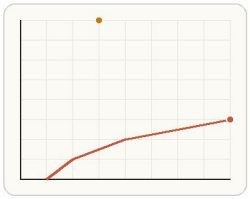
3.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

3.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

4. Why are logarithms called inverse functions of exponentials?



A logarithm reverses an exponential relationship by solving for the exponent instead of the output.

A. They undo exponential growth statements by solving for the exponent.
B. They always make numbers smaller.
C. They remove the base entirely.
D. They reverse multiplication by turning it into subtraction only.

4.1. Why are logs called inverse functions of exponentials?

A. they undo exponentials with the same base
B. they square every input
C. they always make numbers smaller
D. they only work with base 10

4.2. log_7(7^x) simplifies to:

A. 7
B. x
C. 1
D. x^7

4.3. If e^x = e^4, then x equals:

A. 0
B. 1
C. 4
D. e

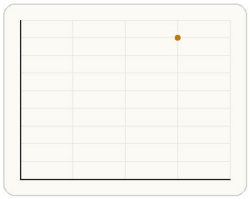
4.4. If y = 10^3, then log_10(y) =

A. 0
B. 1
C. 3
D. 10

4.5. Why is log_2(3^x) not a simple 'undo' expression?

A. the bases do not match
B. 3 is negative
C. logs cannot use exponents
D. x must be 0

5. Which equation is equivalent to log_2(8) = 3?



A logarithmic equation can be read as an exponential equation with the same base, exponent, and output.

A. 3^2 = 8
B. 8^2 = 3
C. 2^3 = 8
D. 2^8 = 3

5.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

5.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

5.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

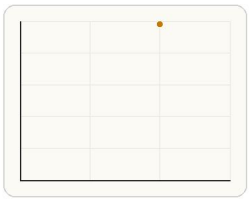
5.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

5.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

6. Which equation matches log_7(49) = 2?



Use the base and output to rewrite the logarithm as the exponential equation it describes.

A. 2^7 = 49
B. 49^2 = 7
C. 7^2 = 49
D. 7^49 = 2

6.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

6.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

6.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

6.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

6.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

7. What is the best first step to solve log_5(x) = 3?

A. Add 5 to both sides.
B. Square both sides.
C. Replace x with 0.
D. Rewrite it as 5^3 = x.

7.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

7.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

7.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

7.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

7.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

8. A student says log(xy) = log(x)log(y). What is the mistake?

A. The product rule uses addition, not multiplication.
B. The quotient rule should be used.
C. Logs can never be separated.
D. The rule should multiply by the base first.

8.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

8.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

8.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

8.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

8.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

9. Evaluate log_10(1000). Answer with a number.

expression	value
10^1	10
10^2	100
10^3	1000

Look for the exponent that makes the target value.

9.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

9.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

9.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

9.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

9.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

10. Evaluate log_2(16). Answer with a number.

10.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

10.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

10.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

10.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

10.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

11. If e^x = e^7, what is x? Answer with a number.

11.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

11.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

11.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

11.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

11.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

12. Evaluate log_5(25). Answer with a number.

12.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

12.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

12.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

12.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

12.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

13. Solve log_2(x) = 5. Answer with a number.

exponent	2^exponent
3	8
4	16
5	32

Solving log_2(x) = 5 means finding the output paired with exponent 5.

13.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

13.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

13.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

13.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

13.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

14. Solve log_3(x) = 2. Answer with a number.

14.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

14.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

14.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

14.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

14.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

15. Evaluate 2log_10(10). Answer with a number.

15.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

15.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

15.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

15.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

15.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

16. If log_4(64) = x, find x. Answer with a number.

16.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

16.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

16.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

16.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

16.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

17. Evaluate log_9(81). Answer with a number.

17.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

17.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

17.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

17.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

17.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

18. Rewrite log_3(81) = 4 in exponential form. Answer as an equation.

18.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

18.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

18.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

18.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

18.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

19. Rewrite 5^3 = 125 in logarithmic form. Answer as an equation.

19.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

19.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

19.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

19.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

19.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

20. Expand log(4x). Answer with an equivalent expression.

20.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

20.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

20.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

20.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

20.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

21. Expand log(x / 7). Answer with an equivalent expression.

21.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of a + b
C. the slope of a graph
D. the reciprocal of a

21.2. Which equation matches log_3(81) = 4?

A. 3^4 = 81
B. 4^3 = 81
C. 81^3 = 4
D. 3^81 = 4

21.3. In log_5(125) = 3, the base is:

A. 3
B. 5
C. 125
D. 15

21.4. Which logarithmic statement matches 2^5 = 32?

A. log_2(32) = 5
B. log_5(32) = 2
C. log_2(5) = 32
D. log_32(2) = 5

21.5. Why does log_4(64) = 3?

A. because 64 / 4 = 16
B. because 4^3 = 64
C. because 3^4 = 64
D. because 64 - 4 = 60

22. Condense log(x) + log(y) into one logarithm. Answer as an expression.

22.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of b + a
C. the reciprocal of a
D. the slope of a graph

22.2. Which exponential equation matches log_2(8) = 3?

A. 2^3 = 8
B. 3^2 = 8
C. 8^2 = 3
D. 2^8 = 3

22.3. log(xy) can be rewritten as:

A. log(x)log(y)
B. log(x) + log(y)
C. log(x) - log(y)
D. log(x/y)

22.4. log(x / y) can be rewritten as:

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

22.5. log_b(b^x) simplifies to:

A. b
B. x
C. 1
D. x^b

23. Condense log(x) - log(y) into one logarithm. Answer as an expression.

23.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of b + a
C. the reciprocal of a
D. the slope of a graph

23.2. Which exponential equation matches log_2(8) = 3?

A. 2^3 = 8
B. 3^2 = 8
C. 8^2 = 3
D. 2^8 = 3

23.3. log(xy) can be rewritten as:

A. log(x)log(y)
B. log(x) + log(y)
C. log(x) - log(y)
D. log(x/y)

23.4. log(x / y) can be rewritten as:

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

23.5. log_b(b^x) simplifies to:

A. b
B. x
C. 1
D. x^b

24. Solve 2^x = 32. Answer in the form x = ...

24.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

24.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

24.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

24.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

24.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

25. Solve 3^x = 81. Answer in the form x = ...

25.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

25.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

25.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

25.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

25.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

26. Expand log(x^3). Answer with an equivalent expression.

26.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

26.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

26.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

26.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

26.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

27. Condense 4log(x) into one logarithm. Answer as an expression.

27.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

27.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

27.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

27.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

27.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

28. Solve log_10(x) = 4. Answer in the form x = ...

28.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

28.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

28.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

28.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

28.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

29. Solve log_2(x) = 6. Answer in the form x = ...

29.1. Evaluate log_2(32).

A. 4
B. 5
C. 6
D. 8

29.2. Solve log_5(x) = 2.

A. 7
B. 10
C. 25
D. 32

29.3. Evaluate log_10(100).

A. 1
B. 2
C. 10
D. 100

29.4. Solve log_3(x) = 4.

A. 7
B. 12
C. 27
D. 81

29.5. Evaluate 2log_10(10).

A. 0
B. 1
C. 2
D. 10

30. Condense log(x) + 2log(y). Answer as an expression.

30.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of b + a
C. the reciprocal of a
D. the slope of a graph

30.2. Which exponential equation matches log_2(8) = 3?

A. 2^3 = 8
B. 3^2 = 8
C. 8^2 = 3
D. 2^8 = 3

30.3. log(xy) can be rewritten as:

A. log(x)log(y)
B. log(x) + log(y)
C. log(x) - log(y)
D. log(x/y)

30.4. log(x / y) can be rewritten as:

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

30.5. log_b(b^x) simplifies to:

A. b
B. x
C. 1
D. x^b

31. Expand log((x^2) / y). Answer with an equivalent expression.

31.1. Which expression equals log(xy)?

A. log(x) + log(y)
B. log(x)log(y)
C. log(x) - log(y)
D. log(x / y)

31.2. Which expression equals log(x / y)?

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

31.3. Which expression equals log(x^4)?

A. 4log(x)
B. log(x) / 4
C. log(4x)
D. xlog(4)

31.4. A student says log(xy) = log(x)log(y). What is wrong?

A. the product rule should add, not multiply
B. the bases are missing squares
C. the expression should divide
D. nothing is wrong

31.5. log((x^2) / y) can be written as:

A. 2log(x) - log(y)
B. log(x)^2 - log(y)
C. 2log(xy)
D. log(x) + log(y)

32. Which expression correctly condenses log(a) + log(b) - log(c)?

A. log(ab / c)
B. log(a + b - c)
C. log(a)log(b) / log(c)
D. log(a / bc)

32.1. log_b(a) asks for:

A. the exponent on b that gives a
B. the value of b + a
C. the reciprocal of a
D. the slope of a graph

32.2. Which exponential equation matches log_2(8) = 3?

A. 2^3 = 8
B. 3^2 = 8
C. 8^2 = 3
D. 2^8 = 3

32.3. log(xy) can be rewritten as:

A. log(x)log(y)
B. log(x) + log(y)
C. log(x) - log(y)
D. log(x/y)

32.4. log(x / y) can be rewritten as:

A. log(x) + log(y)
B. log(x) - log(y)
C. log(y) - log(x)
D. log(xy)

32.5. log_b(b^x) simplifies to:

A. b
B. x
C. 1
D. x^b