

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

1. $\log_9 y + \log_9 7 = \log_9 8$

Domain: real variables $y > 0$

2. $\log_8 z + \log_8 10 = 2$

Domain: real variables $z > 0$

3. $\log_5 2 + \log_5 (4 \cdot z^2) = \log_5 2$

Domain: real variables $4 \cdot z^2 > 0$

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Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

4. $\log_3(7 \cdot n^2 + 21) = \log_3(28 \cdot n)$

Domain: real variables $7 \cdot n^2 + 21 > 0$ $28 \cdot n > 0$

5. $\log_7(3 \cdot n) = \log_7(2 \cdot n + 5)$

Domain: real variables $3 \cdot n > 0$ $2 \cdot n + 5 > 0$

6. $\log_4(9 \cdot z - 9) = \log_4(8 \cdot z - 4)$

Domain: real variables $9 \cdot z - 9 > 0$ $8 \cdot z - 4 > 0$

7. $\log_8(9 \cdot n + 5) = \log_8(6 \cdot n - 7)$

Domain: real variables $9 \cdot n + 5 > 0$ $6 \cdot n - 7 > 0$

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Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

8. $\log_6 z + \log_6 10 = \log_6 10$

Domain: real variables $z > 0$

9. $\log_9 2 + \log_9 (2 \cdot t^2) = \log_9 2$

Domain: real variables $2 \cdot t^2 > 0$

10. $\log_3 (9 \cdot x^2 + 18) = \log_3 (-27 \cdot x)$

Domain: real variables $9 \cdot x^2 + 18 > 0$ $-27 \cdot x > 0$

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Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

11. $\log_4 z + \log_4 9 = 2$

Domain: real variables $z > 0$

12. $\log_3(4 \cdot n) = \log_3(5 \cdot n + 6)$

Domain: real variables $4 \cdot n > 0$ $5 \cdot n + 6 > 0$

Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

1. $\log_9 y + \log_9 7 = \log_9 8$

Domain: real variables $y > 0$

Work:

$$7 \cdot y = 8$$

Check $y = \frac{8}{7}$

Arguments: $\frac{8}{7}$ 7 8

valid: every original log argument is positive

$$y \in \left\{ \frac{8}{7} \right\}$$

2. $\log_8 z + \log_8 10 = 2$

Domain: real variables $z > 0$

Work:

$$10 \cdot z = 64$$

Check $z = \frac{32}{5}$

Arguments: $\frac{32}{5}$ 10

valid: every original log argument is positive

$$z \in \left\{ \frac{32}{5} \right\}$$

3. $\log_5 2 + \log_5 (4 \cdot z^2) = \log_5 2$

Domain: real variables $4 \cdot z^2 > 0$

Work:

$$8 \cdot z^2 = 2$$

Check $z = \frac{-1}{2}$

Arguments: 2 1 2

valid: every original log argument is positive

Check $z = \frac{1}{2}$

Arguments: 2 1 2

valid: every original log argument is positive

$$z \in \left\{ \frac{-1}{2}, \frac{1}{2} \right\}$$

Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

4. $\log_3(7 \cdot n^2 + 21) = \log_3(28 \cdot n)$

Domain: real variables $7 \cdot n^2 + 21 > 0$ $28 \cdot n > 0$

Work:

$$7 \cdot n^2 + 21 = 28 \cdot n$$

Check $n = 1$

Arguments: 28 28

valid: every original log argument is positive

Check $n = 3$

Arguments: 84 84

valid: every original log argument is positive

$$n \in \{1, 3\}$$

5. $\log_7(3 \cdot n) = \log_7(2 \cdot n + 5)$

Domain: real variables $3 \cdot n > 0$ $2 \cdot n + 5 > 0$

Work:

$$3 \cdot n = 2 \cdot n + 5$$

Check $n = 5$

Arguments: 15 15

valid: every original log argument is positive

$$n \in \{5\}$$

6. $\log_4(9 \cdot z - 9) = \log_4(8 \cdot z - 4)$

Domain: real variables $9 \cdot z - 9 > 0$ $8 \cdot z - 4 > 0$

Work:

$$9 \cdot z - 9 = 8 \cdot z - 4$$

Check $z = 5$

Arguments: 36 36

valid: every original log argument is positive

$$z \in \{5\}$$

7. $\log_8(9 \cdot n + 5) = \log_8(6 \cdot n - 7)$

Domain: real variables $9 \cdot n + 5 > 0$ $6 \cdot n - 7 > 0$

Work:

$$9 \cdot n + 5 = 6 \cdot n - 7$$

Check $n = -4$

Arguments: -31 -31

extraneous: an original log argument is nonpositive

No real solution

Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

8. $\log_6 z + \log_6 10 = \log_6 10$

Domain: real variables $z > 0$

Work:

$$10 \cdot z = 10$$

Check $z = 1$

Arguments: 1 10 10

valid: every original log argument is positive

$$z \in \{1\}$$

9. $\log_9 2 + \log_9 (2 \cdot t^2) = \log_9 2$

Domain: real variables $2 \cdot t^2 > 0$

Work:

$$4 \cdot t^2 = 2$$

$$\text{Check } t = \frac{-1}{2} \cdot \sqrt{2}$$

Arguments: 2 1 2

valid: every original log argument is positive

$$\text{Check } t = \frac{1}{2} \cdot \sqrt{2}$$

Arguments: 2 1 2

valid: every original log argument is positive

$$t \in \left\{ \frac{-1}{2} \cdot \sqrt{2}, \frac{1}{2} \cdot \sqrt{2} \right\}$$

10. $\log_3 (9 \cdot x^2 + 18) = \log_3 (-27 \cdot x)$

Domain: real variables $9 \cdot x^2 + 18 > 0$ $-27 \cdot x > 0$

Work:

$$9 \cdot x^2 + 18 = -27 \cdot x$$

Check $x = -2$

Arguments: 54 54

valid: every original log argument is positive

Check $x = -1$

Arguments: 27 27

valid: every original log argument is positive

$$x \in \{-2, -1\}$$

Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

11. $\log_4 z + \log_4 9 = 2$

Domain: real variables $z > 0$

Work:

$$9 \cdot z = 16$$

Check $z = \frac{16}{9}$

Arguments: $\frac{16}{9}$ 9

valid: every original log argument is positive

$$z \in \left\{ \frac{16}{9} \right\}$$

12. $\log_3(4 \cdot n) = \log_3(5 \cdot n + 6)$

Domain: real variables $4 \cdot n > 0$ $5 \cdot n + 6 > 0$

Work:

$$4 \cdot n = 5 \cdot n + 6$$

Check $n = -6$

Arguments: -24 -24

extraneous: an original log argument is nonpositive

No real solution