

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Properties of Logarithms

Expand or condense each logarithmic expression.

1. Expand using logarithm properties.

$$\ln(7^5 \cdot 3)$$

2. Expand using logarithm properties.

$$\log_{10}\left((y \cdot z \cdot s)^{\frac{1}{2}}\right)$$

Domain: variables are positive $y > 0$ $z > 0$ $s > 0$

3. Expand using logarithm properties.

$$\log_7\left(\frac{3^6}{7}\right)$$

4. Expand using logarithm properties.

$$\ln\left(\frac{a^3}{u^6}\right)$$

Domain: variables are positive $a > 0$ $u > 0$

5. Expand using logarithm properties.

$$\log_{10}(9^6 \cdot 6^5 \cdot 7)$$

6. Expand using logarithm properties.

$$\log_6(r \cdot m^5 \cdot y^3)$$

Domain: variables are positive $r > 0$ $m > 0$ $y > 0$

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Properties of Logarithms

Expand or condense each logarithmic expression.

7. Condense to one logarithm.

$$5 \cdot \ln 2 + 2 \cdot \ln 8 + 5 \cdot \ln 9$$

8. Condense to one logarithm.

$$6 \cdot \log_{10} r + 6 \cdot \log_{10} p$$

Domain: variables are positive $r > 0$ $p > 0$

9. Condense to one logarithm.

$$2 \cdot \log_9 5 + \log_9 4 + \log_9 2$$

10. Condense to one logarithm.

$$\ln z + 5 \cdot \ln c$$

Domain: variables are positive $z > 0$ $c > 0$

11. Condense to one logarithm.

$$\log_{10} 3 + \log_{10} 6 + \log_{10} 4$$

12. Condense to one logarithm.

$$\log_{15} q - 2 \cdot \log_{15} a$$

Domain: variables are positive $q > 0$ $a > 0$

Properties of Logarithms

Answer Key

Expand or condense each logarithmic expression.

1. Expand using logarithm properties.

$$\ln(7^5 \cdot 3)$$

Work:

$$\ln(7^5 \cdot 3) = 5 \cdot \ln 7 + \ln 3$$

2. Expand using logarithm properties.

$$\log_{10} \left((y \cdot z \cdot s)^{\frac{1}{2}} \right)$$

Domain: variables are positive $y > 0$ $z > 0$ $s > 0$

Work:

$$\log_{10} \left((y \cdot z \cdot s)^{\frac{1}{2}} \right) = \frac{1}{2} \cdot \log_{10} y + \frac{1}{2} \cdot \log_{10} z + \frac{1}{2} \cdot \log_{10} s$$

3. Expand using logarithm properties.

$$\log_7 \left(\frac{3^6}{7} \right)$$

Work:

$$\log_7 \left(\frac{3^6}{7} \right) = 6 \cdot \log_7 3 - \log_7 7$$

4. Expand using logarithm properties.

$$\ln \left(\frac{a^3}{u^6} \right)$$

Domain: variables are positive $a > 0$ $u > 0$

Work:

$$\ln \left(\frac{a^3}{u^6} \right) = 3 \cdot \ln a - 6 \cdot \ln u$$

5. Expand using logarithm properties.

$$\log_{10} (9^6 \cdot 6^5 \cdot 7)$$

Work:

$$\log_{10} (9^6 \cdot 6^5 \cdot 7) = 6 \cdot \log_{10} 9 + 5 \cdot \log_{10} 6 + \log_{10} 7$$

6. Expand using logarithm properties.

$$\log_6 (r \cdot m^5 \cdot y^3)$$

Domain: variables are positive $r > 0$ $m > 0$ $y > 0$

Work:

$$\log_6 (r \cdot m^5 \cdot y^3) = \log_6 r + 5 \cdot \log_6 m + 3 \cdot \log_6 y$$

Properties of Logarithms

Answer Key

Expand or condense each logarithmic expression.

7. Condense to one logarithm.

$$5 \cdot \ln 2 + 2 \cdot \ln 8 + 5 \cdot \ln 9$$

Work:

$$5 \cdot \ln 2 + 2 \cdot \ln 8 + 5 \cdot \ln 9 = \ln \left(2^5 \cdot 8^2 \cdot 9^5 \right)$$

8. Condense to one logarithm.

$$6 \cdot \log_{10} r + 6 \cdot \log_{10} p$$

Domain: variables are positive $r > 0$ $p > 0$

Work:

$$6 \cdot \log_{10} r + 6 \cdot \log_{10} p = \log_{10} \left((r \cdot p)^6 \right)$$

9. Condense to one logarithm.

$$2 \cdot \log_9 5 + \log_9 4 + \log_9 2$$

Work:

$$2 \cdot \log_9 5 + \log_9 4 + \log_9 2 = \log_9 \left(5^2 \cdot 4 \cdot 2 \right)$$

10. Condense to one logarithm.

$$\ln z + 5 \cdot \ln c$$

Domain: variables are positive $z > 0$ $c > 0$

Work:

$$\ln z + 5 \cdot \ln c = \ln \left(z \cdot c^5 \right)$$

11. Condense to one logarithm.

$$\log_{10} 3 + \log_{10} 6 + \log_{10} 4$$

Work:

$$\log_{10} 3 + \log_{10} 6 + \log_{10} 4 = \log_{10} \left(3 \cdot 6 \cdot 4 \right)$$

12. Condense to one logarithm.

$$\log_{15} q - 2 \cdot \log_{15} a$$

Domain: variables are positive $q > 0$ $a > 0$

Work:

$$\log_{15} q - 2 \cdot \log_{15} a = \log_{15} \left(\frac{q}{a^2} \right)$$