

Math Sheet

Name _____ Score _____ / 14 Teacher _____ Date _____

Exponential Equations Without Logarithms

Rewrite each equation with a common base, equate the exponents, and solve exactly.

1. Rewrite using base 7.

$$\frac{7^{-2 \cdot q}}{7^{-4 \cdot q + 3}} = 7^{4 \cdot q}$$

Domain: real variables $q \in \mathbb{R}$

2. Rewrite using base 4.

$$4^{3 \cdot n + 3} = 4^{4 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

3. Rewrite using base 7.

$$\left(\frac{1}{7}\right)^{n+2} \cdot 343^{2 \cdot n} = \frac{1}{343}$$

Domain: real variables $n \in \mathbb{R}$

4. Rewrite using base 7.

$$49^{4 \cdot m - 2} \cdot 7^m = 343$$

Domain: real variables $m \in \mathbb{R}$

5. Rewrite using base 3.

$$3^{-2 \cdot n + 2} \cdot 27 = 3^{-4 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

6. Rewrite using base 7.

$$7^{-z} \cdot 7^{-4 \cdot z} = \frac{1}{343}$$

Domain: real variables $z \in \mathbb{R}$

7. Rewrite using base 6.

$$6^{2 \cdot n + 1} \cdot 6^n = 6^{2 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

8. Rewrite using base 10.

$$10^{4 \cdot y + 3} = 1000$$

Domain: real variables $y \in \mathbb{R}$

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Exponential Equations Without Logarithms

Rewrite each equation with a common base, equate the exponents, and solve exactly.

9. Rewrite using base 4.

$$4^{-4 \cdot n} \cdot 4^{3 \cdot n} = 16$$

Domain: real variables $n \in \mathbb{R}$

10. Rewrite using base 8.

$$8^{-z+2} \cdot 8^{-z} = 8^{-z}$$

Domain: real variables $z \in \mathbb{R}$

11. Rewrite using base 2.

$$2^m \cdot 2^m = \frac{1}{4}$$

Domain: real variables $m \in \mathbb{R}$

12. Rewrite using base 5.

$$\left(\frac{1}{5}\right)^{2 \cdot y + 1} \cdot 25^{3 \cdot y} = \frac{1}{25}$$

Domain: real variables $y \in \mathbb{R}$

13. Rewrite using base 5.

$$5^{-2 \cdot q + 1} = 25$$

Domain: real variables $q \in \mathbb{R}$

14. Rewrite using base 7.

$$7^{-q+3} = 7^{3 \cdot q}$$

Domain: real variables $q \in \mathbb{R}$

Exponential Equations Without Logarithms

Answer Key

Rewrite each equation with a common base, equate the exponents, and solve exactly.

1. Rewrite using base 7.

$$\frac{7^{-2} \cdot q}{7^{-4} \cdot q + 3} = 7^{4 \cdot q}$$

Domain: real variables $q \in \mathbb{R}$

Work:

$$\frac{7^{-2} \cdot q}{7^{-4} \cdot q + 3} = 7^{4 \cdot q}$$

$$2 \cdot q - 3 = 4 \cdot q$$

$$q \in \left\{ \frac{-3}{2} \right\}$$

2. Rewrite using base 4.

$$4^{3 \cdot n + 3} = 4^{4 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

Work:

$$4^{3 \cdot n + 3} = 4^{4 \cdot n}$$

$$3 \cdot n + 3 = 4 \cdot n$$

$$n \in \{3\}$$

3. Rewrite using base 7.

$$\left(\frac{1}{7} \right)^{n+2} \cdot 343^{2 \cdot n} = \frac{1}{343}$$

Domain: real variables $n \in \mathbb{R}$

Work:

$$7^{-n-2} \cdot 7^{6 \cdot n} = 7^{-3}$$

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

$$n \in \left\{ \frac{-1}{5} \right\}$$

4. Rewrite using base 7.

$$49^{4 \cdot m - 2} \cdot 7^m = 343$$

Domain: real variables $m \in \mathbb{R}$

Work:

$$7^{8 \cdot m - 4} \cdot 7^m = 7^3$$

$$9 \cdot m - 4 = 3$$

$$m \in \left\{ \frac{7}{9} \right\}$$

5. Rewrite using base 3.

$$3^{-2 \cdot n + 2} \cdot 27 = 3^{-4 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

Work:

$$3^{-2 \cdot n + 2} \cdot 3^3 = 3^{-4 \cdot n}$$

$$-2 \cdot n + 5 = -4 \cdot n$$

$$n \in \left\{ \frac{-5}{2} \right\}$$

6. Rewrite using base 7.

$$7^{-z} \cdot 7^{-4 \cdot z} = \frac{1}{343}$$

Domain: real variables $z \in \mathbb{R}$

Work:

$$7^{-z} \cdot 7^{-4 \cdot z} = 7^{-3}$$

$$-5 \cdot z = -3$$

$$z \in \left\{ \frac{3}{5} \right\}$$

7. Rewrite using base 6.

$$6^{2 \cdot n + 1} \cdot 6^n = 6^{2 \cdot n}$$

Domain: real variables $n \in \mathbb{R}$

Work:

$$6^{2 \cdot n + 1} \cdot 6^n = 6^{2 \cdot n}$$

$$3 \cdot n + 1 = 2 \cdot n$$

$$n \in \{-1\}$$

8. Rewrite using base 10.

$$10^{4 \cdot y + 3} = 1000$$

Domain: real variables $y \in \mathbb{R}$

Work:

$$10^{4 \cdot y + 3} = 10^3$$

$$4 \cdot y + 3 = 3$$

$$y \in \{0\}$$

Exponential Equations Without Logarithms

Answer Key

Rewrite each equation with a common base, equate the exponents, and solve exactly.

9. Rewrite using base 4.

$$4^{-4-n} \cdot 4^{3-n} = 16$$

Domain: real variables $n \in \mathbb{R}$

Work:

$$4^{-4-n} \cdot 4^{3-n} = 4^2$$

$$-1-n = 2$$

$$n \in \{-2\}$$

10. Rewrite using base 8.

$$8^{-z+2} \cdot 8^{-z} = 8^{-z}$$

Domain: real variables $z \in \mathbb{R}$

Work:

$$8^{-z+2} \cdot 8^{-z} = 8^{-z}$$

$$-2 \cdot z + 2 = -1 \cdot z$$

$$z \in \{2\}$$

11. Rewrite using base 2.

$$2^m \cdot 2^m = \frac{1}{4}$$

Domain: real variables $m \in \mathbb{R}$

Work:

$$2^m \cdot 2^m = 2^{-2}$$

$$2 \cdot m = -2$$

$$m \in \{-1\}$$

12. Rewrite using base 5.

$$\left(\frac{1}{5}\right)^{2 \cdot y + 1} \cdot 25^{3 \cdot y} = \frac{1}{25}$$

Domain: real variables $y \in \mathbb{R}$

Work:

$$5^{-2 \cdot y - 1} \cdot 5^{6 \cdot y} = 5^{-2}$$

$$4 \cdot y - 1 = -2$$

$$y \in \left\{\frac{-1}{4}\right\}$$

13. Rewrite using base 5.

$$5^{-2 \cdot q + 1} = 25$$

Domain: real variables $q \in \mathbb{R}$

Work:

$$5^{-2 \cdot q + 1} = 5^2$$

$$-2 \cdot q + 1 = 2$$

$$q \in \left\{\frac{-1}{2}\right\}$$

14. Rewrite using base 7.

$$7^{-q+3} = 7^{3 \cdot q}$$

Domain: real variables $q \in \mathbb{R}$

Work:

$$7^{-q+3} = 7^{3 \cdot q}$$

$$-1 \cdot q + 3 = 3 \cdot q$$

$$q \in \left\{\frac{3}{4}\right\}$$