

Lesson 38

NAME:

Exponential Equations and Inequalities



Start by navigating to the Online Lesson for instructions.

Objectives

- ✓ Solve exponential equations.
- ✓ Solve exponential inequalities.

Why?

The Exponent Rules can be applied to equations and inequalities. Applying them allows you to solve more complicated problems, including formulas, in later lessons.



Warm Up

Write the expression as one term.

1) $4^{3x} \cdot 4^{2x-1}$

2) $25 \cdot 5^{x+6}$

Write the number as a single base raised to a power.

3) 81

4) $\frac{125}{64}$



To continue, return to the Online Lesson.

Explore

Exponential Equations

 *Fill in the notes as you watch the video in the Online Lesson.*

- All of the Exponent Rules apply to _____.
- To solve problems with exponents, the _____.
- When an exponent is negative, the _____ is taken.
- _____ to check the solution to exponential equations is recommended because the values are often very large or small.

Example 1

 *Complete the example as you watch the video in the Online Lesson.*

Solve.

$$\left(\frac{1}{32}\right)^{x+5} = 8^{x-3}$$

Plan

Write the equation with a common base
Set the exponential expressions equal to one another
Solve
Check work using technology

Implement

Example 2

 Complete the example as you watch the video in the Online Lesson.

Solve.

$$\left(\frac{64}{25}\right)^{2x+1} = \left(\frac{125}{512}\right)^{1-3x}$$

 Checkpoint: Exponential Equations


Solve.

$$216 = \left(\frac{1}{6}\right)^{3-x}$$



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Exponential Inequalities

 *Fill in the notes as you watch the video in the Online Lesson.*

- Exponential inequalities are solved using the _____ as solving equations.
- Remember, if you multiply or divide by a negative number the _____ of the inequality symbol changes.

Example 3

 *Complete the example as you watch the video in the Online Lesson.*

Solve.

$$8^{x+3} \leq \left(\frac{1}{64}\right)^{x-2}$$

Example 4

 *Complete the example as you watch the video in the Online Lesson.*

Solve.

$$1000^{x+2} > 10^{-3x+9}$$

Checkpoint: Exponential Inequalities

Solve.

$$125^{4x-4} \geq 625^{3-x}$$



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 **Practice 1**

Complete problems on a separate sheet of paper.

Solve.

Remember, there must be a common base before solving for an indicated variable.

1) $\left(\frac{2}{5}\right)^{3x+1} = \left(\frac{8}{125}\right)$

2) $\left(\frac{1}{27}\right)^{2d} = 81^{d-5}$

3) $36^{4c-3} = 216^{c+1}$

4) $8^{2y-5} = 16^y$

5) $100^{2v} = 1000^{v+3}$

6) $\left(\frac{1}{8}\right)^{u+3} = \left(\frac{1}{32}\right)^u$

7) $\left(\frac{25}{81}\right)^{2m+1} = \left(\frac{729}{125}\right)^{-3m}$

8) $7^{5x} = 343^{x-2}$

9) $25^{2t-6} = 125^t$

10) $\left(\frac{1}{36}\right)^{p+3} < 216^{-2p}$

11) $\left(\frac{4}{9}\right)^{3-x} > \left(\frac{8}{27}\right)^{x+1}$

12) $9^{-x+5} \geq 27^{\frac{1}{3}x+2}$

13) $\left(\frac{1}{4}\right)^{-z+8} < \left(\frac{1}{8}\right)^{2z}$

14) $25^{3x+7} > 25^{2x+1}$



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 **Mastery Check** **Show What You Know**

Both groups of students *incorrectly* solved the problem: $64 \cdot 4^{2(x+2)} = 2^{8x+6}$

Rationals Group

$$2^6 \cdot 2^{2(2x+4)} = 2^{(8x+6)}$$

$$6(4x+8) = 8x+6$$

$$24x+48 = 8x+6$$

$$16x = -42$$

$$x = -2.625$$

Irrationals Group

$$2^6 \cdot 2^{2x+4} = 2^{8x+6}$$

$$6+2x+4 = 8x+6$$

$$2x+10 = 8x+6$$

$$4 = 6x$$

$$x = \frac{2}{3}$$

Read the entire problem before starting. You may prefer to solve the equation and then identify the errors, or you may prefer to find the errors and then solve it correctly.

- A)** Solve the problem to find the correct solution. (Hint: Review the exponent rules on your Formula Sheet.)

- B)** Explain the error each group made.

- C) Change the original equation to an inequality so that the incorrect answers for both the Rationals Group and Irrationals Group are true.

 **Say What You Know**

In your own words, talk about what you have learned using the objectives for this lesson and your work on this page.



To continue, return to the Online Lesson.

 Practice 2

Complete problems on a separate sheet of paper.

Solve.

1) $64^{3-x} = 32^{2x+1}$

2) $49^{a+4} = 343^{a+2}$

3) $625^y = \left(\frac{1}{125}\right)^{-2y+5}$

4) $\left(\frac{1}{4}\right)^{3x-2} = 128^{x-2}$

5) $81^{b+5} = 243^b$

6) $36^{3v-4} = \left(\frac{1}{216}\right)^{4-v}$

7) $8^x = 64^x$

8) $27^{3x} = \left(\frac{1}{81}\right)^{2-3x}$

9) $15^{3n} \geq 225^{2n+1}$

10) $1000^{2-3x} < 10000^{x+4}$

11) $\left(\frac{1}{121}\right)^{3h} \leq 11^{2h-3}$

12) $8^{7-2p} > 16^{5-p}$

13) $81^{5w+2} < 27^{4w+2}$

14) $36^{2k-1} > 36^{-k}$



To continue, return to the Online Lesson.