

15. $1\frac{1}{2}$
 14. $\frac{25}{4}$
 13. $6\frac{1}{4}$
 12. $6\frac{1}{4}$
 11. 81
 10. 343
 9. $\frac{1}{4}$
 8. $-\frac{1}{4}$
 7. 4
 6. -4
 5. $\frac{1}{36}$
 4. $\frac{343}{1}$
 3. 125
 2. $\frac{27}{64}$ or $2\frac{27}{10}$
 1. $\frac{100}{1}$
20. $-\frac{3}{2}$
 19. $\frac{9}{4}$
 18. $9\frac{9}{4}$
 17. $2\frac{1}{4}$
 16. $\frac{3}{2}$

BASIC MATH

The Complete Course
Lesson Eighteen

Negative & Fractional Powers

KA8418

Teaching Guide & Worksheet

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HOW TO USE THE VIDEO AND TEACHING GUIDE

1. The "STOP TO THINK" signal means pause to think.
2. The "STOP TO WORK" signal means work the problem(s).
3. Rewind the tape and watch the lesson again if the concept is not clear.
4. Use "Learning Strategies" section of the Teachers Guide as memory aids and topics for classroom discussion.
5. Students should complete the exercises on the worksheet to confirm their understanding of this lesson.

Instructors may duplicate the worksheets as needed

LEARNING STRATEGIES

NEGATIVE POWERS

- A. Using division of numbers in exponential form to discover the meaning of a negative power
- $6^4 \div 6^7 = 6^{-3}$
 - $6^4/6^7 = 1/6^3$
 - $6^{-3} = 1/6^3$
- B. The negative power is the reciprocal
- C. Since dividing by a number is the same as multiplying by its reciprocal, dividing by a number to a power is the same as multiplying by that number to the opposite power
- D. Order of operations
- Change all the division steps to multiplication steps by using the opposite power
 - Multiply by adding the powers
- E. Applying the rules in problems
- $4^5 \div 4^3 \times 4^7 \div 4^2$
 - $4^5 \times 4^3 \times 4^7 \times 4^{-2}$
 - $5 + 3 - 7 - 2 = -1$
 - $4^{-1} = \frac{1}{4}$
-

FRACTIONAL POWERS

- A. Using the rule for raising a base to a power to a power and the rule for multiplying numbers in exponential form to discover the meaning of the fractional power
- B. If a/b is a fractional power, then "a" is the power and "b" is the root
- The $1/2$ power is the square root
 - The $1/3$ power is the cube root
 - The $3/2$ power is the cube of the square root
-

NEGATIVE FRACTIONAL POWERS

- A. The negative power means you must use the reciprocal
- B. The fractional power determines the power and the root
- $64^{-2/3}$
 - $\frac{1}{64^{2/3}}$
 - $\frac{1}{(3\sqrt{64})^2}$
 - $\frac{1}{(3\sqrt{64})^2}$
-

POWERS OF NEGATIVE NUMBERS

- A. Applying the PEMDAS rule to show that -5^2 is not the same as $(-5)^2$
- $-5^2 = -25$
 - $(-5)^2 = +25$
- B. Demonstrating that a negative number to an even power is positive and a negative number to an odd power is negative
- C. Demonstrating that a power of a positive number can never be negative
- $-7 \times -7 \times -7 \times -7 \times -7 \times -7 \times -7$ is positive
 - $-8 \times -8 \times -8 \times -8 \times -8$ is negative

- D. Examine a negative fractional power of a negative number

- $(-27)^{4/3} = \frac{1}{(-27)^{4/3}}$
- $\sqrt[3]{-27} = -3$
- $(-3)^4 = +81$
- $(-27)^{-4/3} = \frac{1}{81}$

WORKSHEET STRATEGIES

Solve the following:

- $10^{-2} = \underline{\hspace{2cm}}$
- $\left(\frac{3}{4}\right)^{-3} = \underline{\hspace{2cm}}$
- $25^{\frac{3}{2}} = \underline{\hspace{2cm}}$
- $49^{-\frac{3}{2}} = \underline{\hspace{2cm}}$
- $(6^2 \div 6^3)^{-2} \div (6^4 \times 5^{-5})^3 \div (6^{-3})^{-5} = \underline{\hspace{2cm}}$
- $-8^{\frac{2}{3}} = \underline{\hspace{2cm}}$
- $(-8)^{\frac{2}{3}} = \underline{\hspace{2cm}}$
- $-8^{-\frac{2}{3}} = \underline{\hspace{2cm}}$
- $(-8)^{-\frac{2}{3}} = \underline{\hspace{2cm}}$
- $49^{-\frac{3}{2}} = \underline{\hspace{2cm}}$
- $(-3)^4 = \underline{\hspace{2cm}}$
- $\left(2\frac{1}{2}\right)^2 = \underline{\hspace{2cm}}$
- $\left(-2\frac{1}{2}\right)^2 = \underline{\hspace{2cm}}$
- $\left(-2\frac{1}{2}\right)^{-2} = \underline{\hspace{2cm}}$
- $\left(2\frac{1}{4}\right)^{\frac{1}{2}} = \underline{\hspace{2cm}}$
- $\left(2\frac{1}{4}\right)^{-\frac{1}{2}} = \underline{\hspace{2cm}}$
- $\left(3\frac{3}{8}\right)^{\frac{3}{2}} = \underline{\hspace{2cm}}$
- $\left(3\frac{3}{8}\right)^{-\frac{3}{2}} = \underline{\hspace{2cm}}$
- $\left(-3\frac{3}{8}\right)^{\frac{3}{2}} = \underline{\hspace{2cm}}$
- $\left(-3\frac{3}{8}\right)^{-\frac{3}{2}} = \underline{\hspace{2cm}}$