



Concept: The Exponents Rules

Name:

- You should have completed Exponents Outline A for Topic 3: The Exponents Rules before beginning this handout.

Warm Up

Complete the following. Show all your steps.

(a) $2^3 \times 2^6 =$

(b) $4^9 \div 4^7 =$

(c) $4^{15} \div 4^5 =$

(d) $(2^2)^4 =$

(e) $(3^4)^3 =$

(f) $(4ab)^3 =$

COMPUTER COMPONENT

Instructions: Select the computer program *Understanding Exponents* (Neufeld)
Follow the instructions to the Main Menu.
Select *The Exponent Rules* from the Main Menu.

Notice: You will need to use the **Jump To** feature of the program (found on the top left of your screen) in order to get to the section where you left off.



Work through all sections of this topic **in order**:

- *A Power with Exponent Zero*
- *A Power with a Negative Exponent*
- *Summary of Exponent Rules*
- *Powers with Rational Bases*
- *Examples Questions*
- *Practice Questions*
-

Additional Required Materials: Scientific calculator



As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Practice Questions* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

NOTES:**Exponent Rule 5**

When calculating a power with exponent _____ :

- The base _____ equal _____ because we cannot
_____ by _____.

$$x^0 = \underline{\hspace{2cm}}$$

Practice:

$$4^0 =$$

Exponent Rule 6

When calculating a power with a _____ exponent:

- The base _____ equal _____ because we cannot _____ by _____.

$$x^{-a} = \frac{1}{x^a}$$

Practice:

$$4^{-7} =$$

Summary of Rules for Exponents

Match the Rules:

$$x^0$$

$$x^{m-n}, \quad x \neq 0$$

$$\frac{x^m}{x^n}$$

$$x^m y^m$$

$$x^1$$

$$x^{m \times n}$$

$$(x^m)^n$$

$$\frac{1}{x^m}, \quad x \neq 0$$

$$(xy)^m$$

$$x$$

$$x^{-m}$$

$$1, \quad x \neq 0$$

Exponent Rule 7

When raising a _____ base to an exponent :

- raise _____ the _____ and _____ to the exponent
- The y base _____ equal _____ because we cannot _____ by _____.

$$\left(\frac{x}{y}\right)^2 = \underline{\hspace{2cm}}$$

Practice:

$$\left(\frac{3}{5}\right)^4 =$$

OFF COMPUTER EXERCISES

1. Simplify. *Remember to use the Rules For Exponents.*

(a) $(2^5)^3 =$

(b) $(-14)^0 =$

(c) $2^5 \times 2^4 \div 2^3 =$

(d) $3^8 \div 3^2 \times 3^3 =$

(e) $(6^0)^4 =$

(f) $(16m^5) \div (8m^3) =$

(g) $2^4 \div 2^5 =$

(h) $3^3 - 2^4 =$

(i) $5^2 \div 5^{-3} =$

(j) $(z^4)^5 \div (z^1)^4 =$

2. A colony of cells triples every hour. The current population is 243 cells. *Complete the chart below in order to determine:*

(a) The cell population 3 hours from now.

(b) The cell population 4 hours ago.

Time (hours) (T)	Population (P)	Population as a Power of 3
-4		
-3		
-2	9	
-1		
0	243	
1		243×3^1
2		243×3^2
3		
4		

- (c) The equation involving P (population) and T (time) that represents the information.

3. Write each as a power with a positive exponent.

Example: $3^{-6} = \frac{1}{3^6}$

(a) $2^{-3} =$

(b) $(-3)^{-2} =$

(c) $-5^{-3} =$

(d) $6^{-2} =$

4. Evaluate.

(a) $(-2)^{-3} =$

(b) $-2^{-4} =$

(c) $8^0 =$

(d) $(3)^{-2} =$

(e) $(4^{-3})^{-2} =$

(f) $15c^{-0} =$

(g) $(15c)^{-0} =$

(h) $5^{-1} =$

(i) $(9)^{-3} \div (9)^{-6} =$

(j) $4w^2 \times 5w^6 =$

5. Evaluate. Remember the rule to follow when the base is a rational number.

$$\text{Example 1: } \left(\frac{1}{9}\right)^2 = \frac{1^2}{9^2} = \frac{1}{81}$$

$$\text{Example 2: } \left(\frac{3}{4}\right)^{-2} = \frac{1}{\left(\frac{3}{4}\right)^2} = \frac{1}{\left(\frac{9}{16}\right)} = 1 \div \frac{9}{16} = \frac{16}{9}$$

(a) $\left(\frac{2}{5}\right)^2$

(b) $\left(\frac{1}{4}\right)^3$

(c) $\left(\frac{1}{5}\right)^{-3}$

(d) $\left(\frac{1}{6}\right)^{-1}$

(e) $\left(\frac{2}{3}\right)^{-4}$

(f) $\left(\frac{4}{5}\right)^{-2}$

6. Review the rules of exponents and decide which one you found most difficult. Explain why it was more difficult. *Give examples to support your answer.*
