

Worksheet 5-2: Zero and Negative Exponents**Investigation: Zero and Negative Exponents**

Quotient	Expanded Form	Number of Factors	Single Power	Evaluated
$\frac{5^4}{5^4}$	$\frac{5 \times 5 \times 5 \times 5}{5 \times 5 \times 5 \times 5}$	0	5^0	1
$\frac{(-3)^5}{(-3)^5}$				
$\frac{2^3}{2^3}$				
$\frac{4^2}{4^3}$	$\frac{4 \times 4}{4 \times 4 \times 4}$	-1	4^{-1}	$\frac{1}{4}$
$\frac{2^3}{2^5}$				
$\frac{(-10)^3}{(-10)^6}$				

Zero Exponent: $x^0 =$

Negative Exponent: $x^{-n} =$

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

Practice:

1. Write each as a single power with positive exponents, then evaluate as integers or fractions.

(a) 8^{-2}

(b) 100^0

(c) $(-4)^{-1}$

(d) $\frac{1}{3^{-2}}$

2. Use exponent rules to simplify each expression then evaluate as integers or fractions.

(a) $4^3 \times 4^{-5}$

(b) $\frac{(-2)^2}{(-2)^{-5}}$

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

(d) $\left(\frac{5^3 \times 5^4}{5^7}\right)^{105}$

3. Evaluate the power in each statement. Express your answers as integers or fractions.

(a) One kilobyte is 2^{10} bytes.(b) One byte is 2^{-10} kilobytes.(c) One megabyte is $(2^{10})^2$ bytes.(d) One byte is $(2^{-10})^3$ gigabytes.(e) One bit is 2^{-3} bytes.(f) One bit is $2^{-40} \times 2^{-3}$ terabytes.

Answers: 1. (a) $\frac{1}{8^2} = \frac{1}{64}$, (b) 1, (c) $\frac{1}{(-4)^1} = -\frac{1}{4}$, (d) $3^2 = 9$; 2. (a) $\frac{1}{16}$, (b) -128 , (c) $\frac{1}{4096}$, (d) 1;

3. (a) 1024, (b) $\frac{1}{1024}$, (c) 1 048 576, (d) $\frac{1}{1073\ 741\ 824}$, (e) $\frac{1}{8}$, (f) $\frac{1}{8\ 796\ 093\ 022\ 208}$