## Lesson 7: Negative Exponents

* Let’s explore numbers with negative exponents.

### 7.1: Math Talk: Powers of Ten

Solve each equation mentally:

$\frac{100}{1}=10^{x}$

$\frac{1000}{x}=10^{1}$

$\frac{x}{100}=10^{0}$

$\frac{100}{1000}=10^{x}$

### 7.2: Maintain the Pattern

Complete the table.

|   | exponential form | number form | calculations |
| --- | --- | --- | --- |
|   | $2^{5}$ |   |   |
|   |   | 16 |   |
| $\frac{2^{4}}{2}=2^{4−1}=2^{3}$ | $2^{3}$ |   |   |
| $\frac{2^{3}}{2}=2^{3−1}=2^{2}$ | $2^{2}$ | 4 |   |
|   |   | 2 | $4⋅\frac{1}{2}=2$ |
|   |   | 1 | $2⋅\frac{1}{2}=1$ |
|   | $2^{-1}$ | $\frac{1}{2}$ |   |
|   |   | $\frac{1}{4}$ | $\frac{1}{2}⋅\frac{1}{2}=\frac{1}{4}$ |
|   | $2^{-3}$ |   |   |
|   | $2^{-4}$ |   |   |
|   |   | $\frac{1}{32}$ |   |

### 7.3: Matching Equal Expressions

Take turns with your partner to match the original expression with an equal or equivalent expression in the list.

* For each match that you find, explain to your partner how you know it’s a match.
* For each match that your partner finds, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.

Which expressions equal $8^{0}$?

* 1
* 0
* $8^{3}⋅8^{−3}$
* $\frac{8^{2}}{8^{2}}$
* $11^{0}$

Which expressions equal $5^{-2}$?

* $-5^{2}$
* $\frac{5^{0}}{5^{2}}$
* $-2^{5}$
* $\frac{1}{5^{2}}$
* $5^{-1}⋅5^{-1}$

Which expressions equal $3^{10}$?

* $3^{5}⋅3^{2}$
* $\left(3^{5}\right)^{2}$
* $3^{7}⋅3^{3}$
* $3^{13}⋅3^{-3}$
* $\frac{3^{10}}{3^{0}}$

Which expressions are equivalent to $x^{-4}$?

* $\frac{x^{9}}{x^{5}}$
* $\frac{x^{5}}{x^{9}}$
* $\frac{x^{3}}{x^{−1}}$
* $x⋅x^{-5}$
* $\frac{1}{x^{4}}$



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