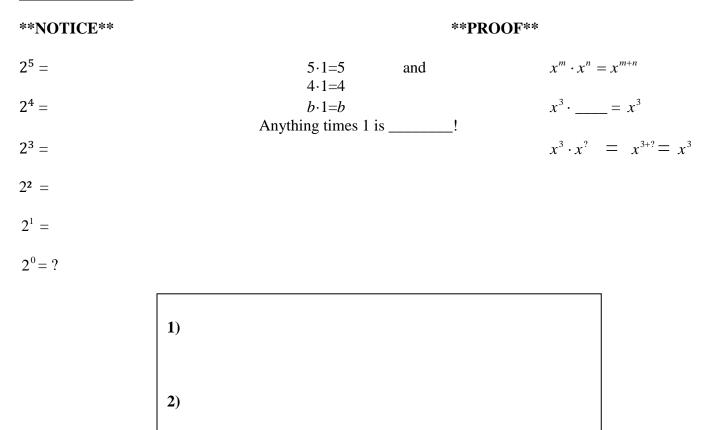# 8.3:  Zero and Negative Exponents

**Goals:** *Simplify expressions raised to the zero power
       *Rewrite expressions using all positive exponents

## Zero Exponents:

**\*\*NOTICE\*\***                                                    **\*\*PROOF\*\***

$2^5 =$                                    $5 \cdot 1 = 5$        and        $x^m \cdot x^n = x^{m+n}$
                                           $4 \cdot 1 = 4$
$2^4 =$                                    $b \cdot 1 = b$                   $x^3 \cdot \underline{\quad} = x^3$
                               Anything times 1 is _____!

$2^3 =$                                                                     $x^3 \cdot x^? = x^{3+?} = x^3$

$2^2 =$

$2^1 =$

$2^0 = ?$

```
1)



2)


```

## Negative Exponents:

**\*\*NOTICE\*\***                                                    **\*\*PROOF\*\***

$2^2 =$                                                $\dfrac{a^m}{a^n} = a^{m-n}$

$2^1 =$

                                                       $\dfrac{2^4}{2^5} = 2^{4-5} = 2^{-1}$

$2^0 =$

$2^{-1} = \qquad = \dfrac{1}{2^?}$             $\dfrac{2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = \qquad = \dfrac{1}{2^?}$

$2^{-2} = \qquad = \dfrac{1}{2^?}$

**Simplify the following expressions. Write your answer using positive exponents.**

**Ex:** $\left(\dfrac{2}{3}\right)^0$

**Ex:** $(-1)^0$

**Ex:** $x^{-2}$

**Ex:** $4^{-3}$

**Ex:** $(-8)^{-2}$

**What if the item is already in the denominator and has a negative exponent?**

**Ex:** $\dfrac{1}{y^{-3}}$

**Ex:** $\dfrac{1}{2^{-3}}$

**Putting it all together.**

**Ex:** $\dfrac{7^3}{7^5}$

**Ex:** $\left(2xy^{-5}\right)^3$

**Ex:** $(3x^{-2}y^2)^3$

**Ex:** $\dfrac{5^{-1}}{5^2}$

**Some more complicated ones:**

**Ex:** $\left(\dfrac{2}{3}\right)^{-2}$

**Ex:** $\dfrac{(2x)^{-2}y^5}{-4x^2y^2}$

**Ex:** $\dfrac{4x^{-2}y^4}{8xy^6}$