**Zero and Negative Exponents**

We’ve seen expressions with positive exponents, but what about having a zero or negative exponent?

Fill in the table below and look for a pattern to help you find $4^{0}$.

$4^{0}=$ ?

|  |  |
| --- | --- |
| $$4^{4}$$ |  |
| $$4^{3}$$ |  |
| $$4^{2}$$ |  |
| $$4^{1}$$ |  |
| $$4^{0}$$ |  |

The **Zero Exponent Property** states that any nonzero base raised to the zero power

is equal to \_\_\_\_\_\_\_.

|  |
| --- |
| **Zero Exponent Property** |
| For any nonzero number *a*$$a^{0}=1$$ |

Look at each expression and determine how to simplify the expression using the Zero Exponent Property.

$1. \left(4.7\right)^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $2. \left(-6\right)^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $3. -\left(6\right)^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$

$4. \left(3ab\right)^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $5. 3ab^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$

|  |
| --- |
| But why isn’t $3ab^{0}$ equal to 1? |

Look carefully at what is being raised to the zero power. Without parentheses, the zero power only applies to base *b* so only $b^{0}$ is equal to 1. Therefore the expression simplifies to $3a$.

Simplify each expression.

$1. x^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $2. \left(-3.4\right)^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$

$3. -6^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $4. 5xy^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Get your answers checked before moving on\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Recall the table previously used to find the value of $5^{0}$. Now let’s extend that table to look at negative exponents. Using the pattern of dividing, complete each table. Express your answers as fractions when necessary.

|  |  |
| --- | --- |
| Expression | Value |
| $$5^{3}$$ |  |
| $$5^{2}$$ |  |
| $$5^{1}$$ |  |
| $$5^{0}$$ |  |
| $$5^{-1}$$ |  |
| $$5^{-2}$$ |  |
| $$5^{-3}$$ |  |

Did you notice a pattern for the negative exponents?

The **Negative Exponent Property** states that any nonzero base raised to a negative power can be written as one over the base to the opposite power.

|  |
| --- |
| **Negative Exponent Property** |
| For all numbers *a* and *n* where $a\ne 0$, $$a^{-n}=\frac{1}{a^{n}}$$ |

Simplify each expression using positive exponents.

$1. x^{-5}y^{7}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $2. 4^{-2}m^{-11}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $3. 7^{-3}s^{13}y^{0}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$

$4. \frac{1}{a^{-3}}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ $5. \frac{-8a^{-1}b}{c^{-5}}=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$