Lesson 1: Exponential Notation

Classwork

5^6 means $5 \times 5 \times 5 \times 5 \times 5 \times 5$ and $\left(\frac{9}{7}\right)^4$ means $\frac{9}{7} \times \frac{9}{7} \times \frac{9}{7} \times \frac{9}{7}$.

You have seen this kind of notation before, it is called **exponential notation**. In general, for any number x and any positive integer n,

$$x^n = \underbrace{(x \cdot x \cdots x)}_{n \text{ times}}$$

The number x^n is called x **raised to the** n**-th power**, n is the **exponent** of x in x^n and x is the **base** of x^n.

Exercise 1

$\underbrace{4 \times \cdots \times 4}_{7 \text{ times}} =$

Exercise 2

$\underbrace{3.6 \times \cdots \times 3.6}_{\_\_\_\_ \text{ times}} = 3.6^{47}$

Exercise 3

$\underbrace{(-11.63) \times \cdots \times (-11.63)}_{34 \text{ times}} =$

Exercise 4

$\underbrace{12 \times \cdots \times 12}_{\_\_\_\_ \text{ times}} = 12^{15}$

Exercise 5

$\underbrace{(-5) \times \cdots \times (-5)}_{10 \text{ times}} =$

Exercise 6

$\underbrace{\frac{7}{2} \times \cdots \times \frac{7}{2}}_{21 \text{ times}} =$

Exercise 7

$\underbrace{(-13) \times \cdots \times (-13)}_{6 \text{ times}} =$

Exercise 8

$\underbrace{\left(-\frac{1}{14}\right) \times \cdots \times \left(-\frac{1}{14}\right)}_{10 \text{ times}} =$

Exercise 9

$\underbrace{x \cdot x \cdots x}_{185 \text{ times}} =$

Exercise 10

$\underbrace{x \cdot x \cdots x}_{\_\_\_\_ \text{ times}} = x^n$

Exercise 11

Will these products be positive or negative? How do you know?

$$\underbrace{(-1)\times(-1)\times\cdots\times(-1)}_{12\ times}=(-1)^{12}$$

$$\underbrace{(-1)\times(-1)\times\cdots\times(-1)}_{13\ times}=(-1)^{13}$$

Exercise 12

Is it necessary to do all of the calculations to determine the sign of the product? Why or why not?

$$\underbrace{(-5)\times(-5)\times\cdots\times(-5)}_{95\ times}=(-5)^{95}$$

$$\underbrace{(-1.8)\times(-1.8)\times\cdots\times(-1.8)}_{122\ times}=(-1.8)^{122}$$

Exercise 13

Fill in the blanks about whether the number is positive or negative.

If n is a positive even number, then $(-55)^n$ is _____.

If n is a positive odd number, then $(-72.4)^n$ is _____.

Exercise 14

Josie says that $\underbrace{(-15) \times \cdots \times (-15)}_{6\ times} = -15^6$. Is she correct? How do you know?

Problem Set

1. Use what you know about exponential notation to complete the expressions below.

$\underbrace{(-5) \times \cdots \times (-5)}_{17\ times} =$

$\underbrace{3.7 \times \cdots \times 3.7}_{\_\_\ times} = 3.7^{19}$

$\underbrace{7 \times \cdots \times 7}_{\_\_\ times} = 7^{45}$

$\underbrace{6 \times \cdots \times 6}_{4\ times} =$

$\underbrace{4.3 \times \cdots \times 4.3}_{13\ times} =$

$\underbrace{(-1.1) \times \cdots \times (-1.1)}_{9\ times} =$

$\underbrace{\left(\frac{2}{3}\right) \times \cdots \times \left(\frac{2}{3}\right)}_{19\ times} =$

$\underbrace{\left(-\frac{11}{5}\right) \times \cdots \times \left(-\frac{11}{5}\right)}_{\_\_\ times} = \left(-\frac{11}{5}\right)^{x}$

$\underbrace{(-12) \times \cdots \times (-12)}_{\_\_\ times} = (-12)^{15}$

$\underbrace{a \times \cdots \times a}_{m\ times} =$

2. Write an expression with (-1) as its base that will produce a positive product.

3. Write an expression with (-1) as its base that will produce a negative product.

4. Rewrite each number in exponential notation using 2 as the base.

$8 =$ $16 =$ $32 =$

$64 =$ $128 =$ $256 =$

5. Tim wrote 16 as $(-2)^4$. Is he correct?

6. Could -2 be used as a base to rewrite 32? 64? Why or why not?