

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 6

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

Exercise 2

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

Exercise 7

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

Exercise 3

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

Exercise 8

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

Exercise 4

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

Exercise 9

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

Exercise 5

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

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?

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

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

Exercise 12

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

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

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

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

Problem Set

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

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

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

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

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

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

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

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

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

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

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

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?