Lesson 1: Exponential Notation

Classwork

5⁶ means 5 × 5 × 5 × 5 × 5 × 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_i

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

The number x^n is called x raised to the n^{th} power, where n is the exponent of x in x^n and x is the base of x^n .

Exercise 1

 $4 \times \cdots \times 4 =$ 7 times

Exercise 2

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

Exercise 3

 $(-11.63) \times \cdots \times (-11.63) =$ 34 times

Exercise 4

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

Exercise 5

 $(-5) \times \cdots \times (-5) =$ 10 times

Exercise 6

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

Exercise 7
$$(-13) \times \cdots \times (-13) =$$

6 times

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

Exercise 9

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

Exercise 10

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



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Exercise 11

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

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

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

Exercise 12

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

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

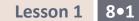
 $\underbrace{(-1.8) \times (-1.8) \times \dots \times (-1.8)}_{122 \text{ times}} = (-1.8)^{122}$





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Exercise 13

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

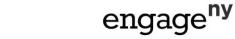
If n is a positive even number, then $(-55)^n$ is _____.

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

Exercise 14

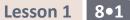
Josie says that $\underbrace{(-15) \times \cdots \times (-15)}_{6 \text{ times}} = -15^6$. Is she correct? How do you know?











Problem Set

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

$$\underbrace{(-5) \times \cdots \times (-5)}_{17 \text{ times}} = \underbrace{3.7^{19}}_{\underbrace{-17 \text{ times}}} = 3.7^{19}$$

$$\underbrace{(-5) \times \cdots \times (-5)}_{17 \text{ times}} = 7^{45}$$

$$\underbrace{(-5) \times \cdots \times (7)}_{17 \text{ times}} = 7^{45}$$

$$\underbrace{(-1.1) \times \cdots \times (-1.1)}_{9 \text{ times}} = \underbrace{(-1.1) \times \cdots \times (-1.1)}_{9 \text{ times}} = \underbrace{(-1.1) \times \cdots \times (-1.1)}_{9 \text{ times}} = \underbrace{(-1.1) \times \cdots \times (-1.1)}_{17 \text{ times}} = \underbrace{(-1.1) \times (-1.1) \times (-1.1)}_{17 \text{ tim$$

- 2. Write an expression with (-1) as its base that will produce a positive product, and explain why your answer is valid.
- 3. Write an expression with (-1) as its base that will produce a negative product, and explain why your answer is valid.
- 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? Explain.
- 6. Could -2 be used as a base to rewrite 32? 64? Why or why not?



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