# **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<sup>th</sup> power, where n is the exponent of x in  $x^n$  and x is the base of  $x^n$ .

#### **Exercise 1**

$$\underbrace{4\times\cdots\times4}_{7\text{ times}} =$$

## **Exercise 2**

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

#### **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**

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

## **Exercise 7**

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

## **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**

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



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## **Exercise 11**

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

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

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

## Exercise 12

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

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

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



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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 \_\_\_\_\_\_.

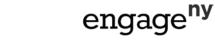
If n is a positive odd number, then  $(-72.4)^n$  is \_\_\_\_\_\_.

# **Exercise 14**

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



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# **Problem Set**

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

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

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

$$\underbrace{7\times\cdots\times7}_{\text{times}}=7^{45}$$

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

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

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

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

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

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

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

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

$$32 =$$

$$64 =$$

$$256 =$$

- 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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