

# Section 1.R.3 Exponents and Order of Operations

Go to Section 1.R.3 Learn mode in Hawkes to follow along!

## The Terms Base and Exponent

When looking at  $3^5 = 243$ , 3 is the \_\_\_\_\_, 5 is the \_\_\_\_\_, and 243 is the \_\_\_\_\_. \_\_\_\_\_ are written slightly to the right and above the \_\_\_\_\_. The expression  $3^5$  is \_\_\_\_\_.

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### ▣ Example 1 Identifying the Base and the Exponent

Identify the base and exponent in each exponential expression.

a.  $6^2$

b.  $10^4$

**Solution**

## Exercises

Rewrite each product by using exponents.

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1.  $11 \cdot 11 \cdot 11$

3.  $2 \cdot 2 \cdot 5 \cdot 5 \cdot 5$

2.  $13 \cdot 13 \cdot 13$

4.  $5 \cdot 5 \cdot 5 \cdot 7 \cdot 7$

For each exponential expression a. identify the base and b. identify the exponent.

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5.  $6^2$

6.  $4^5$

# Evaluating Expressions with Exponents

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## ▣ Example 3 Evaluating Exponential Expressions

Evaluate each exponential expression.

a.  $6^3$

c.  $2^6$

b.  $5^2$

Solution

## Exercises

Evaluate each exponential expression.

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7.  $4^2$

11.  $3^5$

8.  $1^6$

12.  $30^2$

9.  $5^3$

13.  $20^3$

10.  $4^3$

14.  $15^2$

## The Exponents 1 and 0

### The Exponent 1

Any number raised to the first power \_\_\_\_\_

For any number  $a$ ,  $a^1 = a$ .

For example, \_\_\_\_\_

### The Exponent 0

Any nonzero number raised to the 0 power \_\_\_\_\_

For any number  $a$ ,  $a^0 = 1$ .

For example, \_\_\_\_\_

**Note:** The expression  $0^0$  \_\_\_\_\_

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### ▣ Example 4 Evaluating Exponential Expressions

Evaluate each exponential expression.

a.  $9^1$

c.  $15^0$

b.  $8^0$

d.  $10^1$

**Solution**

### Exercises

Evaluate each exponential expression.

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15.  $4^0$

18.  $24^1$

16.  $19^0$

19.  $22^0$

17.  $13^1$

20.  $99^0$

## Order of Operations with Whole Numbers

### Rules for Order of Operations

1. Simplify within grouping symbols, such as \_\_\_\_\_  
(If there are more than one pair of grouping symbols, start with \_\_\_\_\_  
\_\_\_\_\_)
2. Evaluate any \_\_\_\_\_
3. Moving from left to right, perform any \_\_\_\_\_  
\_\_\_\_\_
4. Moving from left to right, perform any \_\_\_\_\_  
\_\_\_\_\_

A well-known mnemonic device for remembering the rules for order of operations is the following.

Please	Excuse	My	Dear	Aunt	Sally
↓	↓	↓	↓	↓	↓
_____	_____	_____	_____	_____	_____

### ▣ Example 8 Using the Order of Operations with Whole Numbers

Simplify:  $30 \div 10 \cdot 2^3 + 3(6 - 2)$

**Solution**

**Exercises**

Simplify.

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**21.**  $6 + 5 \cdot 3$

**24.**  $2 \cdot 5^2 - 8 \div 2$

**22.**  $15 \div 15 + 10 \cdot 2$

**25.**  $(4 + 3)^2 + (2 + 3)^2$

**23.**  $(2 + 3) \cdot 4 \div 5 - 4$

**26.**  $10^3 - 2[(13 + 3) \div 2^4 + 18 \div 3^2]$

Solve.

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- 27.** Camila is a seamstress and is creating wedding dresses. She has 126 yards of silk fabric. For each dress, the skirt requires 4 yards of silk and the bodice requires 2 yards of silk. How many dresses can she make with the amount of silk she has?
- If you simplify the expression  $126 \div 4 + 2$  using the order of operations, will you get the correct answer? If not, explain what is wrong with the expression.
  - What is the answer? If necessary, write the corrected expression to get the correct results when following the order of operations.