

# Powers and Exponents

Flagship

Lesson 6-1-flagship

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Class: \_\_\_\_\_

## SOUND STUDIO MISSION

### **| The Doubling Mixboard**

You are the lead sound engineer at Amplitude Studios. Every time you flip a switch on the new mixboard, the volume doubles — that is the power of exponents. The headline act goes on in one hour, and you must master powers before the speakers can be safely dialed in.

## Key Vocabulary

Level 1 support

Picture first, then the word, then a plain-language meaning. Say each word out loud.

*In  $2^3$ , the small 3 means multiply 2 by itself 3 times:  $2 \times 2 \times 2 = 8$*

### Exponent

A small number that tells how many times to multiply the number by itself.

*In  $5^2$ , the base is 5 — it is the number being multiplied:  $5 \times 5 = 25$*

### Base

The number that gets multiplied by itself.

*$10^3 = 10 \times 10 \times 10 = 1,000$  — read as '10 to the third power' or '10 cubed'*

### Power

A number written with a base and an exponent, like  $2^3$ .

*Evaluate  $3^4$ : write  $3 \times 3 \times 3 \times 3$ , then multiply step by step:  $9 \times 9 = 81$*

### Evaluate

To find the value of an expression.

*In  $3x$ , the 3 is the coefficient — if  $x = 4$ , then  $3x = 3 \times 4 = 12$*

### Coefficient

The number in front of a letter, like the 3 in  $3x$ .

*$4x$  and  $2x$  are like terms (both have  $x$ );  $4x$  and  $4x^2$  are NOT like terms (different powers)*

### Like terms

Terms with the same letter, like  $2x$  and  $5x$ .

## Key Ideas & Notes

- You're a sound engineer at a music studio.
- Each time you flip a switch, the volume doubles.
- The starting volume is 1 unit.
- After flipping the switch 3 times, the volume is  $2^3 = 2 \times 2 \times 2 = 8$  units — that's 8 times louder!
- Evaluate each exponential expression. Write the repeated multiplication and find the value.

### Think About It

- What happens to the volume each time you flip a switch?
- Why is  $2^3$  equal to 8, not 6?
- How is repeated multiplication different from repeated addition?

### My Notes

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## Guided Examples

### Example 1

**What is the value of  $4^3$ ?**

**Solution:**  $4^3 = 4 \times 4 \times 4 = 64$ .

**Answer:** A. 64

### Example 2

**What is the value of  $6^2$ ?**

**Solution:**  $6^2 = 6 \times 6 = 36$ .

**Answer:** A. 36

### Example 3

**Which expression shows  $5^3$  as repeated multiplication?**

**Solution:**  $5^3$  means use 5 as a factor 3 times:  $5 \times 5 \times 5$ . The exponent tells how many times to multiply, not what to multiply by.

**Answer:** A.  $5 \times 5 \times 5$

# Write About the Math

## The Writing Revolution

I can explain my work using the words exponent, base, power, and evaluate.

### 1. Kernel Sentence subject + verb

**Model:** Exponent is a small number that tells how many times to multiply the number by itself.  
*Exponente es un número pequeño que dice cuántas veces multiplicar el número por sí mismo.*

**Write a kernel sentence about exponent. Use a subject and a verb.**

*Escribe una oración base sobre exponente. Usa un sujeto y un verbo.*

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### 2. Sentence Expansion because · but · so

**Kernel:** Exponent matters in math  
*Exponente importa en matemáticas*

Expand the kernel three ways. Add a reason, a contrast, and a result.

**because**  
*porque*      **Exponent matters in math because \_\_\_\_.**  
*Exponente importa en matemáticas porque \_\_\_\_.*

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**but**  
*pero*      **Exponent matters in math, but \_\_\_\_.**  
*Exponente importa en matemáticas, pero \_\_\_\_.*

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**so**  
*entonces*      **Exponent matters in math, so \_\_\_\_.**  
*Exponente importa en matemáticas, entonces \_\_\_\_.*

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### 3. Sentence Types 4 ways to write a math idea

**Statement**  
*Afirmación*

Tell one true fact about exponent.  
*Di un hecho verdadero sobre exponent.*

**Exponent** \_\_\_\_.

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**Question**  
*Pregunta*

Ask a question about exponent.  
*Haz una pregunta sobre exponent.*

**How does** \_\_\_\_ ?

*¿Cómo* \_\_\_\_ ?

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**Exclamation**  
*Exclamación*

Show excitement about exponent.  
*Muestra entusiasmo sobre exponent.*

**Wow,** \_\_\_\_ !

*¡Guau,* \_\_\_\_ !

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**Command**  
*Mandato*

Tell a partner what to do with exponent.  
*Dile a un compañero qué hacer con exponent.*

**First,** \_\_\_\_ .

*Primero,* \_\_\_\_ .

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### 4. Explain Your Reasoning use a sentence starter

**I know** \_\_\_\_ **because** \_\_\_\_ .

*Sé que* \_\_\_\_ *porque* \_\_\_\_ .

**First I** \_\_\_\_ , **then I** \_\_\_\_ .

*Primero* \_\_\_\_ , *luego* \_\_\_\_ .

**This is important because** \_\_\_\_ .

*Esto es importante porque* \_\_\_\_ .

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## Try It

Solve on your own. Check the answer key when you are done.

**1. Which expression shows  $5^3$  as repeated multiplication?**

A.  $5 \times 5 \times 5$

B.  $5 \times 3$

C.  $5 + 5 + 5$

D.  $3 \times 3 \times 3 \times 3 \times 3$

Show your work:

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**2. Evaluate:  $3 \times (4 + 2)^2$**

A. 108

B. 54

C. 36

D. 144

Show your work:

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## Stretch Your Thinking

Level 2 enrichment

Challenge task — explain your reasoning in full sentences.

**A bacteria colony doubles every hour. Starting with 1 bacterium, write a power expression for the number after 6 hours. Explain why exponential growth is so much faster than adding the same number each hour.**

*Sentence starter: After 6 hours there are \_\_\_ bacteria because  $2^6 = \underline{\quad}$ . If it grew by adding 2 each hour instead, there would only be \_\_\_ bacteria. Exponential growth is faster because \_\_\_.*

Show your work:

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## Reflect — Exit Ticket

**What is the value of  $3^4$ ?**

- A. 81
- B. 12
- C. 34
- D. 64

Your answer:

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## Answer Key & Teacher Guide

1. **Try It 1:** A.  $5 \times 5 \times 5 - 5^3$  means use 5 as a factor 3 times:  $5 \times 5 \times 5$ . The exponent tells how many times to multiply, not what to multiply by.
2. **Try It 2:** A.  $108 - 4 + 2 = 6$ .  $6^2 = 36$ .  $3 \times 36 = 108$ .
3. **Exit Ticket:** A.  $81 - 3^4 = 3 \times 3 \times 3 \times 3 = 81$ .

### Writing (TWR) — what to look for

- **Kernel sentence:** A complete sentence needs a subject and a verb. Example: Exponent is a small number that tells how many times to multiply the number by itself.
- **Expansion:** *because* gives a reason, *but* shows a contrast or exception, *so* shows a result. Answers vary; each must keep the kernel idea and add the correct kind of detail.
- **Sentence types:** Statement ends with a period, question with "?", exclamation with "!", and a command starts with an action verb (a "bossy" verb).