

# Power Pattern Quest

Use exponent laws to rewrite and evaluate powers.

GRADE 7 • MA.7.NSO.1.1

**MA.7.NSO.1.1** "Know and apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions, limited to whole-number exponents and rational number bases."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## EXPONENT MOVES

When you multiply powers with the same base, add exponents. When you divide powers with the same nonzero base, subtract exponents, and when a power is raised to a power, multiply exponents. Any nonzero rational number raised to the 0 power equals 1.

## WORKED EXAMPLE

Rewrite and evaluate:  $(11/13)^4 / (11/13)^4$

1. The bases match, so subtract the exponents.
2.  $(11/13)^{(4 - 4)} = (11/13)^0$ .
3. A nonzero base raised to the 0 power equals 1.

**Answer: 1**

## PRACTICE 6 problems

**1** Rewrite as one power:  $(1/2)^2 * (1/2)^8$

**ANSWER** \_\_\_\_\_

**2** Rewrite as one power:  $(3/8)^{10} / (3/8)^2$

**ANSWER** \_\_\_\_\_

**3** Rewrite as one power:  $((-2/3)^3)^2$

**ANSWER** \_\_\_\_\_

**4** Evaluate:  $(6/8)^0$

**ANSWER** \_\_\_\_\_

**5** Rewrite as a power, then evaluate:  $(2/3)^6 / (2/3)^6$

**ANSWER** \_\_\_\_\_

**6** Evaluate:  $(-1/2)^6$

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** A music app uses two fade effects on a song. The first effect changes the volume by a factor of  $(1/2)^2$ , and the second changes it by a factor of  $(1/2)^8$ . What is the total volume factor as one power and as a fraction?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** In a video game, a character's shrink spell has a size factor of  $(2/3)^3$ . The spell is applied to the whole result one more time, making the expression  $((2/3)^3)^2$ . Write the total size factor as one power.

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A student says that  $((2/3)^8 / (2/3)^2)^3 = (2/3)^9$ . Is the student correct? Explain your reasoning and give the correct equivalent expression.

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## PART 1 • PRACTICE

| # | PROBLEM                                                | ANSWER                         |
|---|--------------------------------------------------------|--------------------------------|
| 1 | Rewrite as one power: $(1/2)^2 * (1/2)^8$              | <b><math>(1/2)^{10}</math></b> |
| 2 | Rewrite as one power: $(3/8)^{10} / (3/8)^2$           | <b><math>(3/8)^8</math></b>    |
| 3 | Rewrite as one power: $((-2/3)^3)^2$                   | <b><math>(-2/3)^6</math></b>   |
| 4 | Evaluate: $(6/8)^0$                                    | <b>1</b>                       |
| 5 | Rewrite as a power, then evaluate: $(2/3)^6 / (2/3)^6$ | <b>1</b>                       |
| 6 | Evaluate: $(-1/2)^6$                                   | <b><math>1/64</math></b>       |

## PART 2 • APPLY IT

1.  **$(1/2)^{10} = 1/1024$**  Multiply powers with the same base by adding the exponents,  $2 + 8 = 10$ . Then evaluate  $(1/2)^{10}$ .
2.  **$(2/3)^6$**  For a power raised to a power, multiply the exponents. Since  $3 * 2 = 6$ , the equivalent expression is  $(2/3)^6$ .

## CHALLENGE

**No. First subtract the exponents:  $8 - 2 = 6$ . Then multiply the exponents:  $6 * 3 = 18$ , so the correct expression is  $(2/3)^{18}$ .**

Accept equivalent forms when they match the requested form or value. For negative rational bases, require parentheses so the exponent applies to the entire negative fraction.