

# Exponent Power Moves

Use exponent rules to rewrite expressions in equivalent forms.

GRADE 8 • NY-8.EE.1

**NY-8.EE.1** "Know and apply the properties of integer exponents to generate equivalent numerical expressions."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## EXPONENT RULES

When multiplying powers with the same nonzero base, add exponents. When dividing powers with the same nonzero base, subtract exponents, and when raising a power to a power, multiply exponents. For a nonzero base  $a$ ,  $a^0 = 1$  and  $a^{-n} = 1/a^n$ .

## WORKED EXAMPLE

Divide  $13^{11}$  by  $13^8$ . Write the result as one power of 13.

1.  $13^{11} / 13^8 = 13^{11-8}$

2.  $13^{11-8} = 13^3$

**Answer:  $13^3$**

## PRACTICE 6 problems

**1** Simplify:  $9^4 \cdot 9^5$

ANSWER \_\_\_\_\_

**2** Simplify:  $12^{10} / 12^4$

ANSWER \_\_\_\_\_

**3** Simplify:  $(6^4)^5$

ANSWER \_\_\_\_\_

**4** Simplify:  $10^0$

ANSWER \_\_\_\_\_

**5** Write with a positive exponent:  $4^{-6}$

ANSWER \_\_\_\_\_

**6** Simplify and write your final answer with positive exponents:  $(5^9 \cdot 5^{-4}) / 5^6$

ANSWER \_\_\_\_\_

\_\_\_\_\_

## APPLY IT Show your work

- 1** In a game design project, each of  $6^5$  virtual levels has  $6^4$  collectible points. Write the total number of collectible points as a single power of 6.

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A phone camera captures a flash lasting  $10^{-6}$  second. A slow-motion edit stretches the clip's time by a factor of  $10^4$ . Write the new length as a power of 10.

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

For nonzero  $x$ , is  $(x^6)^{-4} \cdot x^9$  equal to  $1/x^{15}$ ? Explain your reasoning with exponent rules.

WORK SPACE AND ANSWER

## PART 1 • PRACTICE

| # | PROBLEM                                                                                  | ANSWER                     |
|---|------------------------------------------------------------------------------------------|----------------------------|
| 1 | Simplify: $9^4 \cdot 9^5$                                                                | <b><math>9^9</math></b>    |
| 2 | Simplify: $12^{10} / 12^4$                                                               | <b><math>12^6</math></b>   |
| 3 | Simplify: $(6^4)^5$                                                                      | <b><math>6^{20}</math></b> |
| 4 | Simplify: $10^0$                                                                         | <b>1</b>                   |
| 5 | Write with a positive exponent: $4^{-6}$                                                 | <b><math>1/4^6</math></b>  |
| 6 | Simplify and write your final answer with positive exponents: $(5^9 \cdot 5^{-4}) / 5^6$ | <b><math>1/5</math></b>    |

## PART 2 • APPLY IT

1.  **$6^9$  points** Multiply powers with the same base:  $6^5 \cdot 6^4 = 6^5 + 4 = 6^9$ .
2.  **$10^{-2}$  second** Multiply the powers of 10:  $10^{-6} \cdot 10^4 = 10^{-6} + 4 = 10^{-2}$ .

## CHALLENGE

**Yes.  $(x^6)^{-4} = x^{-24}$ , and  $x^{-24} \cdot x^9 = x^{-15} = 1/x^{15}$ .**

Accept equivalent forms that follow the exponent rules. For negative exponents, accept a reciprocal written with a positive exponent, such as  $1/4^6$ .