# PROPERTIES OF EXPONENTS

Properties of exponents can help you simplify expressions with exponents. Review the properties in the table below.

| Property | Example |
|---|---|
| Product of Powers<br>When multiplying powers with the same base, add the exponents. | $3^2 \cdot 3^5 = 3^{(2+5)} = 3^7$ |
| Quotient of Powers<br>When dividing powers with the same base, subtract the exponents. | $\frac{9^7}{9^4} = 9^{(7-4)} = 9^3$ |
| Power of a Power<br>To find a power of a power, multiply the exponents. | $(4^6)^2 = 4^{(6 \cdot 2)} = 4^{12}$ |
| Zero Exponent<br>Any nonzero base raised to the zero power equals 1. | $15^0 = 1$ |
| Negative Exponent<br>If a base has a negative exponent, rewrite the expression as a fraction with 1 in the numerator and a positive exponent in the denominator. | $5^{-2} = \frac{1}{5^2}$ |

**Practice it!** Use the properties of exponents to simplify the expressions.

$6^4 \cdot 6^2 =$ $6^6$

$\frac{9^8}{9^3} =$ $9^5$

$8^{-2} =$ $\frac{1}{8^2}$

$10^0 =$ $1$

$3^4 \cdot 3^6 =$ $3^{10}$

$(7^2)^4 =$ $7^8$

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**Keep going!** Use the properties of exponents to simplify the expressions.

$15^{-7} =$ $\frac{1}{15^7}$

$12^0 =$ $1$

$(5^6)^2 =$ $5^{12}$

$25^3 \cdot 25^2 =$ $25^5$

$8^0 =$ $1$

$\frac{13^9}{13^1} =$ $13^8$

$(36^3)^2 =$ $36^6$

$\frac{5^9}{5^2} =$ $5^7$

$70^{-8} =$ $\frac{1}{70^8}$

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**Challenge!** The problems below require you to use multiple properties of exponents to simplify each expression. Show each step below, and write your final answer in the box.

$3^1 \cdot (3^3)^3 =$ $3^{10}$

$\frac{5^6}{5^4} \cdot 5^3 =$ $5^5$

$6^{-8} \cdot 6^8 =$ $1$

$\frac{4^2}{4^5} =$ $\frac{1}{4^3}$

$(9^3)^4 \cdot (9^2)^2 =$ $9^{16}$

$\frac{(8^7)^2}{8^9} =$ $8^5$