

Basics

**Product
Rule**

**Quotient
Rule**

**Tape here
to paper**

**Zero
Exponent
Rule**

**Power
Rule**

**Negative
Exponent
Rule**

What is an exponent? tells how many times to multiply the base

base 4^3 exponent

EX: 1) 5^3 2) -6^2 3) $(-6)^2$ 4) $(\frac{3}{4})^2$
 125 -36 36 $\frac{9}{16}$

Product Rule: Multiply like or same bases. Keep the base and add their exponents.

Think: $2^3 \cdot 2^4 = \underline{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = 2^7$

EX: 1) $6^2 \cdot 6^3 = 6^5$ 2) $x^3 \cdot x^5 = x^8$

3) $y^3 \cdot y^5 \cdot y^4 = y^2$ 4) $5^1 \cdot 5^8 \cdot 5^3 = 5^{12}$

5) $3y^4 \cdot 6y^2 \cdot y = 18y^3$

multiply coefficients

Quotient Rule: Divide like or same bases. Keep the base and subtract their exponents. Top minus the bottom.

EX: 1) $\frac{4^9}{4^3} = 4^{9-3} = 4^6$ 2) $\frac{b^5}{b^3} = b^{5-3} = b^2$

3) $\frac{10x^5}{5x^{-3}} = 2x^{5-(-3)} = 2x^8$ 4) $\frac{8x^9y^7}{2x^2y} = 4x^7y^6$

or cancel: $\frac{6^7}{6^2} = \frac{\cancel{6} \cdot \cancel{6} \cdot \cancel{6} \cdot \cancel{6} \cdot \cancel{6} \cdot \cancel{6} \cdot \cancel{6}}{\cancel{6} \cdot \cancel{6}} = 6^5$

EXPONENTS

Zero Exponent Rule: Any non-zero number or variable raised to a power of zero will equal one.

Think: $\frac{5}{5} = 1$ 1) $9^0 = 1$

$\frac{x^5}{x^5} = x^0 = 1$ 2) $-6^0 = -1$

3) $(-6)^0 = 1$

Power Rule: when a power is raised to another power, then multiply both powers. (parentheses)

Think: $(4^3)^2 = 4^3 \cdot 4^3 = 4^6$

EX: 1) $(2^5)^2 = 2^{10}$ 2) $(t^4)^3 = t^{12}$

3) $(3x^4)^3 = 27x^{12}$ 4) $(2x^4y^2)^3 = 8x^{12}y^6$

Negative Exponent Rule: Move the base and the negative exponent to the bottom or top of a fraction and change to a positive exponent.

EX: 1) $2x^3 = \frac{2x^3}{1}$ 2) $\frac{1}{4^{-2}} = 4^2$

3) $\frac{z^{-4}}{6x^{-5}} = \frac{x^5}{6z^4}$ 4) $12^{-3} = \frac{1}{12^3}$