# Properties of Exponents

## Exponents

EXPONENT IS USED TO DESCRIBE THE POWER OF A NUMBER OR AN EXPRESSION I.E. FOR HOW MANY TIMES THE NUMBER OR EXPRESSION HAS BEEN MULTIPLIED.

EXAMPLES: $5^4$ $3X^2$ $(Y-3)^3$

| Properties of Exponents | | |
|---|---|---|
| **Zero Exponent Property** | If a non-zero number or an expression is raised to a power "0" then the number or expression equals 1. | Examples:<br>$4^0 = 1$ where $4 \neq 0$<br>$x^0 = 1$ where $x \neq 0$ |
| **Negative Exponent Property** | If the power of a number or expression is negative in the numerator then the power becomes positive in denominator. | Examples:<br>$6^{-2} = \frac{1}{6^2}$<br>$y^{-4} = \frac{1}{y^4}$ |
| **Product of Powers Property** | If two expressions are being multiplied with same bases then the powers/exponents are added. | Example<br>$6^2 \times 6^3 = 6^{2+3} = 6^5$ |
| **Quotient of Powers Property** | If two expressions are being divided with same bases then the powers/exponents are subtracted. | Example<br>$\frac{a^4}{a^{-2}} = a^{4-(-2)} = a^{4+2} = a^6$ |
| **Power of a Product Property** | If two different expressions are being multiplied with same exponents then they can be written as one expression. | Examples<br>$x^2 \times y^2 = (xy)^2$<br>$3^2 \times 2^2 = (3 \times 2)^2 = 6^2$ |
| **Power of a Quotient Property** | If two different expressions are being divided with same exponents then they can be written as one expression. | Examples:<br>$\frac{x^a}{y^a} = \left(\frac{x}{y}\right)^a$ and $\frac{6^3}{4^3} = \left(\frac{6}{4}\right)^3$ |
| **Power of a Power Property** | The exponents will be multiplied if a power of a power is raised to an expression. | Examples:<br>$(x^a)^b = x^{ab}$<br>$(5^3)^2 = 5^{3\times 2} = 5^6$ |
| **Rational Exponent Property** | If a rational exponent is raised to an expression then it can be written as a radical expression. | Examples:<br>$x^{1/a} = \sqrt[a]{x}$<br>$x^{\frac{b}{a}} = \sqrt[a]{x^b} = \left(\sqrt[a]{x}\right)^b$ |

**Meets: Common Core Standard High School – HSA-SSE.A.3c**