ACADEMIC SUPPORT LEARNING TEAM Exponent Rules and Properties



| Rules for Exponents | Definition | Examples |
|---|--------------------------------------|---------------------------------------|
| Zero-Exponent Rule | Anything raised to the zero power is | $3^0 = 1$ |
| $a^0 = 1$ | 1. | $12154^0 = 1$ |
| Power Rule | To raise a power to a power, you | $(x^5)^4 = 20$ |
| $(\mathbf{a}^{\mathbf{m}})^{\mathbf{n}} = \mathbf{a}^{\mathbf{m}^{*}\mathbf{n}}$ | need to multiply the exponents. | $(2x^4y^2)^3 = 2^3x^{12}y^6 =$ |
| | | $8x^{12}y^{6}$ |
| Product Rule | To multiply two exponents with the | $x * x^5 = x^1 + x^5 = x^6$ |
| $\mathbf{a}^{\mathbf{m}} \ast \mathbf{a}^{\mathbf{n}} = \mathbf{a}^{\mathbf{m}+\mathbf{n}}$ | same base, you add the powers and | $y^4 * y^9 = y^{13}$ |
| | keep the base. | |
| $\mathbf{a}^{\mathbf{m}} * \mathbf{b}^{\mathbf{m}} = (\mathbf{a}^{*}\mathbf{b})^{\mathbf{m}}$ | When you have different bases but | $x^3 * y^3 = (x*y)^3$ |
| | the same exponent, you can simply | $3^2 * 4^2 = (3*4)^2$ |
| | multiply the bases and keep the same | |
| | exponent. | |
| Quotient Rule | To divide two exponents with the | x ⁵ 5 0 0 |
| a^m m^n | same base, you subtract the powers | $\frac{1}{x^2} = x^{5-2} = x^3$ |
| $\frac{1}{a^n} = a^{m-n}$ | and keep the base. | $\frac{y^9}{z} = y^{9-5} = y^4$ |
| | | y^5 |
| | | |
| | | |
| | | r ⁶ r |
| a^m a_m | When you have different bases but | $\frac{\pi}{y^6} = (\frac{\pi}{y})^6$ |
| $\overline{\boldsymbol{b}^m} = (\overline{\boldsymbol{b}})^m$ | the same exponent, you can simply | |
| | divide the bases and keep the same | $\frac{4^3}{4} = (\frac{4}{3})^3$ |
| | exponent. | 2^{3} (2) |
| | | |

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| Negative Evnopent Rule | Negative exponents in the numerator | 1 1 |
|-----------------------------|--|---|
| $a^{-n} = \frac{1}{n}$ | get moved to the denominator and | $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$ |
| a^n | become positive exponents. The | 2 7 |
| | same applies for negative exponents | $\frac{x^{-3}}{y^{-7}} = \frac{y^{7}}{x^{3}}$ |
| | that are in the denominator which | y |
| | then get moved to the numerator and | |
| | become positive exponents. | |
| | Remember, only move the negative | |
| | exponents. | |
| One Rule | Any base raise to the one power is | $15^1 = 15$ |
| $\mathbf{a}^1 = \mathbf{a}$ | always itself. | $120^1 = 120$ |
| | | |
| $1^{m} = 1$ | If one is the base, no matter what the | $1^7 = 1$ |
| | exponent is, the result will always be | $1^{215} = 1$ |
| | equal to 1. | |

References:

Mesa Community College. (n.d.). *Rules for Exponents*. https://www.mesacc.edu/~scotz47781/mat120/notes/exponents/review.html

RapidTables (Ed.). (n.d.). *Exponent rules*. Exponent rules | Laws of exponents. https://www.rapidtables.com/math/number/exponent.html.