

# PROPERTIES OF EXPONENTS

Law	Example
$x^a = \underbrace{(x * x * \dots * x)}_{a \text{ times}}$	$7^4 = 7 * 7 * 7 * 7$
$x^a * x^b = x^{a+b}$	$2^3 * 2^2 = (2 * 2 * 2) * (2 * 2) = 2^{3+2} = 2^5$
$\frac{x^a}{x^b} = x^{a-b}$	$\frac{3^4}{3^2} = \frac{3 * 3 * \cancel{3} * \cancel{3}}{\cancel{3} * \cancel{3}} = 3^{4-2} = 3^2$
$(x^a)^b = x^{ab}$	$(5^2)^3 = (5 * 5)^3 = (5 * 5)(5 * 5)(5 * 5) = 5^{2*3} = 5^6$
$(xy)^a = x^a y^a$	$(4 * 3)^2 = (4 * 3)(4 * 3) = 4^2 3^2$
$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$	$\left(\frac{7}{8}\right)^4 = \left(\frac{7}{8}\right)\left(\frac{7}{8}\right)\left(\frac{7}{8}\right)\left(\frac{7}{8}\right) = \frac{7 * 7 * 7 * 7}{8 * 8 * 8 * 8} = \frac{7^4}{8^4}$
$x^{-a} = \frac{1}{x^a}$	$(9^{-7}) = \frac{1}{9^7}$
$(x)^{a/b} = \sqrt[b]{x^a}$	$(16)^{1/4} = \sqrt[4]{16} = \sqrt[4]{2^4} = 2$
$(x)^{a/b} = \sqrt[b]{(x^a)} = (\sqrt[b]{x})^a$	$(8)^{2/3} = \sqrt[3]{(8^2)} = (\sqrt[3]{8})^2 = 4$
$\sqrt[a]{xy} = \sqrt[a]{x} \sqrt[a]{y}$	$\sqrt[2]{36} = \sqrt[2]{9 * 4} = \sqrt[2]{9} \sqrt[2]{4} = 3 * 2 = 6$
$\sqrt[a]{\frac{x}{y}} = \frac{\sqrt[a]{x}}{\sqrt[a]{y}}$	$\sqrt[3]{\frac{27}{8}} = \frac{\sqrt[3]{27}}{\sqrt[3]{8}} = \frac{3}{2}$
$x^0 = 1 \quad (x \neq 0)$	$1 = \frac{11^7}{11^7} = 11^{7-7} = 11^0$
$(-x)^2 \neq -(x)^2$	$(-1)^2 = (-1)(-1) = 1 \neq -(1)^2 = -(1)(1) = -1$