

The Laws of Indices

1. If $x \neq 0$, $x^0 = 1$ so that $2^0 = (-3)^0 = 0.1^0 = 1$
2. $x^1 = x$ so that $4^1 = 4$
3. $x^m * x^n = x^{m+n}$ so that $4^3 * 4^8 = 4^{3+8} = 4^{11}$
4. $\frac{x^m}{x^n} = x^{m-n}$ so that $\frac{4^9}{4^4} = 4^{9-4} = 4^5$
5. $\frac{x^a * x^b}{x^c} = x^{a+b-c}$ so that $\frac{3^4 * 3^7}{3^2} = 3^{4+7-2} = 3^9$
6. $(x^m)^n = x^{mn}$ so that $(2^3)^5 = 2^{15}$
7. $(x^a y^b)^c = x^{ac} y^{bc}$ so that $(2x^3)^4 = (2^1 x^3)^4 = 2^{1*4} x^{3*4} = 2^4 x^{12} = 16x^{12}$ and $(x^2 y^3)^5 = x^{2*5} y^{3*5} = x^{10} y^{15}$
8. $x^{\frac{m}{n}} = (\sqrt[n]{x})^m = \sqrt[n]{x^m}$ so that $27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = 3^2 = 9$
9. $(xy)^{\frac{m}{n}} = x^{\frac{m}{n}} y^{\frac{m}{n}} = (\sqrt[n]{x})^m (\sqrt[n]{y})^m = \sqrt[n]{x^m} \sqrt[n]{y^m}$ so that $(36)^{\frac{3}{2}} = (4*9)^{\frac{3}{2}} = 4^{\frac{3}{2}} 9^{\frac{3}{2}} = (\sqrt[2]{4})^3 (\sqrt[2]{9})^3 = 2^3 * 3^3 = 8*27 = 216$
10. x^{-m} so that $3^{-4} = \frac{1}{3^4}$. In particular $x^{-1} = \frac{1}{x}$ so $2^{-1} = \frac{1}{2}$
11. $x^a y^b * x^c y^d = x^{a+c} * y^{b+d} = x^{a+c} y^{b+d}$ so that $x^3 y^4 * x^5 y^6 = x^{3+5} * y^{4+6} = x^8 y^{10}$
12. $\frac{x^a y^b}{x^c y^d} = x^{a-c} * y^{b-d} = x^{a-c} y^{b-d}$ so that $\frac{x^5 y^7}{x^2 y^3} = x^{5-2} * y^{7-3} = x^3 y^4$
13. $\frac{ax^m * bx^n}{cx^p} = \frac{ab}{c} x^{m+n-p}$ so that $\frac{4x^3 * 6x^5}{2x^4} = \frac{4*6}{2} x^{3+5-4} = 12x^4$
14. $\frac{ax^m y^n * bx^p t^q}{cx^r y^s} = \frac{ab}{c} x^{m+p-r} y^{n+q-s}$ so that $\frac{4x^3 y^5 * 6x^5 y^2}{2x^4 y^3} = \frac{4*6}{2} x^{3+5-4} y^{5+2-3} = 12x^4 y^4$