

Review of the Rules of Exponential Arithmetic

	General Case	Examples	
1)	$(a^m)(a^n) = a^{m+n}$	$(2^{-2})(2^4)(x^{a+b}) = 2^2 x^a x^b$	$10 x^2 x^{-3} x^5 = 10 x^4$
2)	$\frac{a^n}{a^m} = a^{n-m}$	$\frac{x^8}{x^5} = x^3$	$e^{a-b} = e^a / e^b$
3)	$a^{-n} = \frac{1}{a^n}$	$6 x^{-4} = \frac{6}{x^4}$	$x^{-3} y^{-2} z^5 = \frac{z^5}{x^3 y^2}$
4)	$\frac{1}{a^{-n}} = a^n$	$\frac{1}{4^{-5}} = 4^5$	$\frac{x^{-3}}{y^{-2} z^{-5}} = \frac{y^2 z^5}{x^3}$
5)	$(a b)^n = a^n b^n$	$(2x)^5 = 2^5 x^5$	$[(12)(\frac{2}{3})]^3 = 12^3 (\frac{2}{3})^3 = 8^3$
6)	$(a/b)^n = a^n/b^n$	$(\frac{2}{3})^2 = 2^2/3^2$	$5^4/3^6$ does not simplify
7)	$(a^n)^m = a^{n \cdot m}$	$(x^2)^3 = x^6$	$a^{(nm)}$ does not simplify
8)	$(a^n b^m)^p = a^{n \cdot p} b^{m \cdot p}$	$(5^2 x^5)^3 = 5^6 x^{15}$	$e^{nt} = (e^n)^t$
9)	$\sqrt{a} = a^{\frac{1}{2}} = a^{0.5}$	$\sqrt{x^3} = x^{3/2} = x^{1.5}$	$(x^2 y^{-3/2})\sqrt{x^5 y^7} = x^{9/2} y^2$
10)	$a^0 = 1$ (a ≠ 0)	$10^0 = 1$	$\pi^0 = 1$
11)	$0^0 = \text{undefined}$		
12)	$(a \pm b)^2 = \text{DNS}$	no shortcuts, must foil	
13)	$\sqrt{(a)(b)} = a^{(\frac{1}{2})} b^{(\frac{1}{2})}$	$\sqrt{25x^5} = 25^{(1/2)} x^{(5/2)} = 5 x^{2.5}$	$\sqrt{8x^3} = 2x\sqrt{2x} = (2x)^{3/2}$
14)	$\sqrt{\frac{a}{b}} = \frac{a^{(\frac{1}{2})}}{b^{(\frac{1}{2})}}$	$\sqrt{\frac{4}{x^3}} = \frac{2}{x^{(3/2)}}$	
15)	$\sqrt{a^2 \pm b^2} = \text{DNS}$	generally, there is no simplification/shortcuts for addition or subtraction with exponential forms.	

Exponents Practice

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Simplify and combine so that only positive exponents remain.

1) $a^2 b^4 a^5 a^3 b^{12} 2^0 =$

2) $a^{-3} a^5 a^{-4} b^{-3} b^6 b^{-1} =$

3) $a^2 (a^5)^2 (b^{12})^3 =$

4) $(a^3 b^4)^2 (a^3 b^2)^4 =,$

5) $\frac{(a^2 b^3)^3 (a b^4)^2}{(a^4 b^2)^2 (a^3 b^2)^4} =$

6) $\frac{\sqrt{a^3 b} a^{7/6} b^3}{\sqrt[3]{a^5} \sqrt[4]{b^{10}}} =$

7) $2 x^2 y^3 (x y^2 - x^2 y + 2 x^2) =$

8) $[(x^2 y^5 z^4)^3]^2 =$

9) $(x^5 - y^3)^3 =$

10) $2^4 x y^2 (2^2 x^2 y^2)^5 (2^3 x^4 y)^4 =$

11) $2 x^3 (7x^5 - 4x^4 + 3x^3 + 1) =$

12) $\frac{x^{-4} y^{-2} z^{-5}}{a^{-9} b^{-2} c^{-6}} =$

1) $a^{10}b^{16}$	2) b^2/a^2	3) $a^{12}b^{36}$	4) $a^{18}b^{16}$
5) b^5/a^{12}	6) ab	7) $2x^3y^5 - 2x^4y^4 + 4x^4y^3$	8) $x^{12}y^{30}z^{24}$
9) $x^{15} - 3x^{10}y^3 + 3x^5y^6 - y^9$	10) $2^{26}x^{27}y^{16}$	11) $14x^8 - 8x^7 + 6x^6 + 2x^3$	12) $\frac{a^9 b^2 c^6}{x^4 y^2 z^5}$