

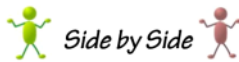
R2

Tuesday, February 20, 2018 1:12 PM

R2 - Exponents

YOU MUST MEMORIZE THE FOLLOWING POWERS and any power of 10 ($10^3, 10^4$, etc)!

$2^2 = 4$	$3^2 = 9$	$4^2 = 16$	$5^2 = 25$	$6^2 = 36$	$13^2 = 169$
$2^3 = 8$	$3^3 = 27$	$4^3 = 64$	$5^3 = 125$	$6^3 = 216$	$14^2 = 196$
$2^4 = 16$	$3^4 = 81$	$4^4 = 256$	$5^4 = 625$	$7^2 = 49$	$15^2 = 225$
$2^5 = 32$	$3^5 = 243$			$7^3 = 343$	$16^2 = 256$
$2^6 = 64$				$8^2 = 64$	$17^2 = 289$
$2^7 = 128$				$8^3 = 512$	$18^2 = 324$
$2^8 = 256$					$19^2 = 361$



The Rules

1. $x^a \cdot x^b = x^{a+b}$

2. $(x^a)^b = x^{a \cdot b} = x^{ab}$

3. $\frac{x^a}{x^b} = x^{a-b}$

4. $(xy)^a = x^a \cdot y^a$

5. $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$

6. $x^{-n} = \frac{1}{x^n}$

7. $x^0 = 1$ $\frac{6^7}{6^7} = 6^{7-7} = 6^0 = 1$

Example:

$$b^2 \cdot b^3 = b \cdot b \cdot b \cdot b \cdot b$$

1. $-3b^4 \cdot 10b^5 = -30b^9$

2. $(-5a^6)^2 = 25a^{12}$

3. $\frac{-5x^{10}}{15x^4} = \frac{-x^6}{3} = -\frac{1}{3}x^6$

4. $(-3a^4b^6)^3 = (-3)^3 (a^4)^3 (b^6)^3 = -27a^{12}b^{18}$

5. *be careful!* $\left(\frac{3m^2n^4}{6m^5}\right)^3 = \frac{-27m^6n^{12}}{216m^{15}} = \frac{-1}{8}m^{6-15} \cdot n^{12} = \frac{-1}{8}m^{-9}n^{12} = \frac{-n^{12}}{8m^9}$ *

6. $\frac{-5x^{-4}}{x^4} = \frac{-5}{x^4}$

7. $(4xy^2)^0 = 1$

Let's combine and practice

$$8. (-2xy^4)(5x^4y^5)^3$$

$$(-2xy^4)(125x^{12}y^{15})$$

$$-250x^{13}y^{19}$$

$$10. \frac{-4x^{-5}y^{-3}z}{8x^2y^{-4}z^2}$$

$$-\frac{1}{2}x^{-5-2}y^{-3-(-4)}z^{1-2}$$

$$-\frac{1}{2}x^{-7}y^1z^{-1}$$

$$-\frac{1}{2x^7z} \text{ or } -\frac{y}{2x^7z}$$

$$x^{07} = \frac{1}{x^7}$$

12. Challenge Question

$$9. \left(\frac{x^6}{y^5}\right)^2 \left(\frac{x^2y}{x}\right)^8$$

$$\frac{x^{12}}{y^{10}} \cdot \left(\frac{x^{16}y^8}{x^8}\right)$$

$$\frac{x^{12} \cdot x^{16}y^8}{y^{10} \cdot x^8}$$

$$x^{12+8}y^{8-10}$$

$$x^{20}y^{-2}$$

$$\frac{x^{20}}{y^2}$$

$$\frac{x^{16}}{x^8} = x^{16-8} = x^8$$

$$11. \left(\frac{-6x^8y^3z^{-1}}{8x^4yz^3}\right)^{-2}$$

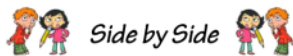
Take the recip.

$$\left(\frac{8x^4yz^3}{-6x^8y^3z^{-1}}\right)^2 = \frac{64x^8y^2z^6}{36x^{16}y^6z^{-2}}$$

$$\frac{16}{9}x^{-8}y^{-4}z^8$$

$$\frac{16z^8}{9x^8y^4}$$

R2 - Radicals and Exponential form



The Rules

Example:

Index
 $\sqrt[n]{x^m} = x^{\frac{m}{n}}$
 Radicand
 $\sqrt{x} = x^{1/2}$

a. $\sqrt[5]{x^2} \Rightarrow x^{2/5}$ or $(x^{1/5})^2$ or $(x^2)^{1/5}$

b. $\sqrt[n]{x^m y^m} = x^{\frac{m}{n}} y^{\frac{m}{n}}$ or $(xy)^{\frac{m}{n}}$

b. $\sqrt[4]{x^2 y^3} = x^{\frac{2}{4}} y^{\frac{3}{4}}$ or $x^{\frac{1}{2}} y^{\frac{3}{4}}$

c. $\sqrt[n]{\frac{x}{y}} = \left(\frac{x}{y}\right)^{\frac{1}{n}} = \frac{x^{\frac{1}{n}}}{y^{\frac{1}{n}}}$

d. $\sqrt[3]{\frac{x}{y^2}} = \frac{x^{1/3}}{y^{2/3}}$ or $\left(\frac{x}{y^2}\right)^{1/3}$ (Func^t Fact^t)

d. $x^{\frac{a}{b}} = \sqrt[b]{x^a}$ or $(\sqrt[b]{x})^a$

d. $\frac{16^3}{(2^4)^{3/4}} = \sqrt[4]{16^3} \Rightarrow (\sqrt[4]{16})^3 = 2^3 = 8$

I. BASIC PRACTICE:

1. $36^{\frac{1}{2}}$
6

2. $27^{\frac{1}{3}}$
3

3. $\sqrt[3]{-27}$
-3

4. $\sqrt[4]{-16}$
no real number

5. $8^{\frac{2}{3}} = \sqrt[3]{8^2}$ or $(\sqrt[3]{8})^2$
or $(2^3)^{2/3} = 4$

6. $\sqrt[4]{3^{12}} = 3^{12/4} = 3^3 = 27$

7. $\sqrt[4]{625}$
5

8. $-49^{\frac{1}{2}} = -\sqrt{49}$
-7

9. $(-49)^{\frac{1}{2}} = \sqrt{-49}$
no real number

II: A little harder:

10. $\sqrt[3]{64}$
 $(4^3)^{1/3} = 4$

11. $(64^{\frac{1}{3}})^{-4/3} = 64^{-4/9}$
 $(4^3)^{-4/3} = 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$

12. $32^{\frac{7}{5}}$
 $32^{-7/5} = (2^5)^{-7/5} = 2^{-7} = \frac{1}{2^7} = \frac{1}{128}$

III: Simplifying Radicals

13. $\sqrt{48}$
 $\sqrt{16 \cdot 3} = \sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$

14. $\sqrt[3]{-54}$
 $\sqrt[3]{-27 \cdot 2} = -3\sqrt[3]{2}$

15. $\sqrt[4]{48}$
 $\sqrt[4]{16 \cdot 3} = 2\sqrt[4]{3}$

$$16. \sqrt{48x^6y^{16}z^7}$$

$$(48x^6y^{16}z^7)^{\frac{1}{2}}$$

$$4 \sqrt[3]{x} \sqrt[4]{y} \sqrt[2]{z} \sqrt{3z}$$

$$17. \sqrt[3]{24a^9b^{10}c^{17}}$$

$$2a^3b^3c^5 \sqrt[3]{3bc^2}$$

$$18. \sqrt[3]{32} + \sqrt[3]{81}$$

$$2\sqrt[3]{4} + 3\sqrt[3]{3}$$

$$19. \sqrt[3]{16} + \sqrt[5]{64} + \sqrt[5]{2} - 5\sqrt[3]{54}$$

$$2\sqrt[3]{2} + 2\sqrt[5]{2} + \sqrt[5]{2} - 15\sqrt[3]{2}$$

$$-13\sqrt[3]{2} + 3\sqrt[5]{2}$$

IV: Rationalizing

$$20. \frac{\sqrt{7x^2}}{3}$$

$$21. \frac{30}{\sqrt[4]{2x}} \Rightarrow \frac{30}{(2x)^{\frac{1}{4}}} \cdot \frac{(2x)^{\frac{3}{4}}}{(2x)^{\frac{3}{4}}} = \frac{30\sqrt[4]{(2x)^3}}{2x}$$

$$= \frac{15\sqrt[4]{(2x)^3}}{x}$$

$$18. \frac{8}{(\sqrt{3}-\sqrt{5})} \cdot \frac{(\sqrt{3}+\sqrt{5})}{(\sqrt{3}+\sqrt{5})}$$

$$\frac{8(\sqrt{3}+\sqrt{5})}{3+\sqrt{15}-\sqrt{15}-5} = \frac{8(\sqrt{3}+\sqrt{5})}{-2} = \boxed{-4(\sqrt{3}+\sqrt{5})}$$