

Unit 9: Radicals & Exponents

What you need to know & be able to do	Things to remember	Examples	
1. Exponential Expressions	Multiply/Divide Coefficients  Add/Subtract Exponents	a. $(3x^2y)^4$ $3x^2y \cdot 3x^2y \cdot 3x^2y \cdot 3x^2y$ $81x^8y^4$	b. $(-2x^3y^4)^2 \cdot x^2y^3x^3y^5$ $-2x^3y^4 \cdot -2x^3y^4 \cdot x^2y^3x^3y^5$ $4x^{11}y^{16}$
		c. $3mn^3 \cdot 6m^6n^7$ $18m^7n^{10}$	d. $\frac{45a^7b^8}{-5a^2}$ $\frac{-9b^8}{a^2}$
		e. $\frac{2y^7x^3}{(2x^2)^4} = \frac{2y^7x^3}{2x^2 \cdot 2x^2 \cdot 2x^2 \cdot 2x^2}$ $= \frac{2x^3y^7}{16x^8} = \frac{y^7}{8x^5}$	f. $\left(\frac{2x^5y^4}{3yx^3}\right)^3 = \frac{2x^5y^4}{3x^3y} \cdot \frac{2x^5y^4}{3x^3y} \cdot \frac{2x^5y^4}{3x^3y}$ $= \frac{8x^{15}y^{12}}{27x^9y^3} = \frac{8x^6y^9}{27}$
2. Estimate Radicals	Determine what two perfect squares the radical is between.	a. Estimate $\sqrt{43}$ to the nearest tenth. Between $\sqrt{36}$ and $\sqrt{49}$ $\approx 6.5$ or $6.6$	a. Estimate $\sqrt{71}$ to the nearest tenth. Between $\sqrt{64}$ and $\sqrt{81}$ $\approx 8.3$ or $8.4$
3. Simplify radicals	-Break each number down into its prime factors and circle pairs of the same number (perfect squares)  -Keep each factor without a buddy underneath the square root.	a. $\sqrt{20} = \sqrt{2 \cdot 2 \cdot 5}$ $= 2\sqrt{5}$	b. $\sqrt{24x^2y^8}$ $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot x^2 \cdot y^8}$ $2xy^4\sqrt{6}$
		c. $5\sqrt{12x^6y^5z^4}$ $5\sqrt{2 \cdot 2 \cdot 3 \cdot x^4 \cdot y^4 \cdot z^4}$ $5 \cdot 2 \cdot x^3y^2 \cdot z^2 \sqrt{3y}$ $10x^3y^2z^2\sqrt{3y}$	d. $-2\sqrt{10x^4y^2}$ $-2\sqrt{2 \cdot 5 \cdot x^4 \cdot y^2}$ $-2x^2y\sqrt{10}$

<p>4. Multiply radicals</p> <p>-Multiply the outside numbers and variables</p> <p>-Multiply the inside numbers and variables</p> <p>-Simplify radical</p>		<p>a. <math>-4\sqrt{15} \cdot \sqrt{3}</math></p> $-4\sqrt{45}$ $-4\sqrt{3 \cdot 3 \cdot 5}$ $-4 \cdot 3\sqrt{5}$ $\boxed{-12\sqrt{5}}$	<p>b. <math>\sqrt{2y^3} \cdot \sqrt{8y^3}</math></p> $\sqrt{16y^6}$ $\boxed{4y^3}$
		<p>c. <math>\sqrt{18a^2} \cdot 4\sqrt{3a^3}</math></p> $4\sqrt{54a^5}$ $4\sqrt{2 \cdot 3 \cdot 3 \cdot 3 \cdot a^5}$ $4 \cdot 3a^2\sqrt{6a}$ $\boxed{12a^2\sqrt{6a}}$	<p>d. <math>2\sqrt{6x^4} \cdot -7\sqrt{4x^2}</math></p> $-14\sqrt{24x^6}$ $-14\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot x^6}$ $-14 \cdot 2 \cdot x^3\sqrt{6}$ $\boxed{-28x^3\sqrt{6}}$
<p>5. Add and Subtract Radicals</p> <p>-Distribute if necessary</p> <p>-Simplify each radical</p> <p>-Add or subtract like terms</p>		<p>a. <math>2\sqrt{6} - 2\sqrt{54}</math></p> $2\sqrt{6} - 2\sqrt{2 \cdot 3 \cdot 3 \cdot 3}$ $2\sqrt{6} - 2 \cdot 3\sqrt{6}$ $2\sqrt{6} - 6\sqrt{6}$ $\boxed{-4\sqrt{6}}$	<p>b. <math>3\sqrt{12} + 3\sqrt{3}</math></p> $3\sqrt{2 \cdot 2 \cdot 3} + 3\sqrt{3}$ $3 \cdot 2\sqrt{3} + 3\sqrt{3}$ $6\sqrt{3} + 3\sqrt{3}$ $\boxed{9\sqrt{3}}$
		<p>c. <math>-4\sqrt{6}(3\sqrt{7} + 5\sqrt{2})</math></p> $-12\sqrt{6} \cdot 3\sqrt{7} - 20\sqrt{12}$ $-12\sqrt{6} \cdot 3\sqrt{7} - 20\sqrt{2 \cdot 2 \cdot 3}$ $-12\sqrt{6} \cdot 3\sqrt{7} - 20 \cdot 2\sqrt{3}$ $\boxed{-12\sqrt{6} \cdot 3\sqrt{7} - 40\sqrt{3}}$	<p>d. <math>-3\sqrt{20} - 4\sqrt{45} + 8\sqrt{3}</math></p> $-3\sqrt{2 \cdot 2 \cdot 5} - 4\sqrt{3 \cdot 3 \cdot 5} + 8\sqrt{3}$ $-3 \cdot 2\sqrt{5} - 4 \cdot 3\sqrt{5} + 8\sqrt{3}$ $-6\sqrt{5} - 12\sqrt{5} + 8\sqrt{3}$ $\boxed{-18\sqrt{5} + 8\sqrt{3}}$