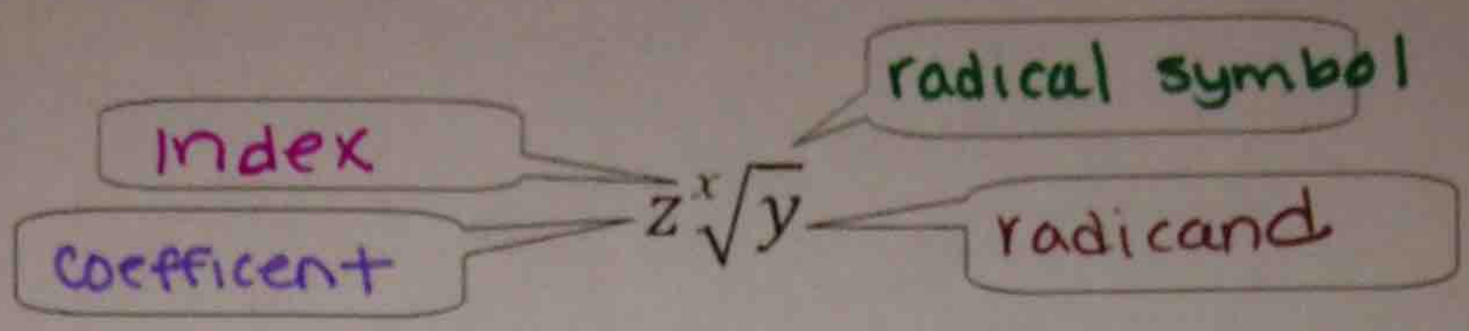
Math 3

1.1 Radical Operations

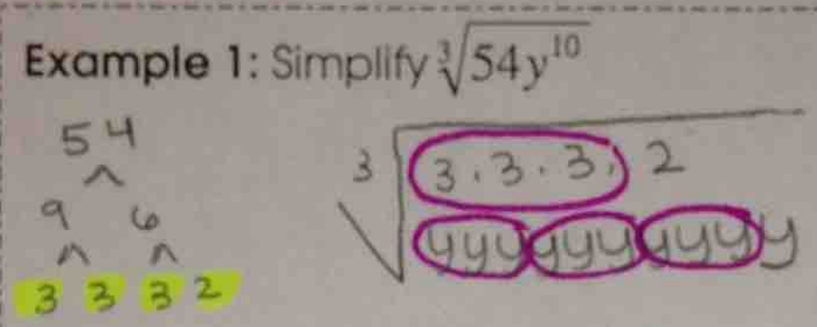
Unit 1

SWBAT simplify radical expressions by applying the appropriate operation.



When simplifying radicals, factor the insides of the radical. Then circle the pairs, triples or quadruples (depending on the index) and pull them outside. Multiply outside factors on the outside and inside factors on the inside.

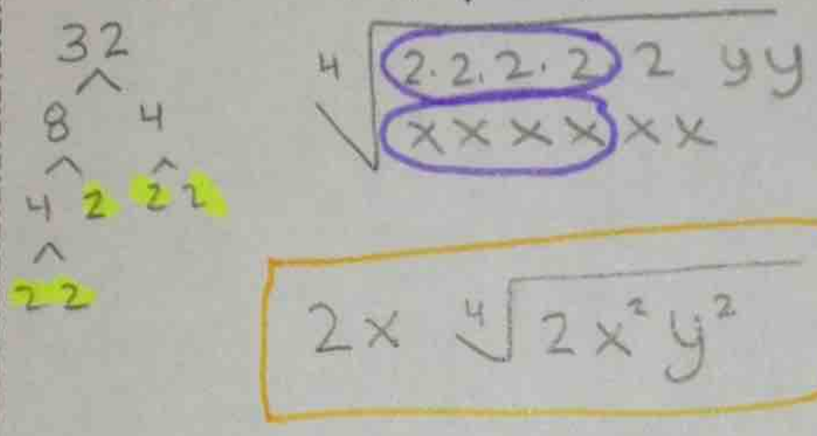
Example 1: Simplify $\sqrt[3]{54y^{10}}$



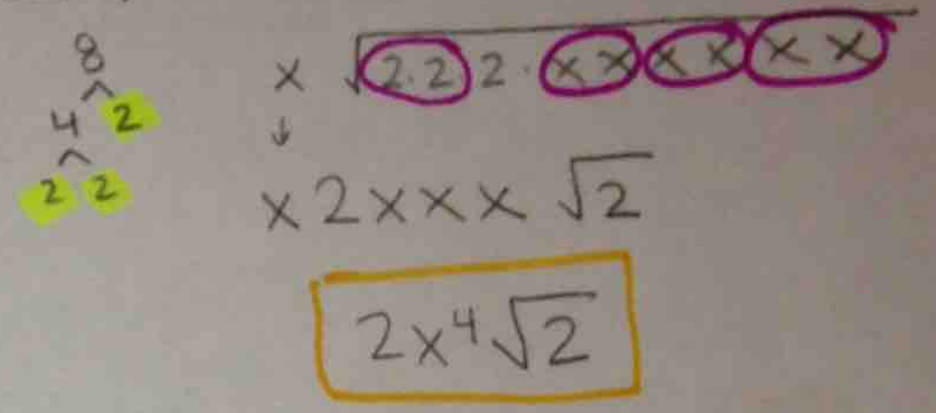
$3yyy\sqrt[3]{2y}$

$3y^3\sqrt[3]{2y}$

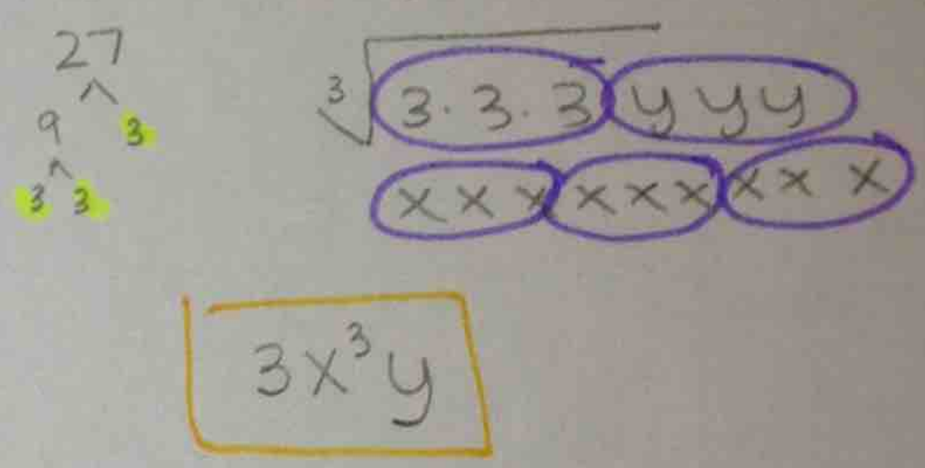
Example 2: Simplify $\sqrt[4]{32x^6y^2}$



Example 3: Simplify $x\sqrt{8x^6}$

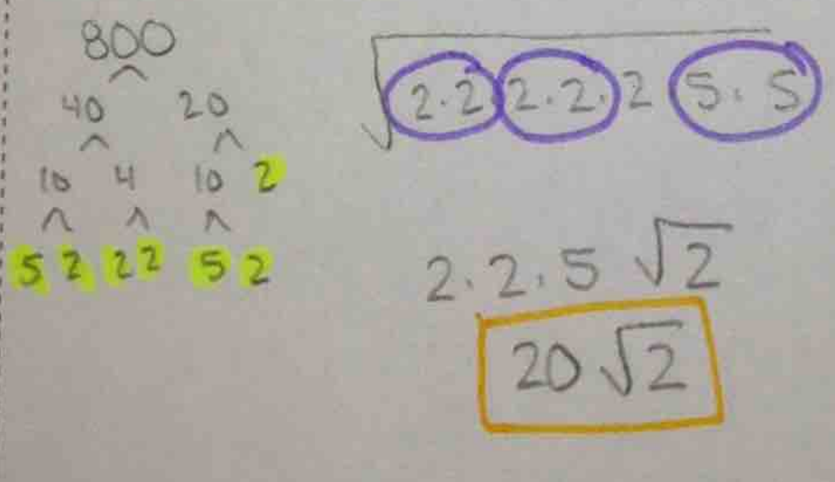


Example 4: Simplify $\sqrt[3]{27x^9y^3}$

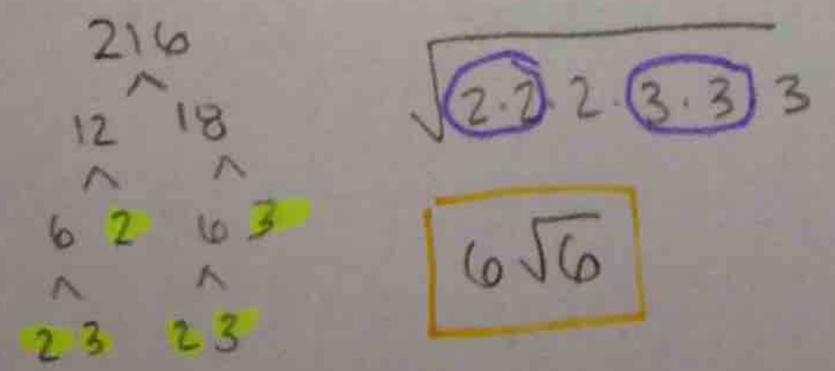


When multiplying radicals, start by simplifying the radicals, if necessary. Then, multiply **outsides by outsides** and **insides by insides**. Then simplify again.

Example 5: $\sqrt{40}\cdot\sqrt{20} = \sqrt{800}$



Example 6: $\sqrt{12}\cdot\sqrt{18} = \sqrt{216}$

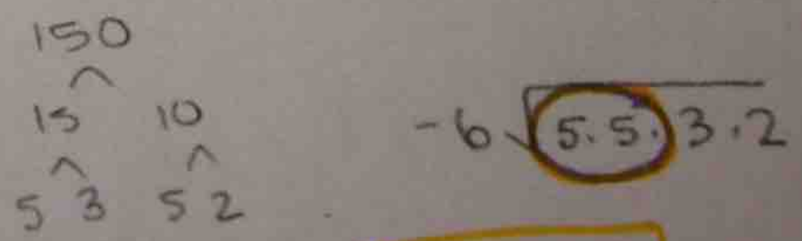


Example 7: $2\sqrt{8}\cdot 3\sqrt{2} = 6\sqrt{16}$

$= 6(4)$

$= 24$

Example 8: $-6\sqrt{10}\cdot\sqrt{15} = -6\sqrt{150}$



Adding Radicals

**Only add like terms (like radicands and indices!)...so simplify first, then add if possible.

Example 1: $\sqrt{72}+\sqrt{32}$

72 → 8, 9 → 4, 2, 3, 3 → 2, 2, 2, 2, 2

32 → 8, 4 → 4, 2, 2, 2 → 2, 2, 2

$6\sqrt{2} + 4\sqrt{2} = \boxed{10\sqrt{2}}$

Example 2: $2\sqrt{20}+5\sqrt{80}$

$2\sqrt{20}$ → 4, 5 → 2, 2, 2

$5\sqrt{80}$ → 8, 10 → 4, 2, 2, 5 → 2, 2, 2, 2, 5

$4\sqrt{5} + 20\sqrt{5} = \boxed{24\sqrt{5}}$

Subtracting Radicals

**Only subtract like terms (like radicands and indices!)...so simplify first, then subtract if possible

Example 3: $6\sqrt{18}-3\sqrt{50}$

$6\sqrt{18}$ → 6, 3 → 2, 3, 3

$3\sqrt{50}$ → 5, 10 → 5, 2, 5

$18\sqrt{2} - 15\sqrt{2} = \boxed{3\sqrt{2}}$

Example 4: $\sqrt[3]{81}-2\sqrt[3]{24}$

$\sqrt[3]{81}$ → 9, 9 → 3, 3, 3, 3

$2\sqrt[3]{24}$ → 8, 3 → 2, 4, 3 → 2, 2, 2, 3

$3\sqrt[3]{3} - 4\sqrt[3]{3} = \boxed{-1\sqrt[3]{3}}$

Multiplying Radicals

Multiply using the BOX method or FOIL method

Example 5: $(2\sqrt{3}+3\sqrt{5})(3-\sqrt{3})$

	$2\sqrt{3}$	$+3\sqrt{5}$
3	$6\sqrt{3}$	$9\sqrt{5}$
$-\sqrt{3}$	$-2\sqrt{9}$ $=-2(3)$	$-3\sqrt{15}$

$\boxed{-6+6\sqrt{3}+9\sqrt{5}-3\sqrt{15}}$

Example 6; $(4\sqrt{2}+7)^2 = (4\sqrt{2}+7)(4\sqrt{2}+7)$

$(4\sqrt{2}+7)(4\sqrt{2}+7)$

$16\sqrt{4} + 28\sqrt{2} + 28\sqrt{2} + 49$

$16(2) + 56\sqrt{2} + 49$

$32 + 56\sqrt{2} + 49$

$\boxed{81 + 56\sqrt{2}}$

Simplifying Quotients

use a conjugate to rationalize a denominator

conjugate– expressions that differ only in the signs of the second terms. ($x + y$ and $x - y$ are conjugates)

Example 7: $\dfrac{2+\sqrt{3}}{4-\sqrt{3}} \cdot \dfrac{(4+\sqrt{3})}{(4+\sqrt{3})}$

$\dfrac{8+2\sqrt{3}+4\sqrt{3}+3}{16+4\sqrt{3}-4\sqrt{3}-3} = \boxed{\dfrac{11+6\sqrt{3}}{13}}$

Example 8: $\dfrac{(1+\sqrt{5})}{(2-\sqrt{7})} \cdot \dfrac{(2+\sqrt{7})}{(2+\sqrt{7})}$

$\dfrac{2+1\sqrt{7}+2\sqrt{5}+\sqrt{35}}{4+2\sqrt{7}-2\sqrt{7}-7} =$

$= \boxed{\dfrac{2+2\sqrt{5}+1\sqrt{7}+\sqrt{35}}{-3}}$