

Section 5.2

Multiplying \rightarrow Dividing Radicals

\rightarrow can only multiply/divide radicals with the same index number

$$\downarrow$$
$$^n\sqrt{x}$$

Property 1: The product of two square roots is equal to the square root of the product.

$$\sqrt{a} \cdot \sqrt{b} = \sqrt{a \cdot b}$$

$$1) \sqrt{5} \cdot \sqrt{2} = \sqrt{10}$$

$$b) \sqrt[3]{6} \cdot \sqrt[3]{3} = \sqrt[3]{18}$$

$$\boxed{\begin{array}{l} \sqrt{5} \cdot 2 \neq \sqrt{10} \\ \sqrt{5} \cdot 2 = 2\sqrt{5} \end{array}}$$

Property 2: The product of two mixed radicals is equal to the product of the coefficients times the product of the radicals.

$$c \sqrt[n]{a} \cdot d \sqrt[n]{b} = cd \sqrt[n]{ab}$$

2a) $3\sqrt{2} \cdot 4\sqrt{5} = 12\sqrt{10}$

b) $7\sqrt{6} \cdot 2\sqrt{3} = 14\sqrt{18}$

* $\sqrt{18}$

$14 \cdot \sqrt{2}$
 $3\sqrt{2}$

18
/ \
3 6
/ \ / \
2 3

$14(3\sqrt{2})$
 $42\sqrt{2}$

$\sqrt{2 \cdot (3 \cdot 3)}$
 $3\sqrt{2}$

c) $\sqrt{12} \cdot \sqrt{18}$

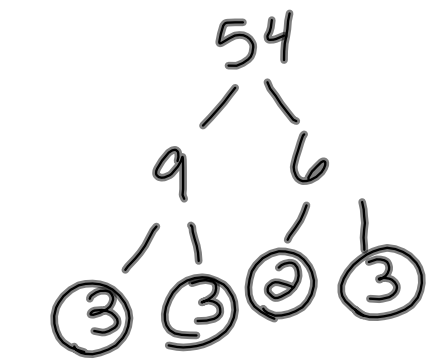
method 1
 $\sqrt{216}$

216
/ \
9 24
/ \ / \
3 3 4 6
/ \ / \ / \
2 2 2 3

$\sqrt{(2 \cdot 2) 2 \cdot (3 \cdot 3) 3}$
 $2 \cdot 3 \sqrt{2 \cdot 3}$
 $6\sqrt{6}$

Method 2
 $(2\sqrt{3})(3\sqrt{2})$
 $6\sqrt{6}$

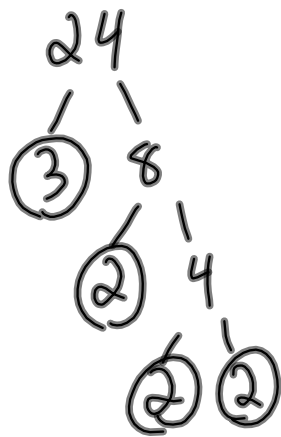
d) $2 \sqrt[3]{54} \cdot 5 \sqrt[3]{24}$



$$\sqrt[3]{2(3 \cdot 3 \cdot 3)}$$

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

$$2(3 \sqrt[3]{2})$$



$$\sqrt[3]{(2 \cdot 2 \cdot 2)3}$$

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

$$5(2 \sqrt[3]{3})$$

$$6 \sqrt[3]{2} \cdot 10 \sqrt[3]{3}$$

$$\boxed{60 \sqrt[3]{6}}$$

$$\sqrt{5} \cdot \sqrt{5} = \sqrt{25} = 5$$

$$\sqrt[3]{5} \cdot \sqrt[3]{5} \cdot \sqrt[3]{5} = \sqrt[3]{125} = 5$$

Property #3

You use the same properties with rational numbers to multiply radicals ...

ie, distributive property
foil (double distributive)

$$3a) 4\sqrt{2}(7\sqrt{5} + \sqrt{3})$$

$$28\sqrt{10} + 4\sqrt{6}$$

$$b) \frac{-2}{\sqrt{11}}(4\sqrt[3]{2} - 3\sqrt[3]{3})$$

$$-8\sqrt[3]{22} + 6\sqrt[3]{33}$$

$$c) (3 + \sqrt{14})(4\sqrt{7} - 5\sqrt{2})$$

$$3(4\sqrt{7} - 5\sqrt{2}) + \sqrt{14}(4\sqrt{7} - 5\sqrt{2})$$

$$12\sqrt{7} - 15\sqrt{2} + 4\sqrt{98} - 5\sqrt{28}$$

$$\begin{array}{r} \sqrt{98} \\ \sqrt{49} \sqrt{2} \\ 7\sqrt{2} \end{array} \qquad \begin{array}{r} \sqrt{28} \\ \sqrt{4} \cdot \sqrt{7} \\ 2\sqrt{7} \end{array}$$

$$12\sqrt{7} - 15\sqrt{2} + 4(7\sqrt{2}) - 5(2\sqrt{7})$$

$$12\sqrt{7} - 15\sqrt{2} + 28\sqrt{2} - 10\sqrt{7}$$

$$\boxed{2\sqrt{7} + 13\sqrt{2}}$$

$$d) (\sqrt{2} - 10\sqrt{3})^2$$

$$(\sqrt{2} - 10\sqrt{3})(\sqrt{2} - 10\sqrt{3})$$

$$\sqrt{2}(\sqrt{2} - 10\sqrt{3}) - 10\sqrt{3}(\sqrt{2} - 10\sqrt{3})$$

$$2 - 10\sqrt{6} - 10\sqrt{6} + 100(3)$$

$$2 - 20\sqrt{6} + 300$$

$$302 - 20\sqrt{6}$$

Section 5.2

$$1 a, d \quad 4 a, d$$

$$2 a, d$$

$$3 a, d$$