

5.2a Multiplying Radicals

Does $\sqrt{3} \times \sqrt{5} = \sqrt{15}$?

Does $3\sqrt{2} \times 5\sqrt{7} = 15\sqrt{14}$?

In general, $(a\sqrt{b})(c\sqrt{d}) = ac\sqrt{bd}$

Ex. Simplify.

8, 27, 64

a) $\sqrt{6} \times \sqrt{2} \times \sqrt{10}$

$$\sqrt{120} = \sqrt{4 \times 30} = 2\sqrt{30}$$

b) $5\sqrt{3} \times 2\sqrt{12}$

$$\frac{10\sqrt{36}}{10(6)} = 60$$

c) $7\sqrt[3]{4} \times 3\sqrt[3]{6}$

$$\frac{7\sqrt[3]{24}}{7\sqrt[3]{8 \times 3}} = 14\sqrt[3]{3}$$

d) $\sqrt{10} \times \sqrt{10}$

$$\frac{\sqrt{10 \times 10}}{10}$$

e) $\sqrt{3a} \times \sqrt{3a}$

$$\frac{\sqrt{3a \times 3a}}{3a}$$

f) $(-3\sqrt{2x})(7\sqrt{3x})$

$$\begin{aligned} & -21\sqrt{6x^2} \\ & -21x\sqrt{6} \end{aligned}$$

g) $\sqrt{21x} \cdot 4x^2\sqrt{\frac{x}{7}}$

$$4x^2 \sqrt{\frac{21^3 x \cdot x}{1 \cdot 7}}$$

$$4x^2(x\sqrt{3}) = 4x^3\sqrt{3}$$

h) $5\sqrt{18} \times 3\sqrt{20}$

$$\frac{5\sqrt{9 \times 2}}{5(3\sqrt{2})} \times \frac{3\sqrt{4 \times 5}}{3(2\sqrt{5})}$$

$$\frac{15\sqrt{2}}{90\sqrt{10}}$$

We can multiply the examples above b/c the indexes are the same

For this reason, $4\sqrt[3]{5} \times 3\sqrt{2}$ cannot be simplified.

The distributive law.

$$\sqrt{5} \times \sqrt{5} = 5$$

$$a) \quad 3\sqrt{5}(4\sqrt{2x} - 2\sqrt{5}) = 12\sqrt{10x} - 6(5)$$

$$12\sqrt{10x} - 30$$

$$2 - 5\sqrt{x}$$

$$b) \quad (2\sqrt{3} - 3\sqrt{2})(2\sqrt{3} + \sqrt{2}) = 4(3) + 2\sqrt{6} - 6\sqrt{6} - 3(2)$$

$$12 + 2\sqrt{6} - 6\sqrt{6} - 6$$

$6 - 4\sqrt{6}$ cannot simplify further.

or $-4\sqrt{6} + 6$

$$c) \quad (\sqrt[3]{w^2} + 4\sqrt[3]{2})(8\sqrt[3]{2} - 5\sqrt[3]{w^2})$$

$$8\sqrt[3]{2w^2} - 5\sqrt[3]{w^4} + 32\sqrt[3]{4} - 20\sqrt[3]{2w^2}$$

$$-5w\sqrt[3]{w} + 32\sqrt[3]{4} - 12\sqrt[3]{2w^2}$$

$$c) \quad (\sqrt{x} - 3)^2 = (\sqrt{x} - 3)(\sqrt{x} - 3) = x - 3\sqrt{x} - 3\sqrt{x} + 9$$

$$x - 6\sqrt{x} + 9$$

$$d) \quad (2\sqrt{x} - \sqrt{y})(2\sqrt{x} + \sqrt{y}) = 4x + 2\sqrt{xy} - 2\sqrt{xy} - y$$

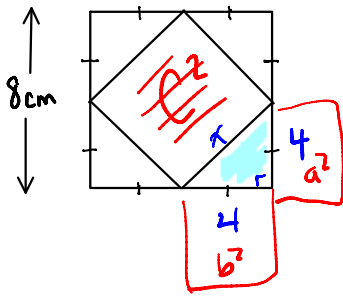
$$0\sqrt{xy} = 0$$

$$4x - y$$

* In general, conjugates are binomials with the same terms that have opposite signs.

$$(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = a - b$$

c) Determine the area & perimeter of the inner square.



$$x^2 = 4^2 + 4^2$$

$$x^2 = 32$$

$$x = \sqrt{32}$$

$$x = 4\sqrt{2}$$

$$\text{Area} = x^2 = (4\sqrt{2})^2$$

$$x^2 = 16(2)$$

$$x^2 = 32$$

$$\text{Perimeter} = 4x$$

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

$$= 16\sqrt{2}$$

Assignment: Worksheet