C11 - 5.1 - Adding and Subtracting Radicals Notes

Square Roots

$\sqrt[2]{7} + \sqrt[2]{7} = 2\sqrt[2]{7}$

Like Radicals: Add or subtract coefficients.

Like Radicals: Same radicand, same index

$1\sqrt[2]{3} + 1\sqrt[2]{3} = 2\sqrt[2]{3}$

Index $\longrightarrow \sqrt[2]{3} \longleftarrow$ Radicand

$2\sqrt[2]{3} + 5\sqrt[2]{3} = 7\sqrt[2]{3}$

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

Cannot add or subtract unlike radicals.

$5\sqrt[2]{2} - 2\sqrt[2]{2} = 3\sqrt[2]{2}$

$4\sqrt[2]{3} - 7\sqrt[2]{2} = -3\sqrt[2]{2}$

Cube Roots

$\sqrt[3]{7} + \sqrt[3]{7} = 2\sqrt[3]{7}$

$\sqrt[3]{5} + \sqrt[3]{5} = 2\sqrt[3]{5}$

$2\sqrt[3]{5} + 6\sqrt[3]{5} = 8\sqrt[3]{5}$

$-2\sqrt[3]{5} - 6\sqrt[3]{5} = -8\sqrt[3]{5}$

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

Can only add or subtract like radicals.

$\sqrt[3]{3} + 1 = \sqrt[3]{3} + 1$

Can only add or subtract like radicals.

C11 - 5.2 - Multiplying and Dividing Radicals Notes

$$\sqrt[2]{3} \times \sqrt[2]{3} = \sqrt[2]{3 \times 3}$$
$$= \sqrt[2]{9}$$
$$= 3$$

$$\sqrt[2]{4} \times \sqrt[2]{3} = \sqrt[2]{4 \times 3}$$
$$= \sqrt[2]{12}$$

$$3\sqrt[2]{4} \times 2\sqrt[2]{3} = 3 \times 2\sqrt[2]{4 \times 3}$$
$$= 6\sqrt[2]{12}$$

Multiply coefficients
Multiply Radicands

$$5\sqrt[2]{2} \times 6\sqrt[2]{3} = 5 \times 6\sqrt[2]{2 \times 3}$$
$$= 30\sqrt[2]{6}$$

Can only multiply like indexes.

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

Cannot multiply unlike indexes.

$$2 \times \sqrt{3} = 2\sqrt{3}$$

$$\sqrt{5} \times 7 = 7\sqrt{5}$$

$$\frac{\sqrt[2]{6}}{\sqrt[2]{3}} = \sqrt[2]{\frac{6}{3}}$$
$$= \sqrt[2]{2}$$

$$\frac{10\sqrt[2]{6}}{2\sqrt[2]{3}} = \frac{10}{2}\sqrt[2]{\frac{6}{3}}$$
$$= 5\sqrt[2]{2}$$

1) $\dfrac{5}{\sqrt[2]{3}} = \dfrac{5 \times \sqrt[2]{3}}{\sqrt[2]{3} \times \sqrt[2]{3}}$

$= \dfrac{5\sqrt[2]{3}}{\sqrt[2]{3 \times 3}}$

$= \dfrac{5\sqrt[2]{3}}{\sqrt[2]{9}}$

$= \dfrac{5\sqrt[2]{3}}{3}$

Multiply the top and bottom by the root in the denominator.

$\sqrt[2]{3^1} = 3^{\frac{1}{2}}$

$\sqrt{3} \times \sqrt{3} = 3$ $\qquad 3^{\frac{1}{2}} \times 3^{\frac{1}{2}} = 3^1$ $\qquad$ Add Exponents

3) $\dfrac{5}{2 - \sqrt[2]{6}} = \dfrac{5 \times (2 + \sqrt[2]{6})}{(2 - \sqrt[2]{6}) \times (2 + \sqrt[2]{6})}$

$= \dfrac{10 + 5\sqrt[2]{6}}{4 + 2\sqrt{6} - 2\sqrt{6} - \sqrt{36}}$

$= \dfrac{10 + 5\sqrt[2]{6}}{4 - 6}$

$= \dfrac{10 + 5\sqrt[2]{6}}{-2}$

Multiply the top and bottom by the **conjugate** of the denominator.

Distribution/Foil

$(a + b)(a - b) = a^2 - ab + ab - b^2$ $\qquad$ F̸O̸I̸L

$= a^2 - b^2$

2) $\dfrac{4}{\sqrt[2]{5} + \sqrt[2]{3}} = \dfrac{4 \times (\sqrt[2]{5} - \sqrt[2]{3})}{(\sqrt[2]{5} + \sqrt[2]{3}) \times (\sqrt[2]{5} - \sqrt[2]{3})}$

$= \dfrac{4\sqrt[2]{5} - 4\sqrt[2]{3}}{\sqrt[2]{25} - \sqrt[2]{9}}$

$= \dfrac{4\sqrt[2]{5} - 4\sqrt[2]{3}}{5 - 3}$

$= \dfrac{4\sqrt[2]{5} - 4\sqrt[2]{3}}{2}$

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

Simplify, by dividing the top and bottom by 2.

Multiply the top and bottom by the cube root of the denominator twice.

$\dfrac{5}{\sqrt[3]{3}} = \dfrac{5 \times \sqrt[3]{3} \times \sqrt[3]{3}}{\sqrt[3]{3} \times \sqrt[3]{3} \times \sqrt[3]{3}}$

$= \dfrac{5\sqrt[3]{9}}{3}$

$\sqrt[3]{3} = 3^{\frac{1}{3}}$ $\qquad$ $\sqrt[3]{3} \times \sqrt[3]{3} \times \sqrt[3]{3} = 3$ $\qquad$ $3^{\frac{1}{3}} \times 3^{\frac{1}{3}} \times 3^{\frac{1}{3}} \times = 3^1$

C11 - 5.4 - Solving Radical Equation Notes

$\sqrt{x+2} = 4$

$\left(\sqrt{x+2}\right)^2 = (4)^2$ Square both sides

$x + 2 = 16$

$x = 14$

Check Answer: LHS=RHS   Left Hand Side = Right Hand Side

$\sqrt{x+2} = 4$

$\sqrt{14+2} = 4$

$\sqrt{16} = 4$

$4 = 4$

LHS=RHS

Square Both Sides First

$2\sqrt{x+3} = 6$

$\left(2\sqrt{x+3}\right)^2 = (6)^2$

$4(x+3) = 36$

$\dfrac{4(x+3)}{4} = \dfrac{36}{4}$

$x + 3 = 9$

$-3 \quad -3$

$x = 6$

Divide First

$2\sqrt{x+3} = 6$

$\dfrac{2\sqrt{x+3}}{2} = \dfrac{6}{2}$

$\sqrt{x+3} = 3$

$\left(\sqrt{x+3}\right)^2 = (3)^2$

$x + 3 = 9$

$-3 \quad -3$

$x = 6$

$3\sqrt{x+1} = \sqrt{x+25}$

$\left(3\sqrt{x+1}\right)^2 = \left(\sqrt{x+25}\right)^2$

$9(x+1) = x + 25$

$9x + 9 = x + 25$

$-x -x$

$8x + 9 = 25$

$-9 \quad -9$

$8x = 16$

$\dfrac{8x}{8} = \dfrac{16}{8}$

$x = 2$