4. Identify the restrictions on the variables for the following radical expressions.

a. $3\sqrt{5n}$

$n \geq 0, n \in R$

b. $\sqrt[4]{y-5} - 1$

$y - 5 \geq 0$

$y \geq 5, y \in R$

c. $\dfrac{1}{2a}\sqrt{7a}$

$a \geq 0$, but $a \neq 0$ because of the a in the denominator

$a > 0, a \in R$

Please complete *Lesson 3.1 Explore Your Understanding Assignment* located in *Workbook 3A* before proceeding to *Lesson 3.2*.

Lesson 3.2: Operations with Radicals

Practice Solutions – II

1. Georgia simplified the expression $5\sqrt{45} - \sqrt{20}$.

$$5\sqrt{45} - \sqrt{20} = (5-1)\sqrt{45-20}$$
$$= 4\sqrt{25}$$
$$= 4(5)$$
$$= 20$$

Explain the error(s) Georgia made, and correct the solution.

The coefficients cannot be subtracted because the radicals are not like radicals. Also, the radicands are not subtracted from each other, ever. First, simplify the radicals. Then, add/subtract the coefficients of any like radicals.

The correct solution is:

$$5\sqrt{45} - \sqrt{20} = 5\sqrt{9 \cdot 5} - \sqrt{4 \cdot 5}$$
$$= 15\sqrt{5} - 2\sqrt{5}$$
$$= 13\sqrt{5}$$

2. Simplify the following expressions.

a. $\sqrt{24} - \sqrt{6}$

$$\sqrt{24} - \sqrt{6} = \sqrt{4 \cdot 6} - \sqrt{6}$$
$$= 2\sqrt{6} - \sqrt{6}$$
$$= \sqrt{6}$$

b. $\sqrt[3]{81x^4} + \sqrt[3]{5} + x\sqrt[3]{192x} - \sqrt[3]{40}$

$$\sqrt[3]{81x^4} + \sqrt[3]{5} + x\sqrt[3]{192x} - \sqrt[3]{40} = \sqrt[3]{27 \cdot 3 \cdot x^3 \cdot x} + \sqrt[3]{5} + x\sqrt[3]{64 \cdot 3x} - \sqrt[3]{8 \cdot 5}$$
$$= 3x\sqrt[3]{3x} + \sqrt[3]{5} + 4x\sqrt[3]{3x} - 2\sqrt[3]{5}$$
$$= 7x\sqrt[3]{3x} - \sqrt[3]{5}$$

3. Simplify the following expressions. Where applicable, identify any restrictions on the variables.

a. $3\sqrt{6r} \cdot 4\sqrt{10}$

Because the index is 2 (even), the radicands must be greater than or equal to zero.

$r \geq 0, r \in R$

$$3\sqrt{6r} \cdot 4\sqrt{10} = 12\sqrt{60r}$$
$$= 12\sqrt{4 \cdot 15r}$$
$$= 24\sqrt{15r}$$

b. $4\sqrt{5}(2 - 3\sqrt{15})$

$$4\sqrt{5}(2 - 3\sqrt{15}) = 8\sqrt{5} - 12\sqrt{75}$$
$$= 8\sqrt{5} - 12\sqrt{25 \cdot 3}$$
$$= 8\sqrt{5} - 60\sqrt{3}$$

4. Simplify the following expressions. Where applicable, identify any restrictions on the variables.

a. $(2\sqrt{3} + \sqrt{7})(3 - \sqrt{21})$

$$(2\sqrt{3} + \sqrt{7})(3 - \sqrt{21}) = 6\sqrt{3} - 2\sqrt{63} + 3\sqrt{7} - \sqrt{147}$$
$$= 6\sqrt{3} - 2\sqrt{9 \cdot 7} + 3\sqrt{7} - \sqrt{49 \cdot 3}$$
$$= 6\sqrt{3} - 6\sqrt{7} + 3\sqrt{7} - 7\sqrt{3}$$
$$= -\sqrt{3} - 3\sqrt{7}$$

b. $(5\sqrt{2} - 2\sqrt{5m})^2, m \geq 0$

$$\begin{aligned}(5\sqrt{2} - 2\sqrt{5m})^2 &= (5\sqrt{2} - 2\sqrt{5m})(5\sqrt{2} - 2\sqrt{5m}) \\ &= 25\sqrt{4} - 10\sqrt{10m} - 10\sqrt{10m} + 4\sqrt{25m^2} \\ &= 25(2) - 20\sqrt{10m} + 4(5)m \\ &= 50 - 20\sqrt{10m} + 20m, \, m \geq 0 \end{aligned}$$

5. Simplify the following expressions.

a. $\dfrac{18\sqrt{35}}{2\sqrt{5}}$

$$\begin{aligned}\frac{18\sqrt{35}}{2\sqrt{5}} &= \left(\frac{18}{2}\right)\sqrt{\frac{35}{5}} \\ &= 9\sqrt{7}\end{aligned}$$

b. $\dfrac{7\sqrt[3]{48x^2}}{21\sqrt[3]{24x}}, \, x \neq 0$

$$\begin{aligned}\frac{7\sqrt[3]{48x^2}}{21\sqrt[3]{24x}} &= \left(\frac{7}{21}\right)\sqrt[3]{\frac{48x^2}{24x}} \\ &= \frac{1}{3}\sqrt[3]{2x} \\ &= \frac{\sqrt[3]{2x}}{3}\end{aligned}$$

Please return to *Unit 3: Radicals Lesson 3.2* to continue your exploration.