Chapter 2 - Whiteboarding Review

1. Write each mixed radical as an entire radical.

a) $3\sqrt{5}$

$= \sqrt{3^2 \cdot 5}$

$= \sqrt{9 \cdot 5}$

$= \sqrt{45}$

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

$= \sqrt[5]{2^5 \cdot 3}$

$= \sqrt[5]{32 \cdot 3}$

$= \sqrt[5]{96}$

c) $\frac{3}{2}\sqrt[3]{\frac{1}{3}}$

$= \sqrt[3]{\left(\frac{3}{2}\right)^3 \cdot \frac{1}{3}}$

$= \sqrt[3]{\frac{27}{8} \cdot \frac{1}{3}}$

$= \sqrt[3]{\frac{27}{24}}$

$= \sqrt[3]{\frac{9}{8}}$

2. State the values for the variable for which each radical is defined. Simplify the radical.

a) $\sqrt{-27m^4n}$

$= \sqrt{-9 \cdot 3\,(mm)(mm)n}$

$= 3m^2\sqrt{-3n}$

Restrictions:
m^4 will always be positive, so
$m \in \mathbb{R}$
$n \leq 0$

b) $\sqrt[3]{-54a^4b^5c^6}$

Restrictions:
you can take the $\sqrt[3]{}$ of pos. or neg.
$\therefore a, b, c \in \mathbb{R}$

$= \sqrt[3]{-27 \cdot 2 \cdot (aaa) \cdot a \cdot (bbb) \cdot bb \cdot (ccc) \cdot (ccc)}$

$= -3abc^2\sqrt[3]{2ab^2}$

3. Simplify.

a) $2\sqrt{8} + 3\sqrt{20} - \sqrt{18} + 5\sqrt{45}$

$= 2\sqrt{4 \cdot 2} + 3\sqrt{5 \cdot 4} - \sqrt{9 \cdot 2} + 5\sqrt{9 \cdot 5}$

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

$= 4\sqrt{2} + 6\sqrt{5} - 3\sqrt{2} + 15\sqrt{5}$

$= \sqrt{2} + 21\sqrt{5}$

b) $\sqrt{28m^4n} + m^2\sqrt{63n}$

$= \sqrt{4 \cdot 7\,(mm)(mm)n} + m^2\sqrt{9 \cdot 7n}$

$= 2m^2\sqrt{7n} + 3m^2\sqrt{7n}$

$= 5m^2\sqrt{7n}$

4. Simplify.

a) $\dfrac{15\sqrt{2}+5\sqrt{3}}{\sqrt{20}}$ * Always try to simplify first!!

$= \dfrac{15\sqrt{2}+5\sqrt{3}}{\sqrt{4\cdot 5}}$

$= \dfrac{(15\sqrt{2}+5\sqrt{3})}{(2\sqrt{5})} \cdot \dfrac{\sqrt{5}}{\sqrt{5}}$

$= \dfrac{15\sqrt{10}+5\sqrt{15}}{2(5)}$

$= \dfrac{\cancel{15}\sqrt{10}+\cancel{5}\sqrt{15}}{\cancel{10}}$

$\boxed{= \dfrac{3\sqrt{10}+\sqrt{15}}{2}}$

OR//

$\dfrac{15\sqrt{2}+5\sqrt{3}}{\sqrt{20}} \cdot \dfrac{\sqrt{20}}{\sqrt{20}}$

$= \dfrac{15\sqrt{40}+5\sqrt{60}}{20}$

$= \dfrac{15\sqrt{4\cdot 10}+5\sqrt{4\cdot 15}}{20}$

$= \dfrac{15(2)\sqrt{10}+5(2)\sqrt{15}}{20}$

$= \dfrac{\cancel{30}\sqrt{10}+\cancel{10}\sqrt{15}}{\cancel{20}}$

$= \dfrac{3\sqrt{10}+\sqrt{15}}{2}$

b) $\dfrac{(4\sqrt{7}-3\sqrt{2})}{(5\sqrt{2}+2\sqrt{7})} \cdot \dfrac{(5\sqrt{2}-2\sqrt{7})}{(5\sqrt{2}-2\sqrt{7})}$

$= \dfrac{20\sqrt{14}+6\sqrt{14}-8(7)-15(2)}{25(2)-\cancel{10\sqrt{14}}+\cancel{10\sqrt{14}}-4(7)}$

$= \dfrac{26\sqrt{14}-56-30}{50-28}$

$= \dfrac{2\cancel{6}\sqrt{14}-\cancel{86}}{\cancel{22}}$

$= \boxed{\dfrac{13\sqrt{14}-43}{11}}$

5. Solve, then check your answer.

a) $\sqrt{3x+27}+5=2$

$\quad\quad\quad -5 \quad -5$

$(\sqrt{3x+27})^2=(-3)^2$

$3x+27=9$

$\quad -27 \quad -27$

$\frac{3x}{3}=\frac{-18}{3}$

$\boxed{x=-6}$

↳ extraneous root. reject!

check:

$\sqrt{3(-6)+27}+5=2$

$\sqrt{-18+27}+5=2$

$\sqrt{9}+5=2$

$3+5\neq 2$

$\therefore$ no solution

b) $(2\sqrt{x+5})^2=(3\sqrt{5x-11})^2$

$4(x+5)=9(5x-11)$

$4x+20=45x-99$

$\quad -20 \quad\quad\quad -20$

$4x=45x-119$

$-45x \quad -45x$

$\frac{-41x}{-41}=\frac{-119}{-41}$

$\boxed{x=\frac{119}{41}}$

check:

$2\sqrt{\left(\frac{119}{41}\right)+5}=3\sqrt{\left(\frac{119}{41}\right)-11}$

$5.622255\ldots=5.622255\ldots$ ✓