

Key

6.5 Operations with Radical Expressions - Day 2 Notes

So what do we do when multiplying radicals containing a coefficient?

$$X^n\sqrt[n]{a} * Y^n\sqrt[n]{b} = X * Y^n\sqrt[n]{ab}$$

ex. $5\sqrt{2x} * 3\sqrt{8x}$

$$\begin{aligned}
& 5 \cdot 3 \sqrt{2x \cdot 8x} \\
& = 15 \sqrt{16x^2} \\
& = 15 \cdot 4 \cdot x \\
& = \boxed{60x}
\end{aligned}$$

5. $4\sqrt{5a^5} * \sqrt{125a^3}$

$$\begin{aligned}
& 4 \sqrt{5a^5 \cdot 125a^3} \\
& = 4 \sqrt{625a^8} \\
& = 4 \cdot 25 \cdot a^4 \\
& = \boxed{100a^4}
\end{aligned}$$

ex. $3\sqrt{5y} * 8\sqrt{10yz}$

$$\begin{aligned}
& 3 \cdot 8 \sqrt{5y \cdot 10yz} \\
& = 24 \sqrt{50y^2z} \\
& = 24 \sqrt{25 \cdot 2y^2z} \\
& = 24 \cdot 5y \sqrt{2z} \\
& = \boxed{120y\sqrt{2z}}
\end{aligned}$$

6. $5\sqrt{x^8y^3} * 5\sqrt{2x^5y^4}$

$$\begin{aligned}
& 5 \cdot 5 \sqrt{x^8y^3 \cdot 2x^5y^4} \\
& = 25 \sqrt{2x^{13}y^7} \\
& = 25 \sqrt{2x^{12} \cdot x \cdot y^6 \cdot y} \\
& = \boxed{25x^6y^3\sqrt{2xy}}
\end{aligned}$$

7. $4^3\sqrt{3xy} * 2^3\sqrt{9x^2y^2}$

$$\begin{aligned}
& 4 \cdot 2^3 \sqrt{3xy \cdot 9x^2y^2} \\
& 8^3 \sqrt{27x^3y^3} \\
& = 8 \cdot 3 \cdot x \cdot y \\
& = \boxed{24xy}
\end{aligned}$$

8. $\sqrt[4]{3x^3y^2} * \sqrt[4]{27xy^2}$

$$\begin{aligned}
& \sqrt[4]{3x^3y^2 \cdot 27xy^2} \\
& = \sqrt[4]{81x^4y^4} \\
& = \boxed{3xy}
\end{aligned}$$

Quotient Property of Radicals: $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Ex. $\frac{\sqrt{27}}{\sqrt{3}} = \sqrt{\frac{27}{3}} = \sqrt{9} = \boxed{3}$

9. $\frac{\sqrt[3]{81}}{\sqrt[3]{3}} = \sqrt[3]{\frac{81}{3}} = \sqrt[3]{27} = 3$

Ex. $\sqrt{\frac{25r^2t}{36}} = \frac{\sqrt{25r^2t}}{\sqrt{36}}$
 $= \frac{5r\sqrt{t}}{6}$

10. $\sqrt{\frac{1}{64}c^4d^7} = \frac{\sqrt{1c^4d^7}}{\sqrt{64}} = \frac{\sqrt{1c^4d^6 \cdot d}}{\sqrt{64}}$
 $= \frac{1c^2d^3\sqrt{d}}{8}$

Rationalizing denominators:

Ex. $\frac{2}{\sqrt{3}} = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

ex. $\sqrt[3]{\frac{24}{216}} = \sqrt[3]{\frac{1}{9}} = \frac{1}{\sqrt[3]{9}}$
 $\frac{1}{\sqrt[3]{9}} \cdot \frac{\sqrt[3]{9^2}}{\sqrt[3]{9^2}} = \frac{\sqrt[3]{81}}{\sqrt[3]{9^3}} = \frac{\sqrt[3]{81}}{9}$

11. $\sqrt[4]{\frac{6}{2x}} = \frac{\sqrt[4]{6}}{\sqrt[4]{2x}} = \frac{\sqrt[4]{6}}{\sqrt[4]{2x}} \cdot \frac{\sqrt[4]{x^3}}{\sqrt[4]{x^3}}$
 $= \frac{\sqrt[4]{6x^3}}{\sqrt[4]{2x^4}} = \frac{\sqrt[4]{6x^3}}{x}$

ex. $= \sqrt[3]{\frac{8}{54}} = \frac{\sqrt[3]{8}}{\sqrt[3]{54}} = \frac{2}{\sqrt[3]{27 \cdot 2}}$
 $= \frac{2}{3\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2^2}}{\sqrt[3]{2^2}} = \frac{2\sqrt[3]{4}}{3 \cdot 2} = \frac{\sqrt[3]{4}}{3}$

12. $\sqrt[3]{\frac{4}{5y}} = \frac{\sqrt[3]{4}}{\sqrt[3]{5y}} = \frac{\sqrt[3]{4}}{\sqrt[3]{5y}} \cdot \frac{\sqrt[3]{5^2y^2}}{\sqrt[3]{5^2y^2}}$
 $= \frac{\sqrt[3]{4 \cdot 25y^2}}{\sqrt[3]{5^3y^3}} = \frac{\sqrt[3]{100y^2}}{5y}$