

Multiplying and Dividing Properties of Radicals

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then when you multiply you will get $\sqrt[n]{ab}$

Ex: Multiply. Simplify if possible.

1) $\sqrt{2} \cdot \sqrt{8}$

$$\sqrt{2 \cdot 8}$$

$$\sqrt{16}$$

4

2) $\sqrt[3]{-5} \cdot \sqrt[3]{25}$

$$\sqrt[3]{-125}$$

$\begin{matrix} \nearrow & \nearrow \\ 5 & 25 \\ \searrow & \searrow \\ & -5 \cdot 5 \end{matrix}$

-5

3) $\sqrt{-2} \cdot \sqrt{8}$

$$\sqrt{-16}$$

Not possible

4) $\sqrt[4]{4} \cdot \sqrt[4]{-4}$

$$\sqrt[4]{-16}$$

Not possible

5) $\sqrt[3]{54x^2y^3} \cdot \sqrt[3]{5x^3y^4}$

$$\sqrt[3]{270x^5y^7}$$

$\begin{matrix} \nearrow & \nearrow \\ 5 & 5 \\ \searrow & \searrow \\ 9 & 6 \\ \nearrow & \nearrow \\ 3 & 3 & 2 \end{matrix}$

$3xy^2 \sqrt[3]{10x^2y}$

6) $3\sqrt{7x^3} \cdot 2\sqrt{21x^3y^2}$

$$6\sqrt{147x^6y^2}$$

$\begin{matrix} \nearrow & \nearrow \\ 7 & 21 \\ \searrow & \searrow \\ & 3 \end{matrix}$

$42x^3y\sqrt{3}$

7) $\sqrt[3]{50x^2z^5} \cdot \sqrt[3]{-15y^3z^2}$

$$\sqrt[3]{-750x^2y^3z^7}$$

$\begin{matrix} \nearrow & \nearrow \\ 50 & 15 \\ \nearrow & \nearrow \\ 2 & 25 & 5 & 3 \\ \nearrow & \nearrow \\ 5 & 5 \end{matrix}$

$-5yz^2 \sqrt[3]{6x^2z}$

Ex: Multiply.

8) $(3+2\sqrt{5})(2+4\sqrt{5})$

FOIL

$$6 + 12\sqrt{5} + 4\sqrt{5} + 8\sqrt{25}$$

$\underbrace{\hspace{2em}}$

$\underbrace{\hspace{2em}}$

8 5

$$6 + 16\sqrt{5} + 40$$

$46 + 16\sqrt{5}$

9) $(2\sqrt{3}+3\sqrt{2})^2$

$$(2\sqrt{3}+3\sqrt{2})(2\sqrt{3}+3\sqrt{2})$$

	$2\sqrt{3}$	$3\sqrt{2}$	
$2\sqrt{3}$	$4\sqrt{9}$	$6\sqrt{6}$	$12 + 12\sqrt{6} + 18$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> $30 + 12\sqrt{6}$ </div>
$3\sqrt{2}$	$6\sqrt{6}$	$9\sqrt{4}$	
	$4\sqrt{9} + 12\sqrt{6} + 9\sqrt{4}$ <div style="display: flex; justify-content: space-around; margin-top: 5px;"> 8 3 2 2 </div>		