

Rationalizing the Denominator

Simplify

$$\frac{3\sqrt{12}}{\sqrt{5}}$$

What do you notice?

**** The rule you must remember, is that we can not have a radical as a denominator!! ****

**** When this arises we use a procedure that is called “Rationalizing the Denominator”.**

#1

$$\frac{3\sqrt{12} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$$

$$\frac{3\sqrt{60}}{5}$$

$$\frac{3\sqrt{4 \cdot 15}}{5}$$

$$= \frac{6\sqrt{15}}{5}$$

#1

$$\frac{3\sqrt{12}}{\sqrt{5}}$$

→ **You must rationalize the denominator!!**

$$= \frac{3\sqrt{12} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$$

→ **Multiply the top and bottom by the radical in the denominator!!**

$$= \frac{3\sqrt{60}}{5}$$

→ **Now, simplify your answer!**

$$= \frac{3\sqrt{4 \times 15}}{5}$$

$$= \frac{6\sqrt{15}}{5}$$

#2

$$\frac{\sqrt{8} \cdot 4\sqrt{13}}{\sqrt{8} \cdot 2\sqrt{8}}$$

$$\frac{4\sqrt{104}}{2(8)}$$

$$\frac{4\sqrt{4 \cdot 26}}{16}$$

$$8 \div 8 \sqrt{26}$$

$$8 \div 16$$

$$= \frac{1\sqrt{26}}{2}$$

#2

$$\frac{4\sqrt{13}}{2\sqrt{8}}$$

→ You must rationalize the denominator!!

$$= \frac{4\sqrt{13} \times \sqrt{8}}{2\sqrt{8} \times \sqrt{8}}$$

→ You can simplify first before you rationalize if you wish!

$$= \frac{4\sqrt{104}}{2(8)}$$

$$= \frac{4\sqrt{104}}{16}$$

$$= \frac{4\sqrt{4 \times 26}}{16}$$

$$= \frac{8\sqrt{26}}{16}$$

→ Simplify if possible!

$$= \frac{\sqrt{26}}{2}$$

#3

$$\frac{\sqrt{6} \cdot (2\sqrt{2} + 3\sqrt{3})}{\sqrt{6} \cdot 3\sqrt{6}}$$

$$\frac{2\sqrt{12} + 3\sqrt{18}}{3(6)}$$

$$\frac{2^2 \sqrt{4 \cdot 3} + 3^3 \sqrt{9 \cdot 2}}{18}$$

$$\Rightarrow \frac{4\sqrt{3} + 9\sqrt{2}}{18}$$

#3

$$\begin{aligned} & \frac{2\sqrt{2} + 3\sqrt{3}}{3\sqrt{6}} \\ \text{Add brackets!} \quad \longrightarrow & \frac{(2\sqrt{2} + 3\sqrt{3}) \times \sqrt{6}}{3\sqrt{6} \times \sqrt{6}} \quad \longrightarrow \text{Make sure all terms are multiplied by the radical!!} \\ & = \frac{2\sqrt{12} + 3\sqrt{18}}{3(6)} \\ & = \frac{2\sqrt{4 \times 3} + 3\sqrt{9 \times 2}}{18} \\ & = \frac{4\sqrt{3} + 9\sqrt{2}}{18} \quad \longrightarrow \text{Simplify if possible!} \\ & = \frac{2\sqrt{3}}{9} + \frac{\sqrt{2}}{2} \end{aligned}$$

#4

$$\frac{16\sqrt{75} + 24\sqrt{30}}{4\sqrt{15}}$$

$$= 4\sqrt{5} + 6\sqrt{2}$$

#4

$$\frac{16\sqrt{75} + 24\sqrt{30}}{4\sqrt{15}} \rightarrow \text{Don't rationalize if there is no need!!}$$

$$= \frac{16\sqrt{75}}{4\sqrt{15}} + \frac{24\sqrt{30}}{4\sqrt{15}}$$

$$= 4\sqrt{5} + 6\sqrt{2}$$

Try These:

#1 $\frac{3\sqrt{12}}{\sqrt{3}}$

#2 $\frac{8\sqrt{72}}{2\sqrt{18}}$

#3 $\frac{3\sqrt{2}}{\sqrt{3}}$

#4 $\frac{6\sqrt{12} - 9\sqrt{21}}{3\sqrt{3}}$

#5 $\frac{2\sqrt{3} - 3\sqrt{5}}{\sqrt{3}}$

#6 $\frac{4\sqrt{8} - 2\sqrt{12}}{3\sqrt{3}}$

$$\#1 \quad \frac{3\sqrt{12}}{\sqrt{3}}$$

$$\#2 \quad \frac{8\sqrt{72}}{2\sqrt{18}}$$

$$\#3 \quad \frac{3\sqrt{2}}{\sqrt{3}}$$

$$\#4 \quad \frac{6\sqrt{12} - 9\sqrt{21}}{3\sqrt{3}}$$

$$\#5 \quad \frac{2\sqrt{3} - 3\sqrt{5}}{\sqrt{3}}$$

$$\#6 \quad \frac{4\sqrt{8} - 2\sqrt{12}}{3\sqrt{3}}$$

