

8.1 Simplifying Radicals

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Perfect Square Roots:

$$\begin{array}{ll} \sqrt{1} = 1 & \sqrt{49} = 7 \\ \sqrt{4} = 2 & \sqrt{64} = 8 \\ \sqrt{9} = 3 & \sqrt{81} = 9 \\ \sqrt{16} = 4 & \sqrt{100} = 10 \\ \sqrt{25} = 5 & \sqrt{121} = 11 \\ \sqrt{36} = 6 & \sqrt{144} = 12 \end{array}$$

ex Simplify: $\frac{\sqrt{16}}{\sqrt{36}} \rightarrow \frac{4}{6} \rightarrow \frac{2}{3}$

① Break down a Square Root:

15.49 $\sqrt{240} \rightarrow 4\sqrt{15}$ 15.49

240
2 120
3 80
4 60
5 48
6 40
8 30
10 24
12 20
15 16 ← greatest perfect square

simplify ↓ stuck ↓
4 $\sqrt{15}$

42.43 $6\sqrt{50}$ greatest perfect square that is a factor of 50

6 $\cdot \sqrt{25} \cdot \sqrt{2}$
simplify ↓ stuck ↓
6 $\cdot 5 \sqrt{2}$
30 $\sqrt{2}$ 42.43

② Square Roots in Fractions

ex $\sqrt{\frac{8}{25}} \rightarrow \frac{\sqrt{8}}{\sqrt{25}} \rightarrow \frac{2\sqrt{2}}{5}$ 0.567

2.82 $\sqrt{8}$
simplify ↓ stuck ↓
2 $\sqrt{2}$ 2.82

Rationalizing the Denominator

ex $\frac{6}{\sqrt{3}} \rightarrow \frac{6 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} \rightarrow \frac{6\sqrt{3}}{3} \rightarrow 2\sqrt{3}$ 3.46

cannot multiply can multiply reduce simplify

* Not allowed to have a $\sqrt{\quad}$ in denominator 0.894

ex $\sqrt{\frac{16}{20}} \rightarrow \frac{\sqrt{16}}{\sqrt{20}} \rightarrow \frac{4}{\sqrt{20}}$ break up

OR $\frac{4}{\sqrt{20}} \rightarrow \frac{4}{\sqrt{4 \cdot 5}} \rightarrow \frac{4}{2\sqrt{5}} \rightarrow \frac{2}{\sqrt{5}}$ reduce

Rationalize the Denominator $\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} \rightarrow \frac{2\sqrt{5}}{5} \rightarrow \frac{2\sqrt{5}}{5}$ 0.894

$$\left. \begin{array}{l} \sqrt[4]{16} \\ \sqrt[4]{20} \\ \sqrt[4]{4} \\ \sqrt[4]{20} \end{array} \right\}$$

$$\text{OR } \sqrt{\frac{4}{5}} \rightarrow \frac{\sqrt{4}}{\sqrt{5}} \rightarrow \frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} \rightarrow \frac{2\sqrt{5}}{\sqrt{25}} \rightarrow \boxed{5} \\ 0.894$$