Section 9.4 - Rationalizing the Denominator

Rational numbers : $\sqrt{36} = 6$

$\sqrt{49} = 7$

Irrational numbers: $\sqrt{7}$

$\sqrt{3}$

$\sqrt{2}$

we want to change fractions so that we don't have any square roots in the denominator

ex 2. $\frac{1}{\sqrt{2}}$

$= \frac{1 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}}$ multiply the top + bottom by the root that is in the denominator.

$= \frac{\sqrt{2}}{\sqrt{4}}$ ← perfect square

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

6. $\frac{4}{\sqrt{6}}$

$= \frac{4 \cdot \sqrt{6}}{\sqrt{6} \cdot \sqrt{6}}$

$= \frac{4\sqrt{6}}{\sqrt{36}}$

$= \frac{4\sqrt{6}}{6}$ reduce the 4 and 6. Leave the root alone.

$= \frac{2\sqrt{6}}{3}$

12. $\sqrt{\frac{5}{2}}$

$= \sqrt{\frac{5}{2}} \cdot \sqrt{\frac{2}{2}}$ use $\frac{\sqrt{2}}{\sqrt{2}}$ or combine them in one root.

$= \frac{\sqrt{10}}{\sqrt{4}}$

$= \frac{\sqrt{10}}{2}$

Simplify radicals first if needed

26. $\frac{1}{\sqrt{18}}$

$= \frac{1}{\sqrt{9}\sqrt{2}}$

$= \frac{1}{3\sqrt{2}}$ Now rationalize

$= \frac{1}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{\sqrt{2}}{3 \cdot \sqrt{4}}$

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

$= \frac{\sqrt{2}}{6}$

32. $\sqrt{\frac{7}{12}}$

$= \frac{\sqrt{7}}{\sqrt{4}\sqrt{3}}$ split into separate roots

$= \frac{\sqrt{7}}{2\sqrt{3}}$

$= \frac{\sqrt{7}}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ now rationalize

$= \frac{\sqrt{21}}{2\sqrt{9}}$

$= \frac{\sqrt{21}}{2 \cdot 3}$

$= \frac{\sqrt{21}}{6}$

Rationalize a denominator with 2 terms

Use the conjugate (same terms with opposite sign)

54. $$\frac{1}{(5+\sqrt{2})} \cdot \frac{(5-\sqrt{2})}{(5-\sqrt{2})}$$

FOIL

use the same terms and change the sign

Remember 9.3 #70

$$= \frac{5-\sqrt{2}}{5\cdot 5 - \cancel{5\sqrt{2}} + \cancel{5\sqrt{2}} - \sqrt{2}\sqrt{2}}$$

$$= \frac{5-\sqrt{2}}{25-2}$$

$$= \frac{5-\sqrt{2}}{23}$$

56. $$\frac{12}{(2-\sqrt{7})} \cdot \frac{(2+\sqrt{7})}{(2+\sqrt{7})}$$ FOIL

$$= \frac{24+12\sqrt{7}}{4 + \cancel{2\sqrt{7}} - \cancel{2\sqrt{7}} + \sqrt{49}}$$

$$= \frac{24+12\sqrt{7}}{4+7}$$

$$= \frac{24+12\sqrt{7}}{11}$$

Supplement Packet for 9.4

1) Is $\frac{30}{\sqrt{12}}$ the same as $5\sqrt{3}$?

a) use your calculator - round to the nearest tenth

$$\frac{30}{\sqrt{12}} \approx 8.7$$

$$5\sqrt{3} \approx 8.7$$

b. Show that they are the same

$$\frac{30}{\sqrt{12}}$$

$$= \frac{30}{\sqrt{4}\sqrt{3}}$$

$$= \frac{30}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\overset{5}{\cancel{\overset{10}{\cancel{30}}}}\sqrt{3}}{\underset{1}{\cancel{2}} \cdot \underset{1}{\cancel{3}}}$$

$$= 5\sqrt{3}$$

2) Solve the equation and rationalize the solution

$$\sqrt{3}x + 4 = 10$$
$$\quad -4 \quad -4$$

$$\frac{\sqrt{3}x}{\sqrt{3}} = \frac{6}{\sqrt{3}}$$

$$x = \frac{6}{\sqrt{3}}$$

$$\frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\overset{2}{\cancel{6}}\sqrt{3}}{\underset{1}{\cancel{3}}}$$

$$= 2\sqrt{3}$$