

SQUARE ROOTS

$$\sqrt{9} = \underset{\substack{\uparrow \\ \text{principal root}}}{3} \text{ or } \cancel{3}$$

$$\sqrt{28} = \sqrt{4 \cdot 7} = \sqrt{4} \cdot \sqrt{7} = 2\sqrt{7}$$

$$\sqrt{45} = \sqrt{9 \cdot 5} = 3\sqrt{5}$$

$$\begin{aligned}\sqrt{72} &= \sqrt{9 \cdot 8} = 3\sqrt{8} = 3\sqrt{4 \cdot 2} = 6\sqrt{2} \\ &= \sqrt{36 \cdot 2} = 6\sqrt{2}\end{aligned}$$

$$\begin{aligned}2\sqrt{3} + 8\sqrt{3} - 4\sqrt{2} \\ = 10\sqrt{3} - 4\sqrt{2}\end{aligned}$$

$$\begin{aligned}\underline{5\sqrt{2}} - \underline{3\sqrt{7}} - \underline{9\sqrt{2}} + \underline{6\sqrt{7}} \\ = -4\sqrt{2} + 3\sqrt{7}\end{aligned}$$

$$\begin{aligned}\sqrt{24} + \sqrt{54} \\ \sqrt{4 \cdot 6} + \sqrt{9 \cdot 6} \\ = 2\sqrt{6} + 3\sqrt{6} \\ = \boxed{5\sqrt{6}}\end{aligned}$$

Multiplication

$$\begin{aligned}\sqrt{2} \cdot \sqrt{6} \\&= \sqrt{12} \\&= \sqrt{4 \cdot 3} \\&= 2\sqrt{3}\end{aligned}$$

$$\begin{aligned}3\sqrt{6} \cdot 5\sqrt{3} \\&= 15\sqrt{18} \\&= 15\sqrt{9 \cdot 2} \\&\quad \cdot 3 \\&= 45\sqrt{2}\end{aligned}$$

$$\begin{aligned}\sqrt{18} \cdot \sqrt{24} \\&= \sqrt{9 \cdot 2} \cdot \sqrt{4 \cdot 6} \\&= 3\sqrt{2} \cdot 2\sqrt{6} \\&= 6\sqrt{12} \\&= 6\sqrt{4 \cdot 3} \\&\quad \cdot 2 \\&= 12\sqrt{3}\end{aligned}$$

$$\begin{aligned}&(\underline{3} + \underline{4\sqrt{3}})(\underline{5} - \underline{2\sqrt{3}}) \\&15 - 6\sqrt{3} + 20\sqrt{3} - 8\sqrt{9} \\&\quad \quad \quad \cdot 3 \\&\quad \quad \quad - 24 \\&= \boxed{-9 + 14\sqrt{3}}\end{aligned}$$

F O I L
f i r s t
o u t e r
i n n e r
l a s t

DIVISION

$$\frac{\sqrt{21}}{\sqrt{7}} = \sqrt{3}$$

$$\sqrt{\frac{36}{25}} = \frac{\sqrt{36}}{\sqrt{25}} = \frac{6}{5}$$

$$\sqrt{\frac{20}{81}} = \frac{\sqrt{20}}{\sqrt{81}} = \frac{\sqrt{4 \cdot 5}}{9} = \frac{2\sqrt{5}}{9}$$

$$\frac{5 \cdot \sqrt{7}}{\sqrt{7} \cdot \sqrt{7}} = \frac{5\sqrt{7}}{7} \text{ Rationalizing the Denominator}$$

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

$$\sqrt{\frac{11}{12}} = \frac{\sqrt{11}}{\sqrt{12}} = \frac{\sqrt{11} \cdot \sqrt{3}}{2\sqrt{3} \cdot \sqrt{3}} = \frac{\sqrt{33}}{6}$$

4.3 3

$$\frac{3+4\sqrt{7} \cdot (5+2\sqrt{7})}{5-2\sqrt{7} \cdot (5+2\sqrt{7})} \text{ FOIL FL}$$

$$\frac{15+6\sqrt{7}+20\sqrt{7}+\overbrace{8 \cdot 7}^{56}}{25+\cancel{10\sqrt{7}}-\cancel{10\sqrt{7}}-\underbrace{4 \cdot 7}_{-28}}$$

$$\frac{-71+26\sqrt{7}}{+3}$$

$$\frac{-71-26\sqrt{7}}{3}$$

$$-\frac{1}{2} \quad -\frac{1}{+2} \quad -\frac{1}{2}$$

$$\frac{\cancel{10}+3\sqrt{7}}{\cancel{2}}$$

No! BAD!

Multiply by the conjugate of the denominator!

	<u>conjugate</u>
$4+\sqrt{3}$	$4-\sqrt{3}$
$-7-\sqrt{5}$	$-7+\sqrt{5}$
$x+4$	$x-4$

$$\frac{16-2\sqrt{5}}{10}$$

$$\frac{8-\sqrt{5}}{5}$$

Solve. for x

$$3x^2 + 7 = 43$$

$$\frac{3x^2}{3} = \frac{36}{3}$$

$$\sqrt{x^2} = \sqrt{12}$$

$$x = \pm 2\sqrt{3}$$

$$\sqrt{(x+6)^2} = \sqrt{50}$$

$$x+6 = \pm 5\sqrt{2}$$

$$x = -6 \pm 5\sqrt{2}$$

$$\sqrt{-1} = i$$

$$\sqrt{-4} = \sqrt{4 \cdot -1} = 2i$$

$$\begin{aligned}\sqrt{-32} &= \sqrt{16 \cdot 2 \cdot -1} \\ &= 4i\sqrt{2}\end{aligned}$$