SQUARE ROOTS

$\sqrt[2]{9} = \sqrt{9} = 3$

$\sqrt{121} = 11$

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

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

$\sqrt{72} = \sqrt{9 \cdot 8} = 3\sqrt{8} = 3\sqrt{9 \cdot 2}$
$= 6\sqrt{2}$
$\sqrt{36 \cdot 2}$

$2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}$

$5\sqrt{2} - 3\sqrt{7} - 9\sqrt{2} =$
$-4\sqrt{2} - 3\sqrt{7}$

$\sqrt{\underset{4 \cdot 6}{24}} + \sqrt{\underset{9 \cdot 6}{54}}$

$2\sqrt{6} + 3\sqrt{6}$
$= \boxed{5\sqrt{6}}$

Multiplication

$\sqrt{2} \cdot \sqrt{6} = \sqrt{12}$
$= \sqrt{4 \cdot 3}$
$= 2\sqrt{3}$

$3\sqrt{6} \cdot 5\sqrt{3} = 15\sqrt{18}$ (9·2)
$= 15\sqrt{9 \cdot 2}$ (3)
$= 45\sqrt{2}$

$\sqrt{24}$ (4·6) $\cdot \sqrt{98}$ (49·2)
$= 2\sqrt{6} \cdot 7\sqrt{2}$
$= 14\sqrt{12}$ (·2 ×·3)
$= 28\sqrt{3}$

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

First Outer Inner Last

$= 15 - 6\sqrt{5} + 20\sqrt{5} - 8 \cdot 5$
-40
$= \boxed{-25 + 14\sqrt{5}}$

DIVISION

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

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

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

$$\frac{5}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{5\sqrt{7}}{7}$$

Rationalizing the denominator
- get rid of $\sqrt{\ }$ in denominator

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

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

($12 = 4 \cdot 3$; $\sqrt{3} \cdot \sqrt{3} = 3$)

FOIL

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

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

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

Multiply by the conjugate of the denominator

$2+\sqrt{3}$ $\quad$ $2-\sqrt{3}$

$-4-3\sqrt{5}$ $\quad$ $-4+3\sqrt{5}$

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