Square Roots

$\sqrt{9} = 3$ ~~or -3~~

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

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

$\sqrt{72} = \sqrt{9 \cdot 8} = 3\sqrt{8} = 3\sqrt{4 \cdot 2} = 6\sqrt{2}$

$= \sqrt{36 \cdot 2} = 6\sqrt{2}$

$2\sqrt{3} + 8\sqrt{3} = 10\sqrt{3}$

$5\sqrt{2} - 3\sqrt{7} - 9\sqrt{2} + 6\sqrt{7}$

$= \boxed{-4\sqrt{2} + 3\sqrt{7}}$

$\sqrt{24} + \sqrt{54}$

$= \sqrt{4 \cdot 6} + \sqrt{9 \cdot 6}$

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

$= \boxed{5\sqrt{6}}$

$11^2 = 121$

$12^2 = 144$

$13^2 = 169$

$14^2 = 196$

$15^2 = 225$

$20^2 = 400$

Multiplication

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

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

$\sqrt{24} \cdot \sqrt{72}$
$= \sqrt{4 \cdot 6} \cdot \sqrt{36 \cdot 2}$
$= 2\sqrt{6} \cdot 6\sqrt{2}$
$= 12\sqrt{12}$
$= 12\sqrt{4 \cdot 3}$
$= 24\sqrt{3}$

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

Firsts
Outer
Inner
Last

$15 - 6\sqrt{5} + 20\sqrt{5} - 8\sqrt{25}$
$- 40$

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

$\sqrt{5} \cdot \sqrt{5} = \sqrt{25} = 5$
$\sqrt{7} \cdot \sqrt{7} = 7$
$\sqrt{31} \cdot \sqrt{31} = 31$

DIVISION

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

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

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

$\sqrt{\frac{32}{100}} = \frac{\sqrt{16 \cdot 2}}{10} = \frac{4\sqrt{2}}{10} = \frac{2\sqrt{2}}{5}$

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

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

$\sqrt{\frac{11}{12}} = \frac{\sqrt{11}}{\sqrt{12}} = \frac{\sqrt{11}}{\sqrt{4 \cdot 3}} = \frac{\sqrt{11} \cdot \sqrt{3}}{2\sqrt{3} \cdot \sqrt{3}} = \frac{\sqrt{33}}{6}$

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

$\frac{15 - 6\sqrt{7} + 20\sqrt{7} - 56}{25 - 10\sqrt{7} + 10\sqrt{7} - 28}$

FL

$\frac{+41 + 14\sqrt{7}}{+3}$

$\frac{41 + 14\sqrt{7}}{3}$

Multiply by the conjugate of the denom.

$4 + \sqrt{2}$	$4 - \sqrt{2}$
$7 - 2\sqrt{3}$	$7 + 2\sqrt{3}$
$-4 + 3\sqrt{5}$	$-4 - 3\sqrt{5}$
$-\frac{1}{2}$	$\frac{1}{-2}$

$3x^2 + 7 = 43$

$-7 \quad -7$

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

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

$4 \cdot 3$

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

$\sqrt{x^2} = \sqrt{9}$

$x = 3$ or -3

$\sqrt{-1} = i$

$\sqrt{-4} = 2i$

$-1 \cdot 4$

$\sqrt{-63} = \sqrt{-1 \cdot 9 \cdot 7} = 3i\sqrt{7}$

$\sqrt{-98} = \sqrt{-1 \cdot 16 \cdot 3} = 4i\sqrt{3}$