Radical Expressions

Product Property $\sqrt{a}\cdot\sqrt{b}=\sqrt{ab}$

$\sqrt{20}$ ← radicand

Quotient Property $\frac{\sqrt{a}}{\sqrt{b}}=\sqrt{\frac{a}{b}}$

Simplest Radical Form
- no perfect square factor in the radicand
- no radical in the denominator

1. $\sqrt{50}=\sqrt{2\cdot5\cdot5}=5\sqrt{2}$ / $\sqrt{50}=\sqrt{25}\sqrt{2}=5\sqrt{2}$

   (2, 25; 5, 5)

2. $\sqrt{7}*\sqrt{35}=\sqrt{7}\cdot\sqrt{7}\cdot\sqrt{5}=7\sqrt{5}$

3. $\sqrt{\frac{11}{144}}=\frac{\sqrt{11}}{\sqrt{144}}=\frac{\sqrt{11}}{12}$

4. $\sqrt{\frac{2}{15}}=\frac{\sqrt{2}}{\sqrt{15}}\cdot\frac{\sqrt{15}}{\sqrt{15}}=\frac{\sqrt{30}}{15}$

5. $4(3+\sqrt{2})=12+4\sqrt{2}$ STOP!

   $=16\sqrt{2}$ NO!

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Radical Expressions (continued)

6. $(3+\sqrt{2})(4-\sqrt{8})$

FOIL

$12-3\sqrt{8}+4\sqrt{2}-\sqrt{16}$

$12-3\sqrt{8}+4\sqrt{2}-4$

$8-3\sqrt{8}+4\sqrt{2}$

$8-3\sqrt{4}\sqrt{2}+4\sqrt{2}$

$8-3\cdot 2\sqrt{2}+4\sqrt{2} = 8-6\sqrt{2}+4\sqrt{2}$

$= 8-2\sqrt{2}$

7. $\dfrac{4}{5-\sqrt{2}}$

8. $\dfrac{7}{2+\sqrt{3}}$

9. $\dfrac{2+2\sqrt{3}}{2}$

Complex Numbers

Real

- Counting Numbers $1, 2, 3, 4, \ldots$
- Whole Numbers $0, 1, 2, 3, 4 \ldots$
- Integers $\ldots -3, -2, -1, 0, 1, 2, 3 \ldots$
- Rational Numbers $\frac{p}{q}$ where p & q are integers ($q \neq 0$) (terminating or repeating decimal)
- Irrational Numbers $\pi, \sqrt{2}, \sqrt{3}$

Imaginary

$\sqrt{-1} = i$ or i ~~i~~ $\quad i = \sqrt{-1} \quad i^2 = -1$

$\sqrt{-7} = \sqrt{-1} \cdot \sqrt{7} = i\sqrt{7}$

$\sqrt{-12} = \sqrt{-1} \cdot \sqrt{12} = i\sqrt{12} = i\sqrt{4}\sqrt{3} = i \cdot 2\sqrt{3} = 2i\sqrt{3}$

Solve: $2x^2 + 18 = -72$

$-18 \quad -18$

$2x^2 = -90$

$x^2 = -45$

$\sqrt{x^2} = \sqrt{-45}$

$x = \pm\sqrt{-45}$

$x = \pm i\sqrt{45}$

$= \pm i\sqrt{9}\sqrt{5}$

$= \pm i \cdot 3\sqrt{5} = \pm 3i\sqrt{5}$

Solve: $-4(n - 2)^2 = 20$

Complex

$a + bi$

real, imaginary

1) $(-8 + 8i) - (2 + 4i)$

$-8 + 8i - 2 - 4i$

$-10 + 4i$

11) $(-1 + 3i)(1 + 6i)$

FOIL $-1 - 6i + 3i + 18i^2$

$-1 - 3i + 18(-1)$

$-1 - 3i - 18 = -19 - 3i$

14) $(-3 - 2i)(-7 - i)$

$21 + 3i + 14i + 2i^2$

$21 + 17i + 2(-1)$

$21 + 17i - 2$

$19 + 17i$

31) $\dfrac{8}{7 + 8i}$