

# 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.  $\sqrt{50} = \sqrt{2 \cdot 5 \cdot 5} = 5\sqrt{2} \quad / \quad \sqrt{50} = \sqrt{25} \sqrt{2} = 5\sqrt{2}$

*(Handwritten notes: 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

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

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

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

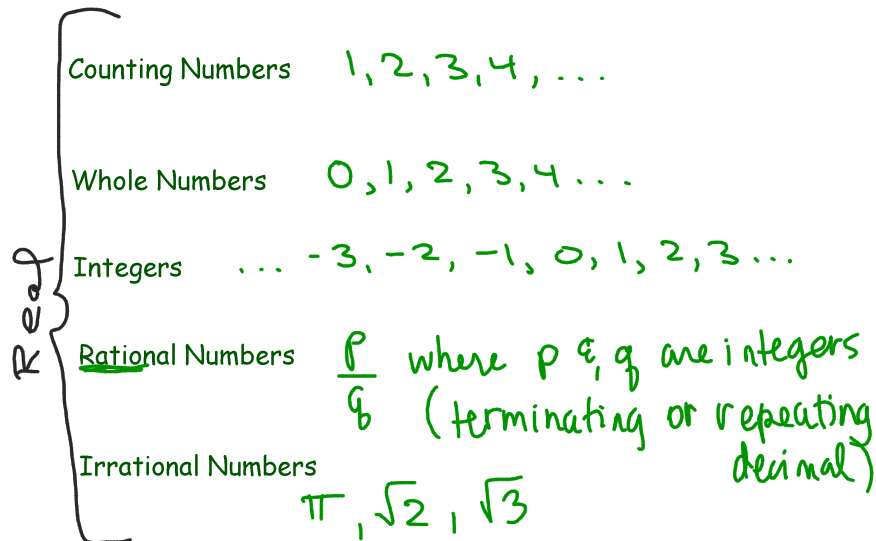
$$8 - 3\sqrt{4\sqrt{2}} + 4\sqrt{2}$$

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

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

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

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



Imaginary

$$\sqrt{-1} = i \text{ or } i \text{ (with } i \text{ crossed out)} \quad i = \sqrt{-1} \quad i^2 = -1$$

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

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

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

$$\begin{aligned} -18 & -18 \\ 2x^2 & = -90 \\ x^2 & = -45 \end{aligned}$$

$$\begin{aligned} \sqrt{x^2} & = \sqrt{-45} \\ x & = \pm\sqrt{-45} \\ x & = \pm i\sqrt{45} \\ & = \pm i\sqrt{9} \sqrt{5} \\ & = \pm i \cdot 3\sqrt{5} = \pm 3i\sqrt{5} \end{aligned}$$

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

## Complex

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

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

$$-10 + 4i$$

$a + bi$   
↑     ↑  
real   imaginary

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

FOIL

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

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

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

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

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

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

$$21 + 17i - 2$$

$$19 + 17i$$

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