3.1 - Solving Quadratic Equations

Warmup - Solve by factoring

a. $2t^2 + 5t - 3 = 0$

$t = \left\{-3, \frac{1}{2}\right\}$

b. $3x^2 - 8x + 5 = 0$

$x = \left\{\frac{5}{3}, 1\right\}$

c. $3p^2 - 7p - 6 = 0$

$p = \left\{-\frac{2}{3}, 3\right\}$

d. $4r^2 + 8r + 3 = 0$

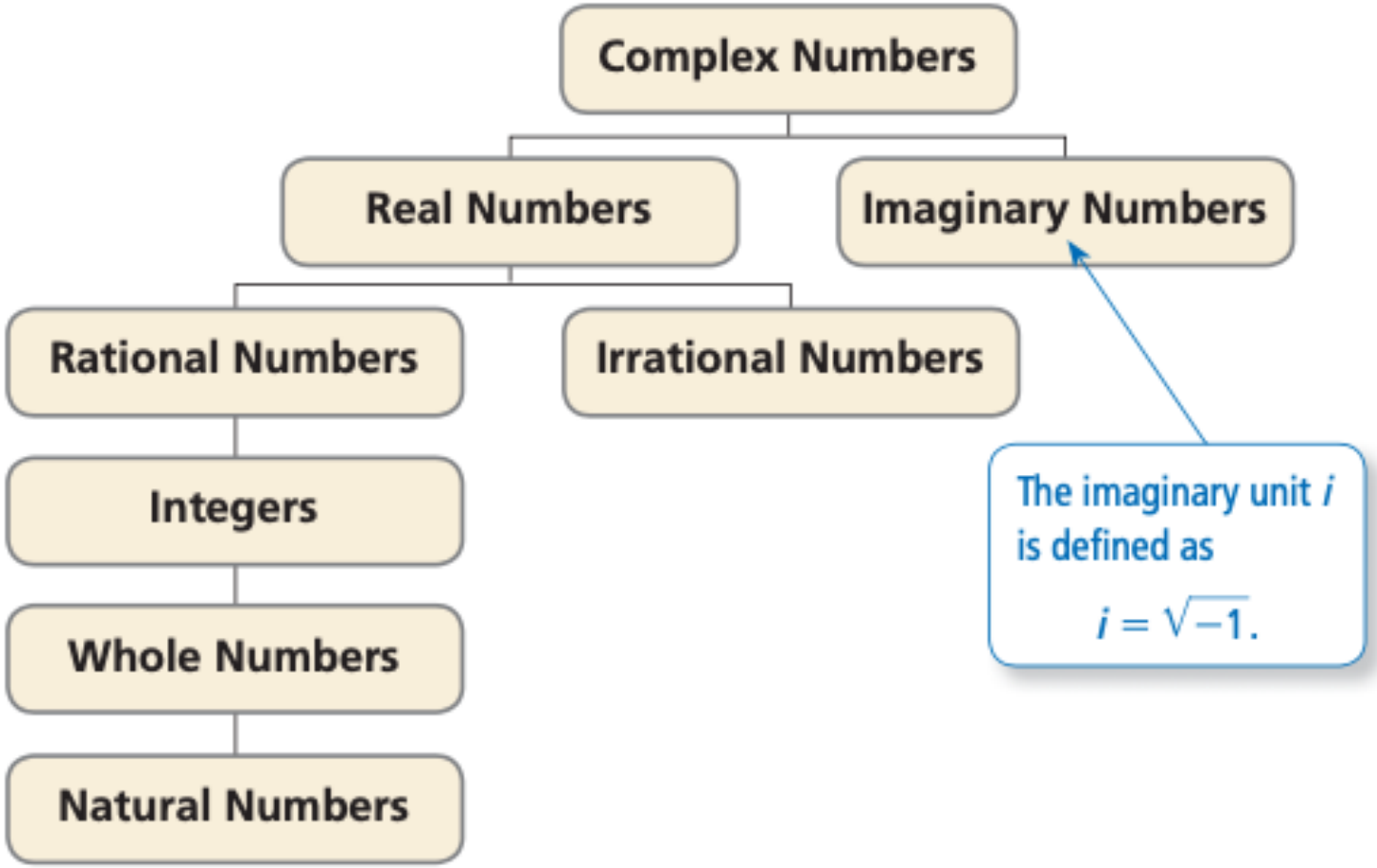
$r = \left\{-\frac{3}{2}, -\frac{1}{2}\right\}$

Chapter 3
Quadratic Equations and Complex Numbers

1. Solving Quadratic Equations
2. **Complex Numbers**
3. Completing the Square
4. Using the Quadratic Formula
5. Solving Nonlinear Systems
6. Quadratic Inequalities

3.2 - Complex Numbers

Subsets of the set of complex numbers



3.2 - Complex Numbers

The Imaginary Unit *i*

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

$$\sqrt{-81} = 9i$$

$$\sqrt{-56} = 2i\sqrt{14}$$

$$-7\sqrt{-12} = -14i\sqrt{3}$$

3.2 - Complex Numbers

A **complex number** is written in standard form as

$$a + bi$$

where *a* is the real part and *bi* is the imaginary part.

$a + bi$ is a **complex number** (a≠0, b≠0).

bi is a **pure imaginary number** (a=0).

3.2 - Complex Numbers

Find x and y that satisfy the equation

$$5x - 20i = 35 + yi$$

$x = 7,\ y = -20$

Simplify the expression and write in standard form.

$$16 - (13 + 6i) + 8i$$

$3 + 2i$

3.2 - Complex Numbers

Practice: Simplify the expression and write in standard form.

10. $(1 + i) + (3 + i)$

11. $(4 - 3i) + (2 + 6i)$

12. $(-4 - i) - (4 + 5i)$

13. $(5 - 3i) + (-3 - 6i)$

3.2 - Complex Numbers

Multiplying complex numbers

$$15i(-1+2i)$$

$$-30-15i$$

$$(4-12i)(11+8i)$$

$$140-100i$$

3.2 - Complex Numbers

Practice: Multiply the complex numbers

14. $3i(4 + 2i)$

15. $-2i(3 - i)$

16. $(2 + i)(4 + 2i)$

17. $(5 - 2i)(1 - 3i)$

3.2 - Complex Numbers

Solving Quadratic Equations

$$x^2 + 121 = 0$$

$$x = \pm 11i$$

$$3x^2 + 25 = -416$$

$$x = \pm 7i\sqrt{3}$$

3.2 - Complex Numbers

Practice

Solve the equation.

1. $x^2 = -36$

2. $x^2 + 121 = 0$

4. $x^2 = 2x^2 + 4$

5. $3x^2 + 40 = -x^2 - 56$

7. $(x - 3)^2 = -12$

8. $-2(x - 1)^2 = 36$

3.2 - Complex Numbers

Simplify (rationalize denominator)

$$\frac{5-i}{2+3i}$$

$$\frac{7-17i}{13}$$

Practice

Find the reciprocal of $3-i$

$$\frac{3+i}{10}$$

3.2 - Complex Numbers

Exponents of i

$$i =$$

$$i^2 =$$

$$i^3 =$$

$$i^4 =$$

$$i^{54} =$$