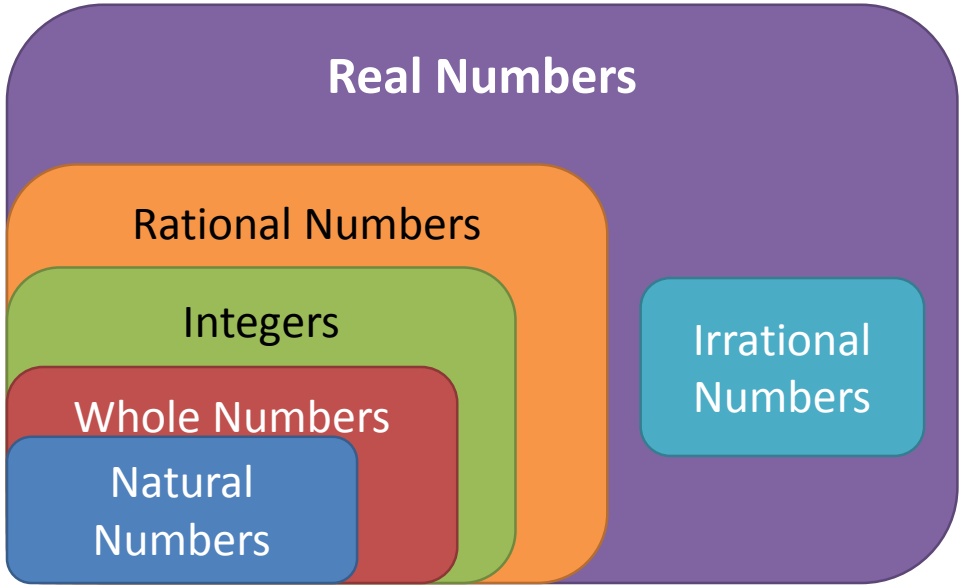
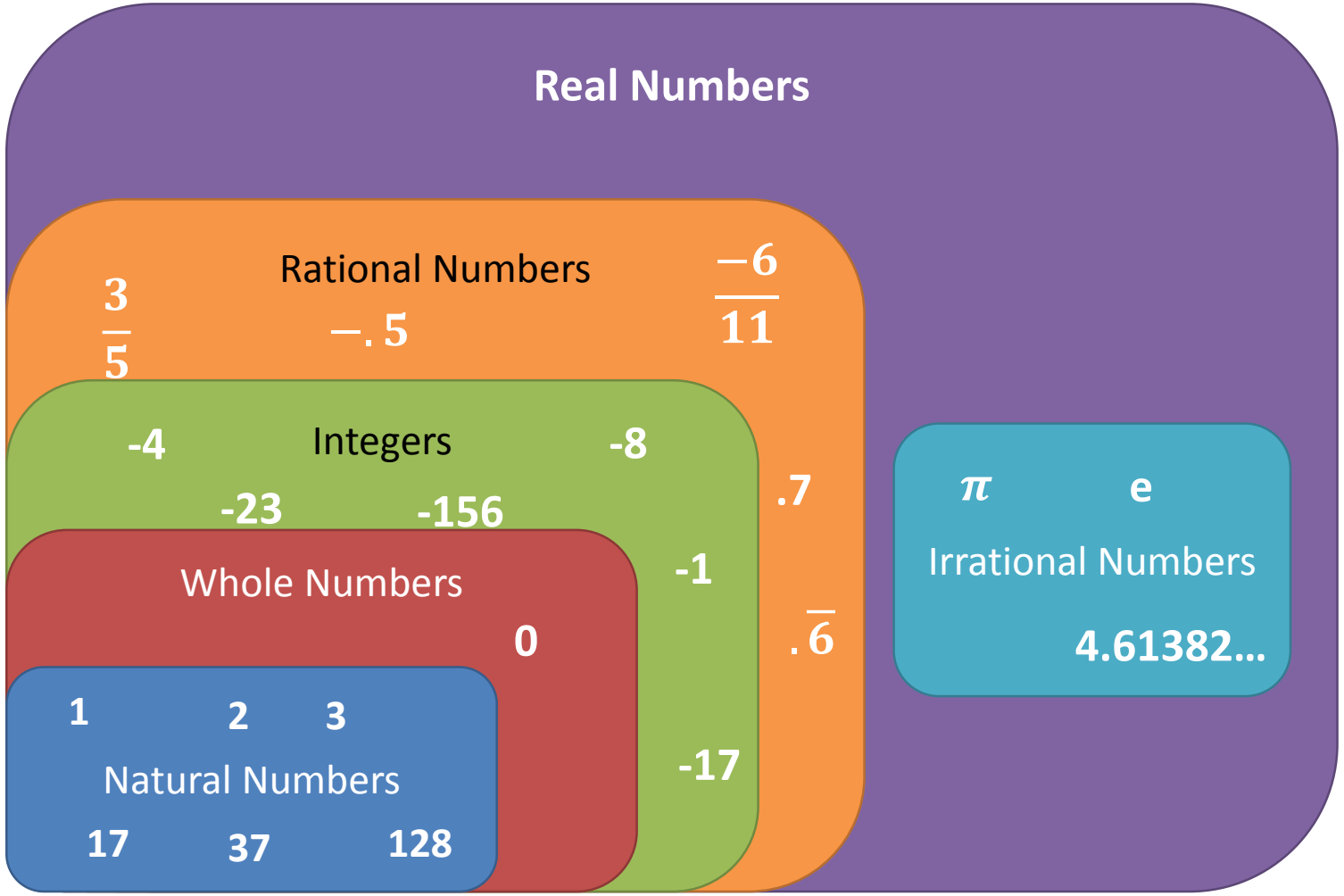
Complex Numbers

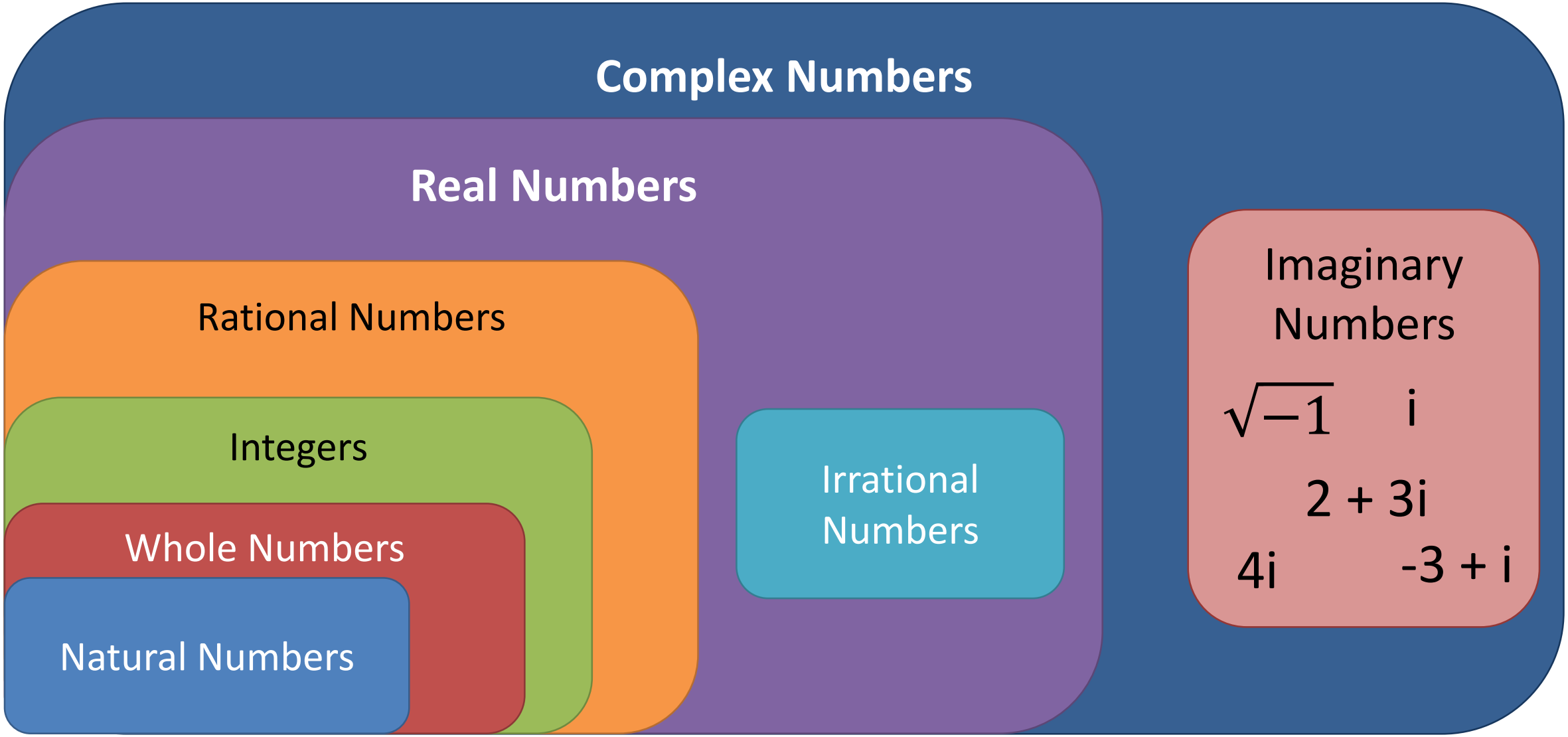
Lesson 3.2



Real Number System



Complex Number System



Ex. 1 Find the square root of each number

$a.\sqrt{-81}$ $\sqrt{(-1)(81)}$ $\sqrt{81}\cdot\sqrt{-1} = 9i$

$b.\sqrt{-56}$ $\sqrt{-1}\sqrt{8\cdot 7} = 2i\sqrt{14} = 2\sqrt{14}\,i$

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

$c.-7\sqrt{-12} = -7(2)i\sqrt{3} = -14i\sqrt{3} = -14\sqrt{3}\,i$

Complex Number in Standard Form

- A complex number is written in standard form when it is of the form $a + bi$. The number a is the real part and the number bi is the imaginary part.

Add and Subtract Complex Numbers

- When adding (or subtracting) two complex numbers, add (or subtract) their real parts and their imaginary parts separately.

Example 2 - Add or Subtract

a. $(2 + 9i) + (11 - i)$ $2+11$ $9i+-i$ $= 13+8i$

b. $(13 + 4i) - (8 + 4i)$ $13+-8$ $4i-4i$ $= 5$

c. $16 - (13 + 6i) + 8i$ $16-13$ $-6i+8i$ $= 3+2i$

$$\sqrt{-1} = i \text{ so } i^2 = \left(\sqrt{-1}\right)^2 = -1$$

Example 3 Multiply. Write the answer in standard form.

a. $6(3 + 4i)$

$18 + 24i$

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

$-15i + 30i^2$

$-30 - 15i$

$30(-1)$

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

$140 - 100i$

$44 + 32i - 132i - 96i^2$

$44 - 100i + 96$

$140 - 100i$

	4	$-12i$
11	44	$-132i$
$+8i$	$32i$	$-96i^2$

96

d. $(1 - 7i)(2 - 3i)$

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

$-19 - 17i$

$-19 - 17i$

	1	$-7i$
2	2	$-14i$
$-3i$	$-3i$	$21i^2$

-21

Example 4 Solve

a. $x^2 + 121 = 0$

$-121 \quad -121$

$\sqrt{x^2} = \sqrt{-121}$

$x = \pm 11i$

$(-11i)(-11i)$

$+121i^2$

-121

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

$-25 \quad -25$

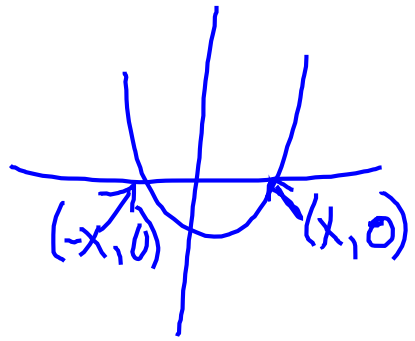
$\frac{3x^2}{3} = \frac{-441}{3}$

$\sqrt{x^2} = \sqrt{-147}$

$x = \pm i\sqrt{3 \cdot 49}$

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

Example 5 Find the Zeros



a. $f(x) = 7x^2 + 70$

$0 = 7x^2 + 70$

$-70 \qquad -70$

$-70 = 7x^2$

$\frac{-70}{7} = \frac{7x^2}{7}$

$\sqrt{-10} = \sqrt{x^2}$

$\pm i\sqrt{10} = x$

$\pm 1i\sqrt{10} = x$

b. $g(x) = -3x^2 - 48$

$0 = -3x^2 - 48$

$+48 \qquad +48$

$48 = -3x^2$

$\frac{48}{-3} = \frac{-3x^2}{-3}$

$\sqrt{-16} = \sqrt{x^2}$

$\pm 4i = x$

$\pm 4i = x$

Lesson 3.2 p. 108 2-30 even, 37-43 odd, 49-61 odd, 82-84