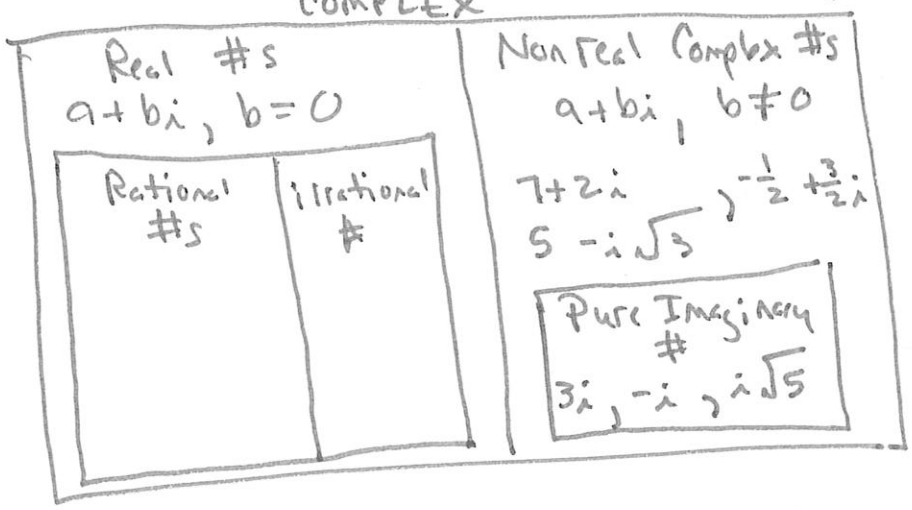
1.3 Complex Numbers

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

Complex Number $a + bi$

a: Real, bi: imaginary



Ex 1 Write as a product of a real number and i.

(a) $\sqrt{-16} = \sqrt{-1}\sqrt{16} = 4i$

(b) $\sqrt{-70} = \sqrt{70}\sqrt{-1} = i\sqrt{70}$

(c) $\sqrt{-48} = \sqrt{48}\sqrt{-1} = i\sqrt{48} = i\sqrt{16 \cdot 3}$

$= i(4)\sqrt{3}$

$= \boxed{4i\sqrt{3}}$

$\sqrt{48}$

$2 \cdot 24$

$2 \cdot 12$

$3 \cdot 4$

$2\ 2$

$\sqrt{(2 \cdot 2) \cdot 3 \cdot (2 \cdot 2)} \rightarrow 2 \cdot 2\sqrt{3} = 4\sqrt{3}$

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1.3 Finding Products + Quotients involving $\sqrt{-9}$

Ex 2 (a) $\sqrt{-7}\,\sqrt{-7} = i\sqrt{7}\; i\sqrt{7}$

$= i^2 7 = \boxed{-7}$

(b) $\sqrt{-6}\,\sqrt{-10} = i\sqrt{6}\; i\sqrt{10} = i^2\sqrt{60}$

$-1\sqrt{4\cdot 15} = -1\sqrt{(2\cdot 2)\cdot 15} = \boxed{-2\sqrt{15}}$

(c) $\dfrac{\sqrt{-20}}{\sqrt{-2}} = \dfrac{i\sqrt{20}}{i\sqrt{2}} = \sqrt{\dfrac{20}{2}} = \boxed{\sqrt{10}}$

Ex 3 Simplifying a Quotient with $\sqrt{-a}$

$\dfrac{-8+\sqrt{-128}}{4}$ Write in standard form $a+bi$

$\dfrac{-8+i\sqrt{64\cdot 2}}{4} = \dfrac{-8+8i\sqrt{2}}{4}$

$= \dfrac{4(-2+2i\sqrt{2})}{4} = \boxed{-2+2i\sqrt{2}}$

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