Name: _____                                              Date: _____

| Learning Goal 4.1 | Identify and order irrational numbers. |
|---|---|

Take a moment.  What distinguishes these sets of numbers?  What does each grouping have in common with each other?  How are they different from the other group?  Add **three** more values to each group

**Rational**

$= -2$

$0.5$        $\boxed{\sqrt[5]{-32}}$        $\sqrt[3]{8}$        $\sqrt{\dfrac{9}{64}} = \dfrac{3}{8}$

$\sqrt{100}$        $\sqrt{0.25}$        $\dfrac{5}{6}$        $0.8^2$

$= 5\sqrt{-2 \times -2 \times -2 \times -2 \times -2}$

**Irrational.**

$\sqrt{2}$        $\sqrt[3]{9}$        $\pi$

$\sqrt{0.24}$        $\sqrt{\dfrac{1}{3}}$        $\sqrt[4]{12}$

**Example** Tell whether each number is rational or irrational.  Explain.

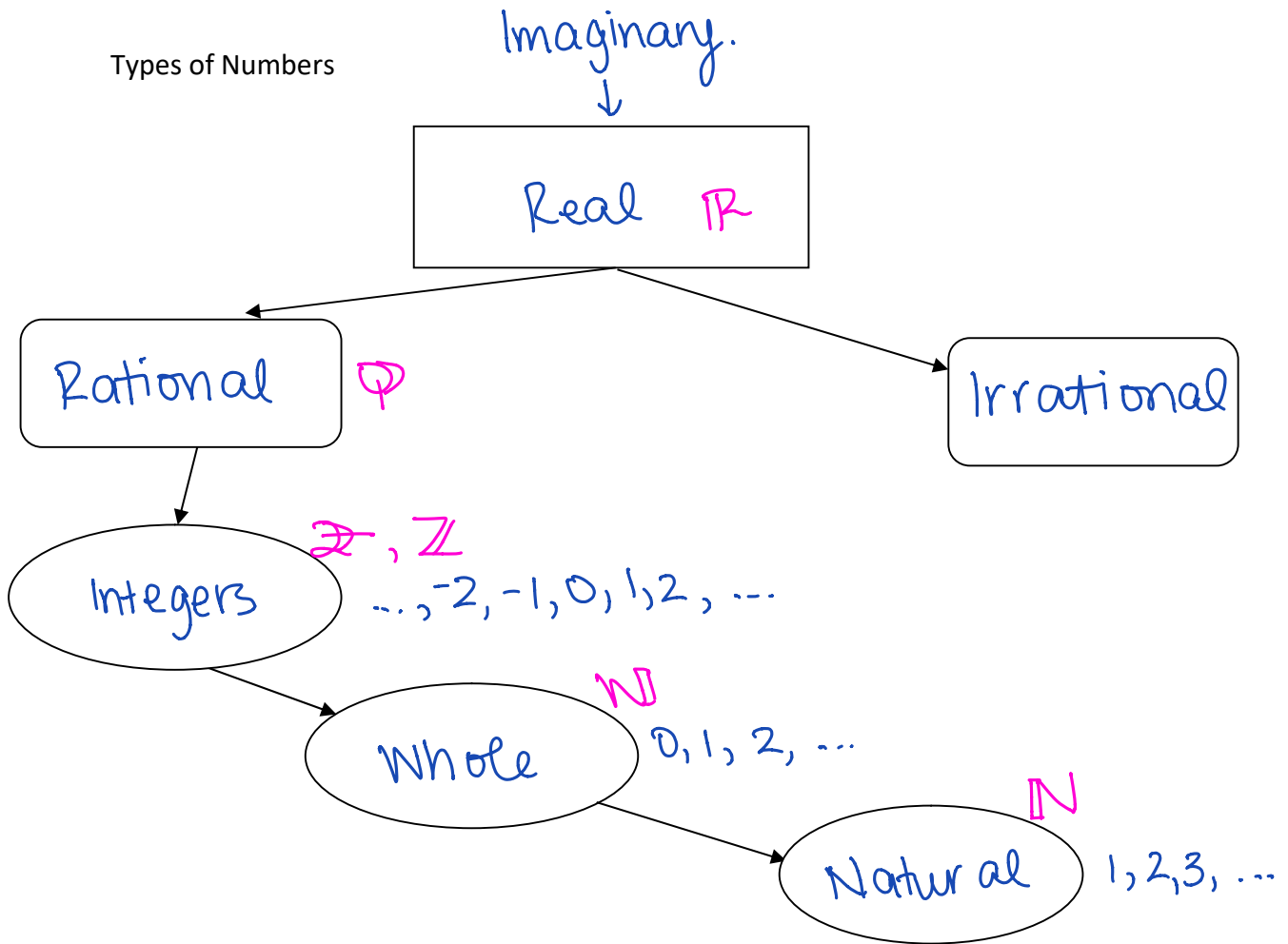1.  $\sqrt{\dfrac{49}{16}}$  rational

$= \dfrac{7}{4}$

2.  $\sqrt[3]{30}$  irrational

3 10
    25

3.  $1.21 = \dfrac{121}{100} = 1\dfrac{21}{100}$

Again!  How are these groups different from one another?  Add **three values** to each.

$10^2$        $\sqrt[5]{-1} = -1$  $\sqrt[4]{128}$        $(-8)^3$

$-\sqrt{100}$        $\sqrt[3]{8} = 2$
$= -10$

$\sqrt{\dfrac{64}{4}} = \dfrac{8}{2}$
$= 4$

**Integers.**

**Rational.**        $\dfrac{1}{2}$

$0.8^2$        $0.5$

$\sqrt{0.25}$        $\sqrt{\dfrac{1}{9}}$        $\sqrt[3]{\dfrac{64}{27}} = \dfrac{4}{3}$
$= 0.5$

$\sqrt{0.25} = \sqrt{\dfrac{25}{100}} = \dfrac{5}{10} = 0.5$

Types of Numbers

Imaginary.
↓

$$\boxed{\text{Real} \quad \mathbb{R}}$$

Rational $\mathbb{Q}$

Irrational

Integers $\mathbb{Z}, \mathbb{Z}$
$\dots, -2, -1, 0, 1, 2, \dots$

Whole $\mathbb{W}$
$0, 1, 2, \dots$

Natural $\mathbb{N}$
$1, 2, 3, \dots$

**Example** Use a number line to order these numbers least to greatest.

$$\sqrt{2}, \sqrt[3]{-2}, \sqrt[3]{6}, \sqrt{11}, \sqrt[4]{30}$$

$\sqrt{1} < \sqrt{2} < \sqrt{4}$        $\sqrt[3]{1} < \sqrt[3]{6} < \sqrt[3]{8}$        $\sqrt{9} < \sqrt{11} < \sqrt{16}$

$1 < \sqrt{2} < 2$                    $1 < \sqrt[3]{6} < 2$                    $3 < \sqrt{11} < 4$

$(\sqrt{2} < \sqrt[3]{6})$

$\sqrt[4]{16} < \sqrt[4]{30} < \sqrt[4]{81}$

$2 < \sqrt[4]{30} < 3$

$\sqrt[3]{-2}$        $\sqrt{2}$        $\sqrt[3]{6}$        $\sqrt[4]{30}$        $\sqrt{11}$

0