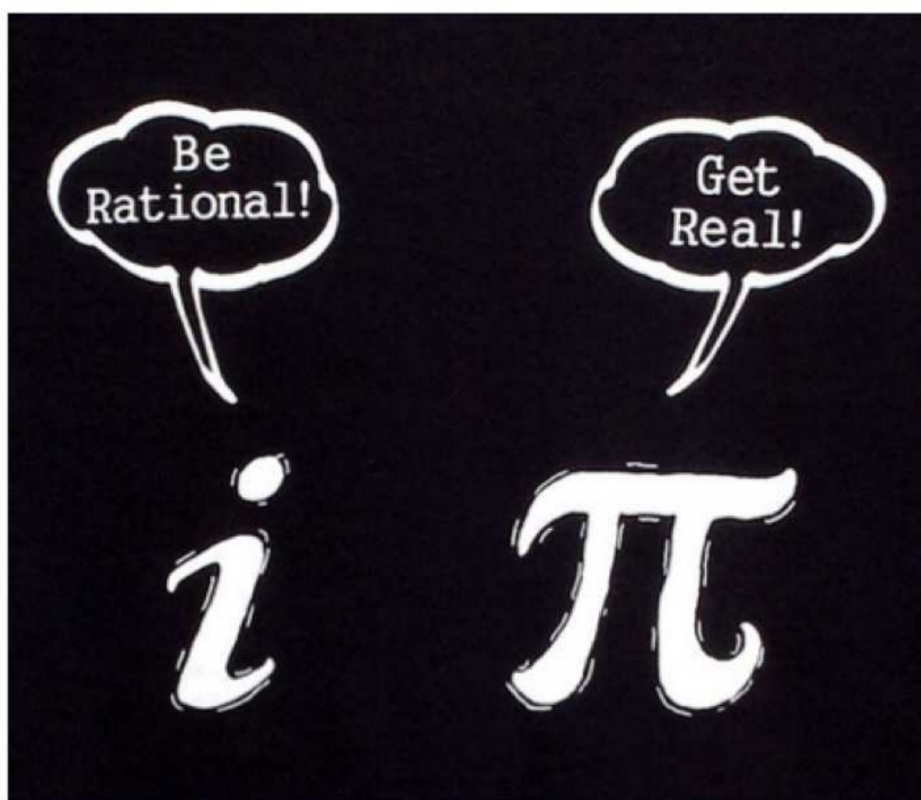


Number Sets, Set & Interval Notation



*See printout.

Number Set	Symbol	Definition
Real	\mathbb{R}	A real number is a value that can be represented as a quantity on a continuous number line.

1 8 400 -1 $\frac{1}{2}$ $-\frac{1}{4}$
 $.8$ $\sqrt{11}$ π $\sqrt{4}$

*See printout.

Number Set	Symbol	Definition
Rational	\mathbb{Q}	<p>A rational number is any quantity that can be expressed as the ratio of two integers.</p> <p>Ex: 4 (since $4 = \frac{8}{2}$), 1.2 (since $1.2 = \frac{12}{10} = \frac{6}{5}$), $-\sqrt{9}$ (since $-\sqrt{9} = -3 = \frac{-3}{1}$, etc.)</p>

$$\bar{3} = \frac{1}{3}$$

Number Set	Symbol	Definition
Irrational	I	An irrational number is any quantity that can NOT be expressed as a fraction (any nonrepeating & nonterminating decimal) Ex: π , e , $\sqrt{2}$

≈ 3.14 ≈ 2.718

4.786....

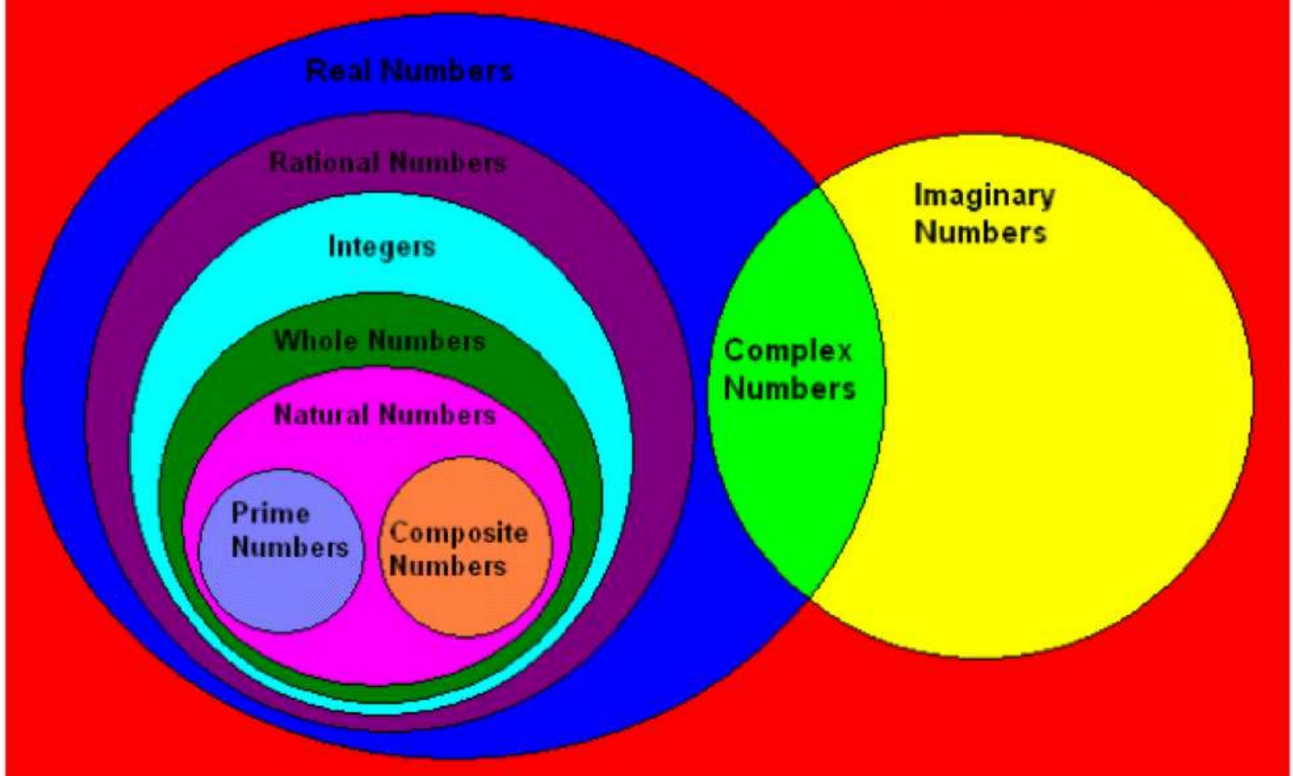
Number Set	Symbol	Definition
Integers	\mathbb{Z}	The set of integers contains whole numbers, negative whole numbers and zero. $\{\dots-3, -2, -1, 0, 1, 2, 3\dots\}$

Number Set	Symbol	Definition
Whole	W	Whole numbers are nonnegative integers $\{0, 1, 2, 3, \dots\}$

Number Set	Symbol	Definition
Natural	N	Natural numbers are positive integers. This set is commonly referred to as the "counting" numbers set. $\{1, 2, 3, \dots\}$

Number Set	Symbol	Definition
Digits	D	A digit is any number that can be found in a phone number. {0, 1, 2...9}

The Set of All Numbers



ex 1: List all sets to which each number belongs.

a) 2 $\mathbb{R}, \mathbb{Q}, \mathbb{Z}, \mathbb{N}, \mathbb{W}, \mathbb{D}$

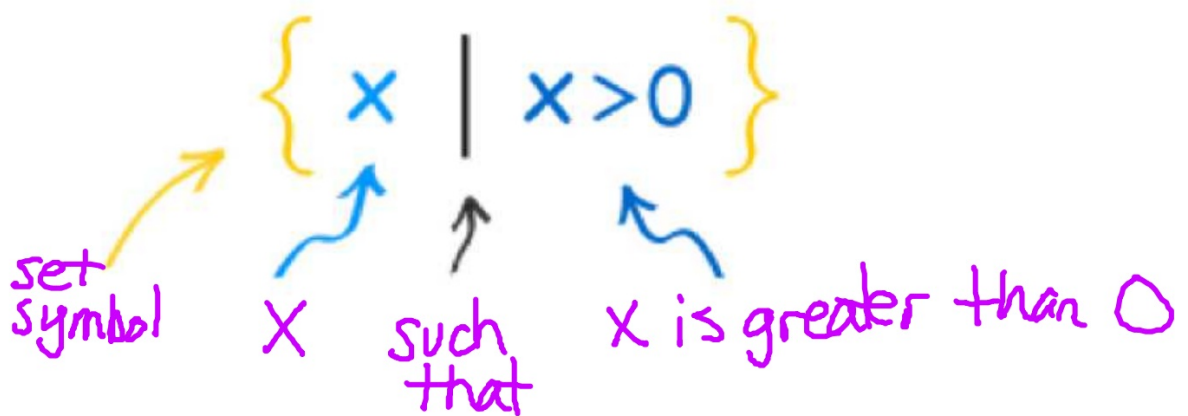
b) $\sqrt{4} - \sqrt{9}$
 -1 $\mathbb{R}, \mathbb{Q}, \mathbb{Z}$

c) $\pi(3)^2$
 9π \mathbb{R}, \mathbb{I}

d) $\sqrt{-4}$ none

Set & Interval Notation

Set Notation - A Set is a collection of things (usually numbers). Example: $\{5, 7, 11\}$ is a set. But we can also "build" a set by describing what is in it. Here is a simple example of set-builder notation:



ex 2: Express each set of numbers in set notation.

a) $n \leq 40$ $\{n \mid n \leq 40\}$

b) domain: the set of real numbers

$\{x \mid x \in \mathbb{R}\}$ is an element of

c) range: the set of integers

$\{y \mid y \in \mathbb{Z}\}$

$$d) 3x + 4 \neq \frac{1}{2}$$

$$3x \neq \frac{1}{2} - 4$$

$$3x \neq \frac{1}{2} - \frac{8}{2}$$

$$\frac{3x}{3} \neq \frac{-7}{2 \cdot 3}$$

$$e) z < 2 \text{ or } z \geq 5$$

$$2 \left(3x + 4 \neq \frac{1}{2} \right)$$

$$6x + 8 \neq 1$$

$$x \neq \frac{-7}{6}$$

$$\left\{ x \mid x \neq \frac{-7}{6} \right\}$$

$$\left\{ z \mid z < 2 \text{ or } z \geq 5 \right\}$$



f) $z < 2$ and $z \geq 5$

$\{ \}$ or \emptyset

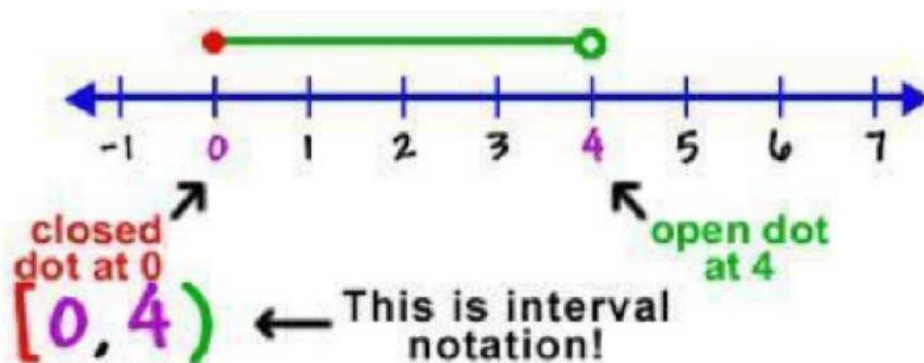
g.) $z > 2$ and $z \leq 5$



$\{z \mid 2 < z \leq 5\}$

Interval Notation - A notation for representing an interval as a pair of numbers. The numbers are the endpoints of the interval.

*Parentheses and/or brackets are used to show whether the endpoints are excluded or included.



Parentheses, (), indicate a quantity is excluded.

Brackets, [], indicate a quantity is included.

When using infinity or negative infinity always use parenthesis.

Examples of interval notation:

$(-\infty, 1)$

 $\{x | x < 1\}$

A number line with an arrow pointing left from a point marked with a circle containing a plus sign. A vertical tick mark is below the point, and a vertical line connects it to the number 1. The arrow points to the left, indicating the interval continues to negative infinity.

$(1, 3)$

$\left[-\frac{1}{2}, 0\right]$

$(-4, 7]$

$[5, 6)$

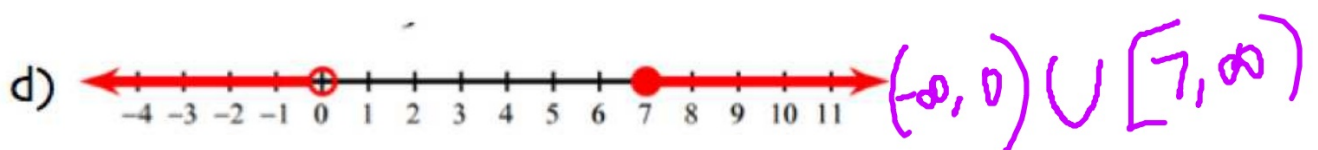
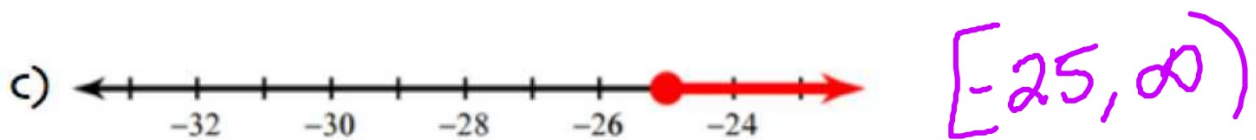
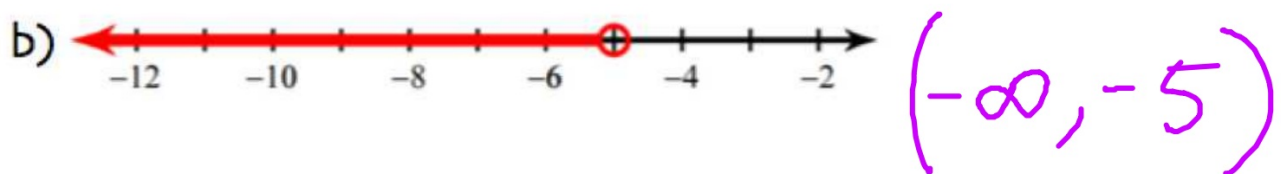
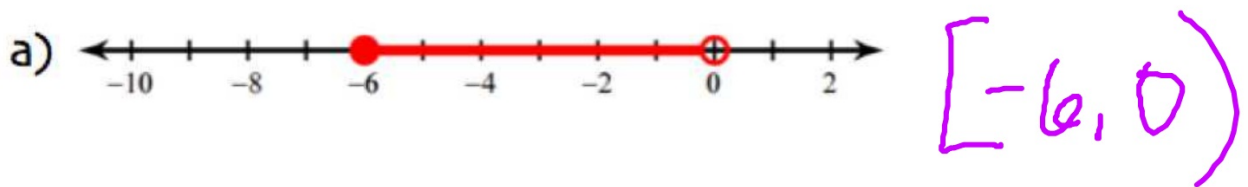
$(1, \infty)$

$(-\infty, 0]$

~~$[1, 0]$~~

~~$(1, -\infty)$~~

ex 3: Express each set of numbers in interval notation.



e) $2 < x \leq 6$

$(2, 6]$

f) $x > 30$

$(30, \infty)$

g) $y \leq 40$



$(-\infty, 40]$

h) the set of real numbers

$(-\infty, \infty)$

i) the set of whole numbers

not possible

j) no greater than -25

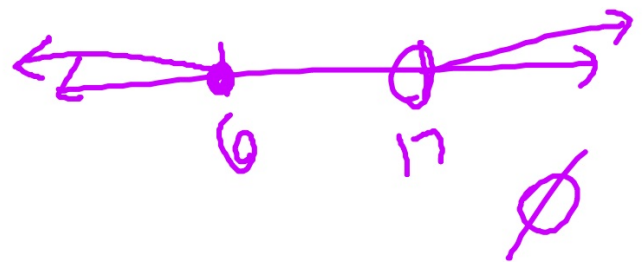
$(-\infty, -25]$

k) $z \leq 10$ or $z > 17$

$(-\infty, 10] \cup (17, \infty)$

l) ~~$x > 0$ or $x < 5$~~

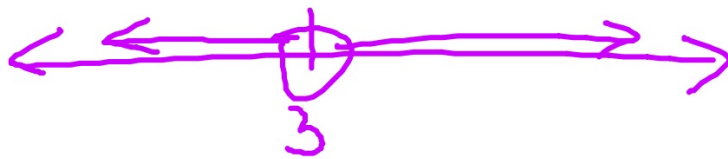
$z \leq 6$ and $z > 17$



m) $n = 3$

$$[3]$$

n) $n \neq 3$



$$(-\infty, 3) \cup (3, \infty)$$

$$\text{Set: } \{x \mid x \neq 3\}$$

Solve:

$$3(x-4) \leq 2+5(x+1)$$

$$3x-12 \leq 2+5x+5$$

$$3x-12 \leq 5x+7$$

$$-2x \leq 19$$

$$x \geq -19/2$$

$$\text{Set: } \{x \mid x \geq -19/2\}$$

$$\left(\frac{1}{3}(5x+1) > \frac{1}{2}(x-3) \right)$$

$$2(5x+1) > 3(x-3)$$

$$10x+2 > 3x-9$$

$$x > -\frac{11}{7}$$

Set:

$$\{x \mid x > -\frac{11}{7}\}$$