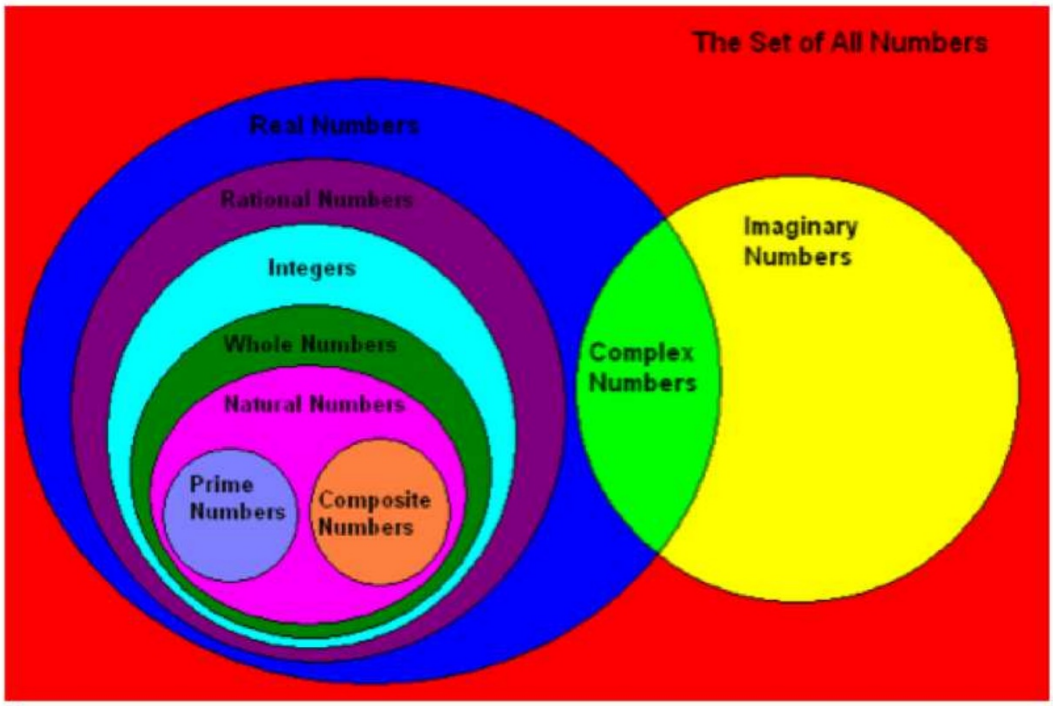
Number Sets

Number Set	Symbol	Definition
Real	R	A real number is a value that can be represented as a quantity on a continuous number line.
Rational	Q	A rational number is any quantity that can be expressed as the ratio of two integers. 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.*
Integers	Z	The set of integers contains whole numbers, negative whole numbers and zero. $Z=\{\ldots -3, -2, -1, 0, 1, 2, 3\ldots\}$
Whole	W	Whole numbers are nonnegative integers $W=\{0, 1, 2, 3\ldots\}$

*See printout.

Number Set	Symbol	Definition
Natural	N	Natural numbers are positive integers. This set is commonly referred to as the "counting" numbers set. N={1, 2, 3…}
Digits	D	A digit is any number that can be found in a phone number. D={0, 1, 2…9}
Irrational	I	An irrational number is any quantity that can NOT be expressed as a fraction (any nonrepeating & nonterminating decimal) Ex: π, $\sqrt{2}$
Transcendental	T	Transcendental numbers are numbers that are NOT the solution to an algebraic equation. Ex: π, ϕ (phi – the golden number), e

$e \approx 2.718\ldots$


The Set of All Numbers
Real Numbers
Rational Numbers
Integers
Whole Numbers
Natural Numbers
Prime Numbers
Composite Numbers
Complex Numbers
Imaginary Numbers

ex: List all sets to which each number belongs.

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

b) $\sqrt{4} - \sqrt{9}$

$2 - 3$

-1

$\mathbb{R}, \mathbb{Q}, \mathbb{Z},$

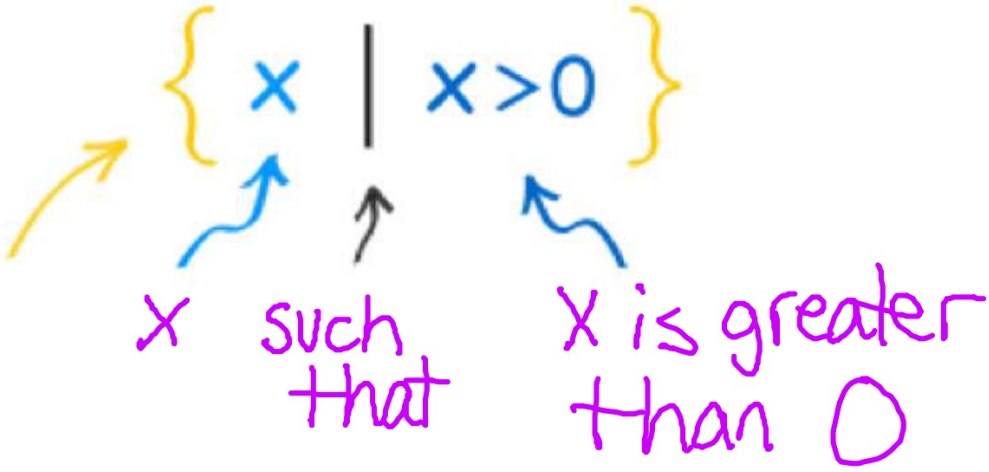
c) $\pi(3)^2$

9π

$\mathbb{R}, \mathbb{I}, \mathbb{T}$

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: Express each set of numbers in set notation.

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

$\in$: element of

b) domain: the set of real numbers

$\{x \mid x \in \mathbb{R}\}$

c) range: the set of integers $\{y \mid y \in \mathbb{Z}\}$

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

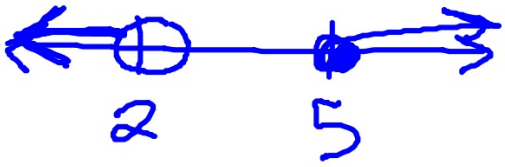
$3x \neq \frac{1}{2} - 4$

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

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

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

e) $z < 2$ or $z \geq 5$

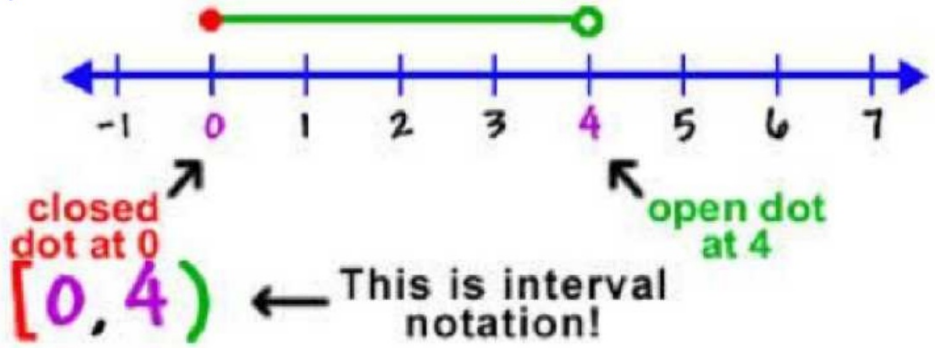


$\{ z \mid z < 2 \text{ or } z \geq 5 \}$

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

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

$\{x \mid 0 \leq x < 4\}$



closed dot at 0

open dot at 4

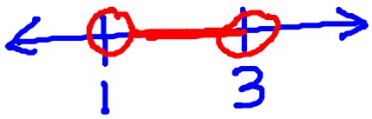
$[0, 4)$ ← This is interval notation!

Parentheses, ( ), indicate a quantity is not included.

Brackets, [ ], indicate a quantity is included.

When using infinity or negative infinity always use parenthesis.

examples of interval notation:



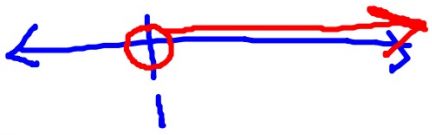
$(1,3)$

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

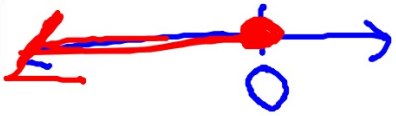
$(-4,7]$

$[5,6)$

$(1,\infty)$



* $(-\infty,0]$



Note: NEVER use infinity symbol with set notation!!!

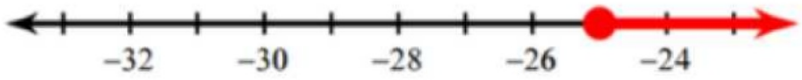
ex: Express each set of numbers in interval notation.

a) 

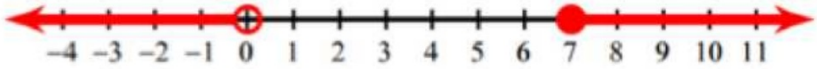
$[-6, 0)$

b) 

$(-\infty, -5)$

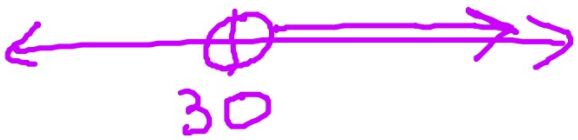
c) 

$[-25, \infty)$

★ d) 

$(-\infty, 0) \cup [7, \infty)$

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 n/a

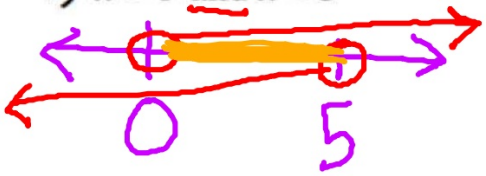
j) no greater than -25

$x \leq -25$ $(-\infty, -25]$

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

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

l) $x > 0$ and $x < 5$ overlap

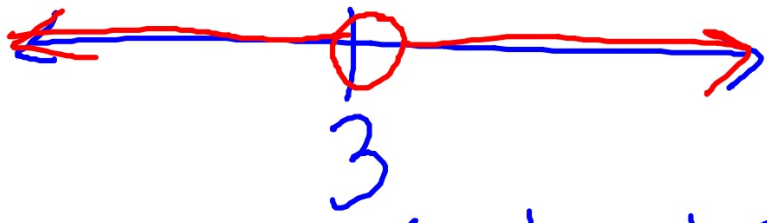


$(0, 5)$

m) $n = 3$

[3]

n) $n \neq 3$



set: $\{n \mid n \neq 3\}$

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