

Lesson 1 – Number Sets & Set Notation

Math 2 Honors – Mr Santowski

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Fast Five

- (a) List the solution set for $3x + 5 > -1$
- (b) Is $3x > 4x$?

- Interpret what each algebraic statement really means
- Outline a strategy you can use to solve the problems

- Explain your solution

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BIG PICTURE

- Define mathematics → What IS Mathematics?

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BIG PICTURE

- What IS Mathematics?

- (WEBSTERS) the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations

- (OXFORDS) the abstract science of number, quantity, and space, either as abstract concepts (pure mathematics), or as applied to other disciplines such as physics and engineering (applied mathematics)

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BIG PICTURE

- Explain the difference between the following 2 statements:

- (a) Columbus DISCOVERED America in 1492

- (b) Columbus INVENTED America in 1492

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BIG PICTURE

- Explain the difference between the following 2 statements:

- (a) Alexander Graham Bell DISCOVERED the telephone in 1876

- (b) Alexander Graham Bell INVENTED the telephone in 1876

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BIG PICTURE

- Answer the following questions:
- (a) Was the number 2 invented or discovered?
- (b) Was the number -3 invented or discovered?
- (c) Was the number π invented or discovered?
- (d) Was the number $\sqrt{5}$ invented or discovered?
- (e) Was the number $\frac{1}{2}$ invented or discovered?

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Lesson Objectives

- Since Math is about NUMBERS, you will **classify numbers** according to the number sets
- Since you need to DESCRIBE and COMMUNICATE with numbers, you will **recognize, interpret, and use both set notation and interval notation to describe** sets of discrete or continuous numbers

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(A) Number Sets

- What are the various number sets that you can recall and how are they related?

(A) Number Sets

- **Natural numbers** (N) are positive counting numbers. Natural numbers do not have any decimals and they cannot be fractions. The natural numbers are {1,2,3,4,5,...}
- **Whole numbers** (W) are positive counting numbers AND 0. The whole numbers are {0,1,2,3,4,5,...}
- **Integers** (I or Z) are the positive and negative counting numbers and 0. Integers do not contain decimals and they cannot be fractions. The Integers are {...-5,-4,-3,-2,-1,0,1,2,3,4,5,...}
- The set of {Whole numbers} is a subset of {Integers}.
- The set of {Natural numbers} is a subset of {Integers}.

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(A) Number Sets

- **Rational numbers** are any number that can be expressed as a ratio of two integers (a ratio being one number placed over another with a "/" in).
- The set of {integers} is a subset of {Rational numbers}. The Rational numbers include decimals, and fractions.
- The **irrational numbers** are any number that cannot be expressed as a ratio of two integers
- Examples include π , e and radicals

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(A) Number Sets

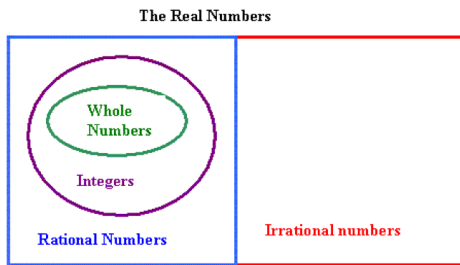
- Finally (for now), The **Real numbers** encompass everything
- {Real numbers}={Rational numbers} together with {Irrational numbers}.

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(A) Number Sets – The Visual Summation



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(B) Revisiting the Fast Five

- Now back to our question → List the solution set for $3x + 5 > -1$ if x is a whole number? (if $x \in \mathbf{W}$)
- Now back to our question → List the solution set for $3x + 5 > -1$ if x is an integer? (if $x \in \mathbf{I}$)
- Now back to our question → List the solution set for $3x + 5 > -1$ if x is a real number? (if $x \in \mathbf{R}$)

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(B) Revisiting the Fast Five

- Now back to our question → is $3x > 4x$ if x is a whole number? (if $x \in \mathbf{W}$)
- Now back to our question → is $3x > 4x$ if x is an integer? (if $x \in \mathbf{I}$)
- Now back to our question → is $3x > 4x$ if x is a real number? (if $x \in \mathbf{R}$)

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(C) Set and Interval Notation

- We now need to find a way to communicate the set of numbers that we are interested in working with in the context of algebraic equations.
- We will present four ways to represent a set of numbers

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(C) Set and Interval Notation

- You are given the following descriptions of sets:
 - (i) The set of all real numbers less than or equal to 3.
 - (ii) The set of all integers less than or equal to 3.
 - (iii) The set of all whole numbers greater than or equal to 4 and less than 8.
 - (iv) The set of all real numbers between 12 and 8, including 12 but not including 8.
 - (v) The set of all real numbers either greater than 6 or between, but not equal to, -3 and -2.
- We will represent each of these sets in (i) set notation, (ii) interval notation, (iii) graphically as number lines

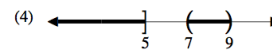
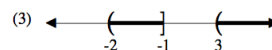
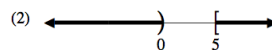
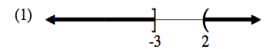
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(C) Set and Interval Notation

- Now, you are given a set of numbers in a graphic representation (as a number line). Express each set in:
 - (i) set notation,
 - (ii) in interval notation,
 - (iii) as a verbal description:



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(D) Presentation Methods

- As a summary, you should now see that there are 4 different, yet equivalent manners in which a solution can be presented or 4 ways in which a problem can be approached.
- These 4 manners are:
 - (1) Numeric
 - (2) Graphic
 - (3) Algebraic
 - (4) Verbal

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Links for HELP

- See worksheet at [Worksheet Interval notation Solutions](#)

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Homework

- See worksheet at [Worksheet on Inequalities & Notations](#)
- Attempt the online quiz at this website: [Number Sets Quiz from Maths Online](#)

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