

GMO – 244 Chapter 11 Set Operations Involving Intervals of *Real Numbers* ( $\mathbb{R}$ )Sets of Real Numbers ( $\mathbb{R}$ )

Since sets of real numbers include *all* numbers (decimals, etc.) in a range, two of the above methods will not usually work (listing the elements, and Venn diagrams will not work because it is impossible to list *all* the numbers in a range).

e.g. if a set is all real numbers ( $\mathbb{R}$ ) from 2 to 5:  $2 \leq x \leq 5$   
It is impossible to list all these. (e.g. 2.0000001, 2.23, 2.46, 3.45454, etc.)

For this reason, we have other methods for describing a set of real numbers ( $\mathbb{R}$ ):

1. Set-builder notation
2. Number line.
3. Interval notation.

You will learn how to use each of these methods to describe

- simple sets of real numbers.
- sets of real numbers which result from using any of the four set operations on sets of real numbers (intersection, union, difference, and complement).

P. 1: Using Number Lines and Interval Notation to Represent Simple Sets of  $\mathbb{R}$ 

SET - BUILDER NOTATION	GRAPH ON A NUMBER LINE	DEFINE USING INTERVAL NOTATION
$A = \{x \in \mathbb{R} \mid x \geq 5\}$		
$B = \{x \in \mathbb{R} \mid x > 2\}$		
$C = \{x \in \mathbb{R} \mid x < 2\}$		
$D = \{x \in \mathbb{R} \mid x \leq 5\}$		
$E = \{x \in \mathbb{R} \mid -5 \leq x \leq 3\}$		
$F = \{x \in \mathbb{R} \mid -4 < x < 2\}$		
$G = \{x \in \mathbb{R} \mid -7 \leq x < 6\}$		
$H = \{x \in \mathbb{R} \mid -8 < x \leq 6\}$		

Part 2: Intersection of Two Intervals

SET - BUILDER NOTATION	GRAPH ON A NUMBER LINE	DEFINE USING INTERVAL NOTATION
		$A = -\infty, 6 [$ $B = ] 3, \infty$ Find $A \cap B$
		$[ 2, 5 [ \cap ] 6, 9 ]$
$C = \{x \in \mathbb{R} \mid 2 \leq x < 6\}$ $D = \{x \in \mathbb{R} \mid x > 4\}$ Find $C \cap D$		
		$[ 3, \infty \cap ] 6, \infty$
		$-\infty, 5] \cap ] 5, \infty$

Part 3: Union of Two Intervals

SET - BUILDER NOTATION	GRAPH ON A NUMBER LINE	DEFINE USING INTERVAL NOTATION
$A = \{x \in \mathbb{R} \mid x \geq -2\}$ $B = \{x \in \mathbb{R} \mid x < 3\}$ Find $A \cup B$		
$C = \{x \in \mathbb{R} \mid 3 \leq x < 5\}$ $D = \{x \in \mathbb{R} \mid x > 4\}$ Find $C \cup D$		$[-3, 4] \cup [1, 6]$
		$[2, 4] \cup [6, 8]$



**Part 4: Difference of Two Intervals & Complement of an Interval**

SET - BUILDER NOTATION	GRAPH ON A NUMBER LINE	DEFINE USING INTERVAL NOTATION
		$-\infty, -2 ] \cup [ -5, 0 ]$
$A = \{x \in \mathbb{R} \mid 2 \leq x < 6\}$ $B = \{x \in \mathbb{R} \mid 3 < x < 4\}$ Find $A \setminus B$ .		
$C = \{x \in \mathbb{R} \mid x < 7\}$ Find $C'$		
		$( [3, 5] )'$