Chapter 1 Homework

1.1 #1-137 odd

1.2 #97-113 odd

1.3 #30-57 odd; 97-105 odd; and study properties!

1.4 #1-31 odd

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1.1 Introduction to Real Numbers = $\mathbb{R}$

Set – collection of objects

Element – an object in a set

Natural numbers = counting numbers

- if we add two natural numbers together, we get a natural number

{1,2,3,4,…} = $\mathbb{N}$

Prime number = only factors are 1 and itself

{2,3,5,7,11…}

Composite number = has factors other than 1 and itself

{4,6,8,9,10,…}

Integers = set of all positive and negative whole numbers, plus 0

- integers allow us to subtract (same as adding a negative)

{…,-3,-2,-1,0,1,2,3,…} = $\mathbb{Z}$

* look up why $\mathbb{Z}$

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Rational Numbers

- the set of all numbers that can be written as fractions
- allow us to divide and define multiplicative inverses
- the set of all terminating and repeating decimals

$\mathbb{Q} = \left\{ \frac{p}{q} \mid p, q \in \mathbb{Z} \right\}$ ("such that"; are elements of; set of integers)

Irrational Numbers

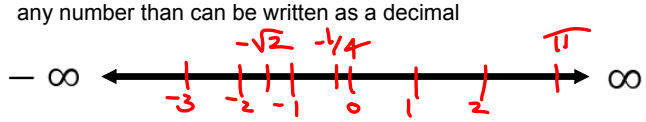
- the set of all non-terminating, non-repeating decimals
- includes $\pi, \sqrt{2},$ etc.

3.14159265358979323846264338327 95 . .

Real Numbers

$\mathbb{R}$

- the set of rationals together with the irrationals
- any number than can be written as a decimal



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Methods of Writing a Set

Roster Method – list

{1, 2, 3,…}; {…-2,-1,0,1,2,…}; {1/2, 3.74, π}; {a, b, c}

Set-Builder Notation

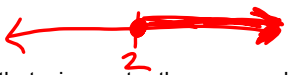
{variable(s) | condition(s) on the variables}

{p/q | p,q ∈ **Z**} = rational #'s ($\mathbb{Q}$)

"such that"

"the set of fractions p/q such that p and q are elements of the set of integers"

{x | x ≥ 2}



"the set of numbers x such that x is greater than or equal to 2"

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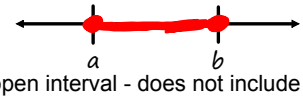
Interval Notation

closed interval - includes both endpoints

$[a,b]$ 

open interval - does not include either endpoint

(a,b) 

half-open or half-closed or "clopen" interval - includes one endpoint only

$(a,b]$ 

$[a,b)$ 

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$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$ ← real #'s

$\mathbb{R} = (-\infty, \infty)$ *infinity is not a number, so it is never included

$\{x \mid x \geq 2\} = [2, \infty)$

$\emptyset$ = the empty set = the set containing no elements

$\{\emptyset\}$ = the set containing the empty set as an element

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Union, Intersection, and Relative Complement

$\{1,2,3\} \cup \{4,5,6\} = \{1,2,3,4,5,6\}$

Union = the set of all of the elements from any set

$\{1,2,3\} \cup \{3,4,5\} = \{1,2,3,4,5\}$

$A \cup B$ = the set of elements from either set A or set B

Intersection = the set of all elements that occur in each set; overlap of sets

$\{1,2,3\} \cap \{3,4,5\} = \{3\}$

$A \cap B$ = the set of all elements that occur in both set A and set B

$\{1,2,3\} \cap \{4,5,6\} = \emptyset$

Relative Complement - the set of all elements that are in one set but not the other

$\{1,2,3\} - \{3,4,5\} = \{1,2\}$

$A - B$ = the set of all elements that are in set A but are not in set B

$A \setminus B$ $\{1,2,3\} - \{4,5,6\} = \{1,2,3\}$

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$A = \{1,2,3,4,5\}$; $B = \{4,5,6,7\}$; $C = \{6,7,8\}$

$A \cup B = \{1,2,3,4,5,6,7\}$

$A \cap B = \{4,5\}$

$A \cap C = \emptyset$

$B \cup C = \{4,5,6,7,8\}$

$A \cup B \cup C = \{1,2,3,4,5,6,7,8\}$

$(A \cap B) \cup C = \{4,5,6,7,8\} = B \cup C$

$A \cup \emptyset = A$

$B \cap \emptyset = \emptyset$

$A / B = A - B = \{1,2,3\}$

$A - C = A$

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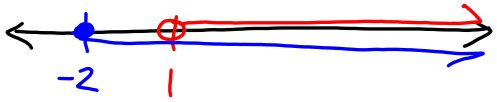
1.1

77. $\{x|x>1\} \cap \{x|x \geq -2\} = \{x|x>1\}$



$= (1, \infty)$

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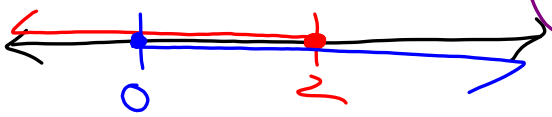
75. $\{x|x \leq 2\} \cap \{x|x \geq 0\} = [0,2]$

$= \{x|0 \leq x \leq 2\}$

$2 \geq x \geq 0$



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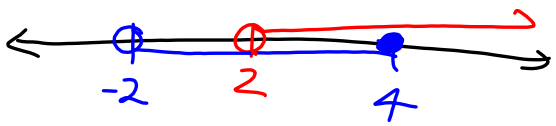
113. $(2,\infty) \cup (-2,4] = (-2,\infty)$



$= \{x \mid x > -2\}$

$= \{x \mid -2 < x < \infty\}$ redundant

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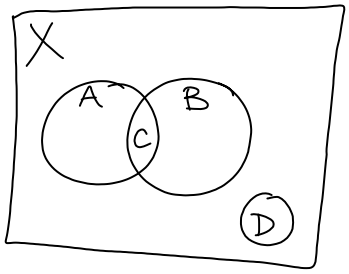

$A \cap X = A$

$A \cup X = X$

$A \cap D = \emptyset$

$B \setminus D = B$

$A \cap B = C$

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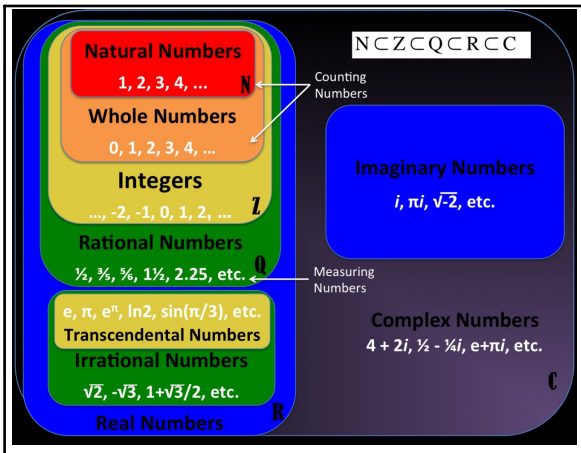
N⊂Z⊂Q⊂R⊂C
Natural Numbers
1, 2, 3, 4, ...
N
Counting Numbers
Whole Numbers
0, 1, 2, 3, 4, ...
Integers
..., -2, -1, 0, 1, 2, ...
Z
Rational Numbers
½, ⅜, ⅝, 1½, 2.25, etc.
Q
Measuring Numbers
e, π, e^π, ln2, sin(π/3), etc.
Transcendental Numbers
Irrational Numbers
√2, -√3, 1+√3/2, etc.
Real Numbers
R
Imaginary Numbers
i, πi, √-2, etc.
Complex Numbers
4 + 2i, ½ - ¼i, e+πi, etc.
C

Aug 19-9:47 AM