How can we compare two different sets?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 10, Lesson 1

1. Warm-up
2. Intersection of Sets
3. ICA- Matching Sets

Intersection of Sets

How can we compare two different sets?

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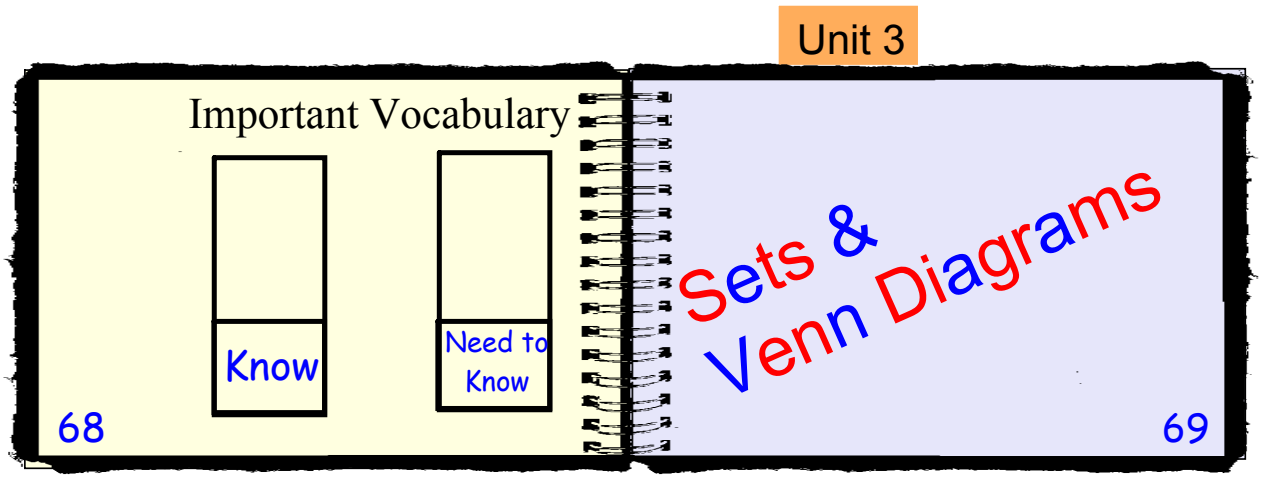
Warm-up: If the average speeding ticket costs $275 with a standard deviation of $30, then:

a) what percentage of tickets cost $200 or less?
b) what percentage of tickets cost between $250 and $300?
c) how expensive is your ticket of it costs more than 60% of all tickets?


Unit 3
Important Vocabulary
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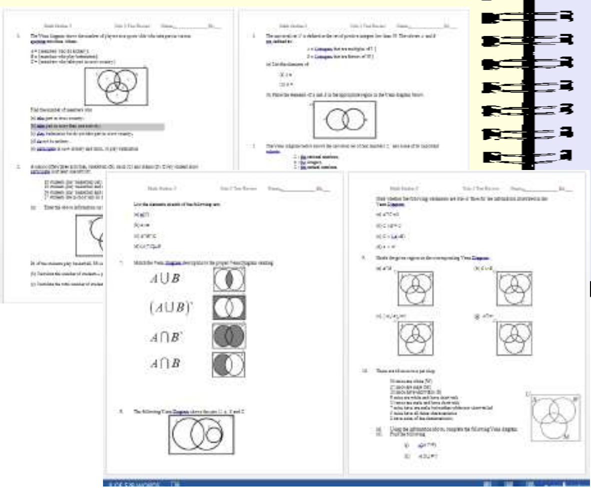
Midterm Study Guide



Show Your Work

Intersection of Sets

Standard 3.2

Set- A set is a collection of numbers or objects
We organize sets using { }

i.e.- The set of odd numbers $O = \{ 1 , 3 , 5 , 7 , 9 , 11 , \dots \}$

The set of all vowels $V = \{a, e, i, o, u\}$

Element- An individual number/object of a set

$5 \in O$ $\quad b \notin V$

Intersection of Sets- The elements that sets have IN COMMO
Represented by $\cap$

Example 1- Find the intersection of set A and set B

$A = \{ 1 , 5 , 6 , 6 , 8 , 11 , 15 \}$
$B = \{ 2 , 2 , 2 , 5 , 8 , 12 , 13 \}$

$A \cap B = \{5, 8\}$

Example 2- Find the intersection of set C and set D

$C = \{ 1 , 3, 5 , 7 , 9 , 11 , 13 \}$
$D = \{ 2 , 4 , 6 , 8 , 10 , 12 , 14 \}$

$C \cap D = \varnothing$

When there is nothing in common for the intersection, then the intersection is *THE EMPTY SET*, represented by $\varnothing$

Finite set - A set which has a finite number of elements.

Stops

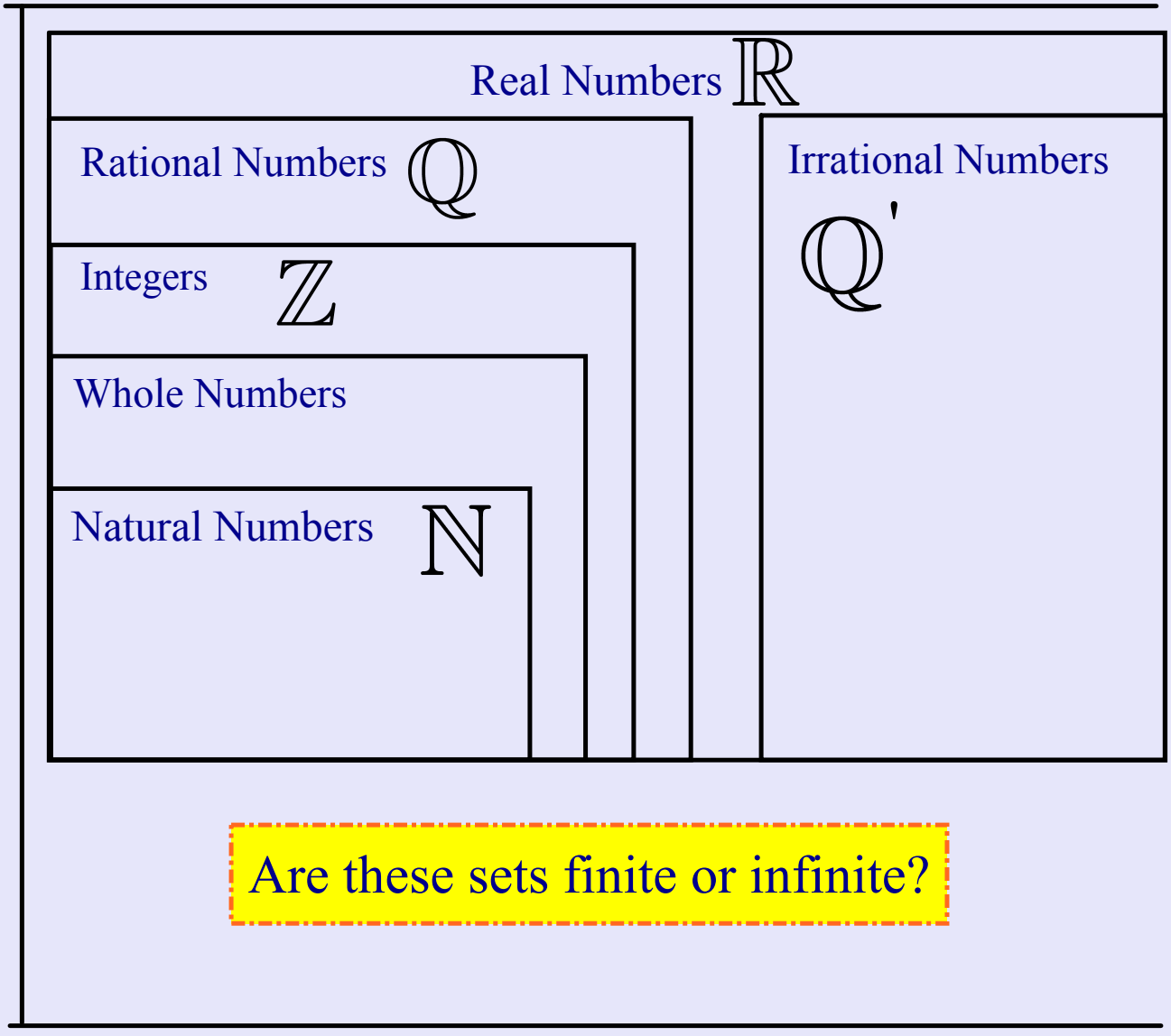
Infinite set - A set which has infinitely many elements.

∞

Summary:

Notes Notes

Real Number Sets



Are these sets finite or infinite?

Summary:

Match the Intersections

$$A = \{\ldots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \ldots\}$$

$$B = \{0, 1, 2, 3, 4, 5, \ldots\}$$

$$C = \{1, 2, 3, 4, 5, \ldots\}$$

1) $A \cap B$

2) $B \cap C$

3) $A \cap \mathbb{N}$

4) $A \cap \mathbb{Z}$

A) $\mathbb{N}$

B) $\{1, 2, 3, \ldots\}$

C) $\{0, 1, 2, 3, 4, 5, \ldots\}$

D) $\mathbb{Z}$

WHAT IS THE DIFFERENCE BETWEENINTERSECTIONS AND UNIONS?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 10, Lesson 2

1. Warm-up
2. Union of Sets

Union of Sets

WHAT IS THE DIFFERENCE BETWEEN INTERSECTIONS AND UNIONS?

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Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: Find the intersection of sets A and B

$$A = \{1,2,3,5,11,15,18,21,25\}$$

$$B = \{2,3,4,6,10,11,13,17,21\}$$

$$A \cap B = \{2,3,11,21\}$$

Union of Sets

Standard 3.1

Union of Sets - The union of sets A and B contains elements in set A, set B, or both Represented by $\bigcup$

Example 1- Find the union of set A and set B

$A = \{ 1 , 5 , 6 , 8 , 11 , 15 \}$

$B = \{ 2 , 5 , 8 , 12 , 13 \}$

$$A \bigcup B = \{1,2,5,6,8,11,12,13,15\}$$

Example 2- Find the union of set C and set D

$C = \{ 1 , 3, 5 , 7 , 9 , 11 , 13 , ...\}$

$D = \{ 2 , 4 , 6 , 8 , 10 , 12 , 14 , ... \}$

$$C \bigcup D = \mathbb{N}$$

Example 3- Find the union of sets E , F , and G

$E = \{... , -5 , -4 , -3 , -2 , -1 , 0 \}$

$F = \{ 0 , 1 , 3 , 5 , 7 , 9 , ...\}$

$G = \{ 2 , 4 , 6 , 8 , 10 , ... \}$

$$E \bigcup F \bigcup G = \mathbb{Z}$$

Nasty Problems

Standard 3.2

When there is a mix of unions AND intersections, then do parenthesis first

i.e.- If given $(A \cap B) \cup C$ then you would first find the intersection of A and B, then find the union of that with set C

For examples 4 , 5 , 6 , and 7 , use the following sets

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

~~$B = \{ x \mid 0 < x < 50$, where x is a perfect square$\}$~~

~~$C = \{ x \mid x$ is a prime number $< 50 \}$~~

$B = \{1,4,9,16, 25, 36,49\}$

$C = \{2,3,5,7,11,13,17,19,23,29,31,37,41,43,47\}$

Example 4

$A \cup (B \cap C)$

① $B \cap C = \emptyset$ ② $A \cup \emptyset = \{A\}$

Example 5

$B \cup (A \cap C)$

① $A \cap C = \{2,3,5,7\}$ ② $B \cup \{2,3,5,7\}$

$\{1,2,3,4,5,7,9,16,25,36,49\}$

Example 6

$(A \cap B) \cup C$

① $A \cap B = \{1,4\}$ ② $\{1,4\} \cup C$

$\{1,2,3,4,5,7,11,13,17,19,23,29,31,37,41,43,47\}$

Example 7

$B \cap C$ $\emptyset$

Disjoint- When the intersection of two sets is the empty set, we say the two sets are *disjoint*

Summary:

ARE DISJOINT AND EMPTY SETS THE SAME?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 10, Lesson 3
1. Warm-up
2. Notes
3. ICA

Intersections and Unions

ARE DISJOINT AND EMPTY SETS THE SAME?

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Warm-up: Define the following symbols.

$\notin$ not an element

$\mathbb{N}$ Natural Numbers

$\varnothing$ Empty set

$\mathbb{Q}'$ Irrational Numbers

$\in$ element

$\mathbb{R}$ Real Numbers

$\cap$ Intersection

$\mathbb{Z}$ Integers

$\cup$ Union

$\mathbb{Q}$ Rational Numbers

Identify the following as $\mathbb{R}, \mathbb{Z}, \mathbb{Q}, or \mathbb{N}$.

(Some may have more than one.)

1. 0.47 $\mathbb{Q}$ $\mathbb{R}$
2. .363636 $\mathbb{Q}$ $\mathbb{R}$
3. -4 $\mathbb{Z}$ $\mathbb{Q}$ $\mathbb{R}$
4. $\sqrt{9}$ $\mathbb{N}$ $\mathbb{Z}$ $\mathbb{Q}$ $\mathbb{R}$
5. 234 $\mathbb{N}$ $\mathbb{Z}$ $\mathbb{Q}$ $\mathbb{R}$
6. 3.141593.... $\mathbb{R}$

π is the most famous irrational number, $\mathbb{Q}'$

True or False?

-136 is a natural number

$\frac{15}{2}$ is a rational number

$\frac{14}{2}$ is not an integer

Unions and Intersections

***Exercise* #1:** For each of the following, sets A and B are given. Find $A \cup B$ and $A \cap B$.

(a) $A = \{2, 4, 6, 8, 10\}$ $B = \{2, 3, 4, 5, 6\}$

$A \cup B =$

$A \cap B =$

(b) $A = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$ $B = \{\ldots, -5, -3, -1, 1, 3, 5, \ldots\}$

$A \cup B =$

$A \cap B =$

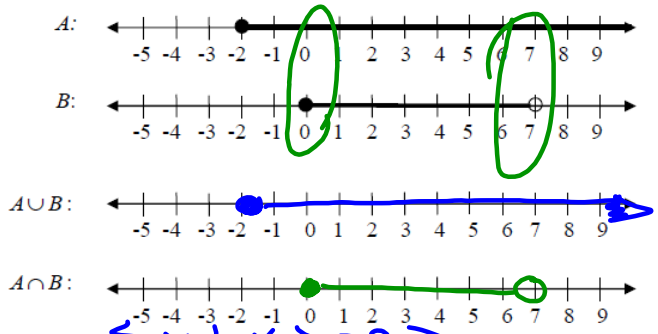
(c) $A =$ {apples, bananas, oranges, grapefruit, peaches} $B =$ {lemons, peaches, apples}

$A \cup B =$

$A \cap B =$

***Exercise* #2:** For each of the following, the graphs of two sets, A and B, are shown below. In each case, graph $A \cup B$ and $A \cap B$. Then write each using set-builder notation.

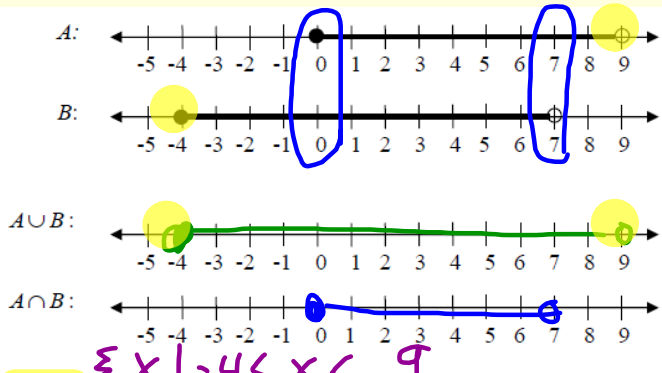
(a)



$A \cup B =$ $\{x \mid x \geq -2\}$

$A \cap B =$ $\{x \mid 0 < x < 7\}$

(b)



$A \cup B =$ $\{x \mid -4 \leq x < 9\}$

$A \cap B =$ $\{x \mid 0 \leq x < 7\}$

***Exercise* #3:** For any set A, determine each of the following:

$A \cup \varnothing =$ ________ $A \cap \varnothing =$ ______

***Exercise* #4:** Within the set of real numbers $(-\infty, 5] \cap (-2, 7] = ?$

(1) $(-2, 7)$ (3) $(-2, \infty)$

(2) $[-2, 5]$ (4) $(-2, 5]$ __________

ARE THERE "OPPOSITES" OF SETS?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 10, Lesson 4
1. Warm-up
2. Notes
3. ICA
4. Homework

Universal & Compliment Sets

ARE THERE "OPPOSITES" OF SETS?

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Warm-up: Consider the following sets

$A = \{ 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10 \}$

$B = \{ x \mid x \text{ is all even numbers less than } 11, x \in \mathbb{N} \}$

$C = \{ x \mid x \text{ is a multiple of } 4 , x < 21, x \in \mathbb{N} \}$

$B = \{2,4,6,8,10\}$

$C = \{4,8,12,16,20\}$

Find $(A \cap B) \cup C$ and $A \cap (B \cup C)$

① $A \cap B$

$\{2,4,6,8,10\}$

② $\{2,4,6,8,10\} \cup \{2,4,6,8,10,12,16,20\}$

① $B \cup C$

$\{2,4,6,8,10,12,16,20\}$

② $A \cap \{2,4,6,8,10,12,16,20\}$

$\{2,4,6,8,10\}$

Universal & Compliment Sets

Standard 3.2

The Universal Set- The set that contains all elements for a given problem
The set where any other set is a subset
Represented by U

Subsets $\subseteq$

A is a subset of B if and only if every element of A is in B

$\{a\} \subseteq \{f, r, a, u\}$
$\{1,2,3\} \subseteq \{-1, 0, 1,2,3\}$
$\{4, 5, 7, 10\} \subseteq \{4, 5, 7, 10\}$

Proper Subsets $\subset$

A is a proper subset of B if and only if every element of A is in B, and A is not equal to B.

$\{a\} \subset \{f, r, a, u\}$
$\{1,2,3\} \subset \{-1, 0, 1,2,3\}$
$\{4, 5, 7, 10\} \not\subset \{4, 5, 7, 10\}$

Determine if the following sets are a subset or proper set of U.

$U = \{1,2,3,4,5,6,7,8,9,10\}$
$A = \{1,3,5,7,9\}$ Proper subset $A \subset U$
$B = \{2,4,6,8,10\}$ Proper subset $B \subset U$
$C = \{1,5,9,15\}$ $C \not\subset U$

Example 1- Consider the universal set U

$$U = \{2,5,8,11,15,18,20,21,25,28,30\}$$

True or false, the following sets are subsets of the universal set U

$A = \{2,8,11,15\}$ $TRUE, A \subset U$
$B = \{1,2,3,4,5,6\}$ $FALSE, B \not\subset U$
$C = \{15,18,21,28\}$ $TRUE, C \subset U$
$D = \{30\}$ $TRUE, D \subset U$
$E = \{\varnothing\}$ $TRUE$, $\varnothing$ is a subset of all sets

Example 2-

$U_1 = \mathbb{N}$ $U_2 = \mathbb{Z}$ $U_3 = \mathbb{Q}$

For each of the following subsets, determine which universal sets the subsets are contained in

$A = \{1,2,3,4,5\}$ $A \subset U_1$
$B = \{-14,-11,12.527,13.5\}$ $B \subset U_3$
$C = \left\{\frac{5}{2}, 12.5, 15, 20, 25, \frac{100}{3}\right\}$ $C \subset U_3$
$D = \{-5,-1,0,4,15\}$ $D \subset U_2$

Universal & Compliment Sets

Compliment of a Set- The elements not contained in a given set, but are contained in the Universal Set.
- The "leftover" elements

Example 3- Given the universal set U and subsets A, B, and C, find the following compliments:

$U = \{x \mid 0 \le x \le 20,$ where x is a whole number$\}$

$A = \{2,4,6,8,10,12,14,16,18,20\}$

$B = \{1,2,3,4,5,6,7,8,9,10\}$

$C = \{3,5,7,9,11,13,15,17,19\}$

$U = \{0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20\}$

$A' = \{0,1,3,5,7,9,11,13,15,17,19\}$

$B' = \{0,11,12,13,14,15,16,17,18,19,20\}$

$C' = \{0,1,2,4,6,8,10,12,14,16,18,20\}$

$(A \cap B) = \{2,4,6,8,10\}$

$A \cup B = \{1,2,3,4,5,6,7,8,9,10,12,14,16,18,20\}$

$A' \cap B = \{1,3,5,7,9\}$

$A' \cup B' = \{0,1,3,5,7,9,11,12,13,14,15,16,17,18,19,20\}$

$(A \cap B)' = \{0,1,3,5,7,9,11,13,14,15,16,17,18,19,20\}$

Summary:

Attachments

U11L4UnionandIntersection.pdf