IV Set Theory and Venn Diagrams

Date: ***10/08-13/2014*** ***Topic IV:*** Set Theory and Venn Diagrams

1st **Class**

Objective: the students will

1. Symbols, Terminology, Set Builder Notation
2. Sets of Numbers
3. Rules for Operations on Sets
4. Venn Diagrams

Agenda:

Bell ringer

vocabulary:

Examples : **Topic 4 Resources**

Class work: **Topic 4 Resources**

Closing Activity : ***Exit Ticket***

Homework:

Set Theory

A set is a collection of objects, or elements. Sets are represented by capital letters, and elements by lower case (usually).

$$A = \{1,3,5,7\}$$

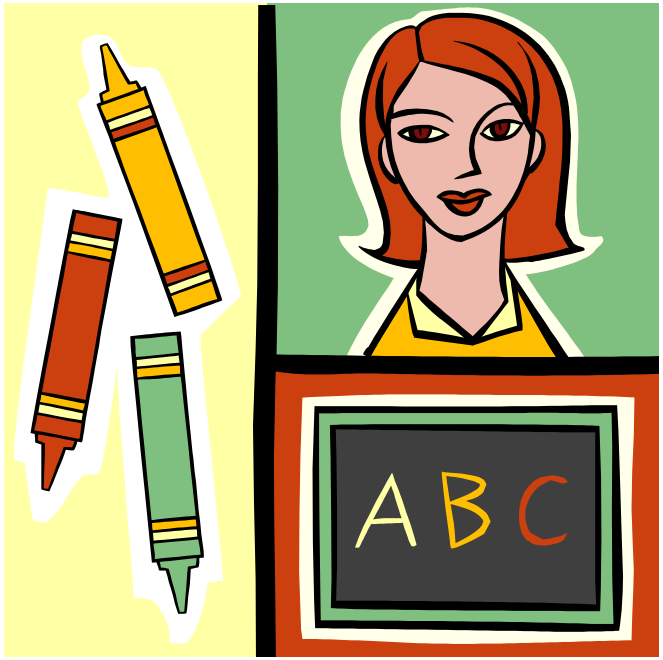
Set A contains elements 1, 3, 5, and 7.

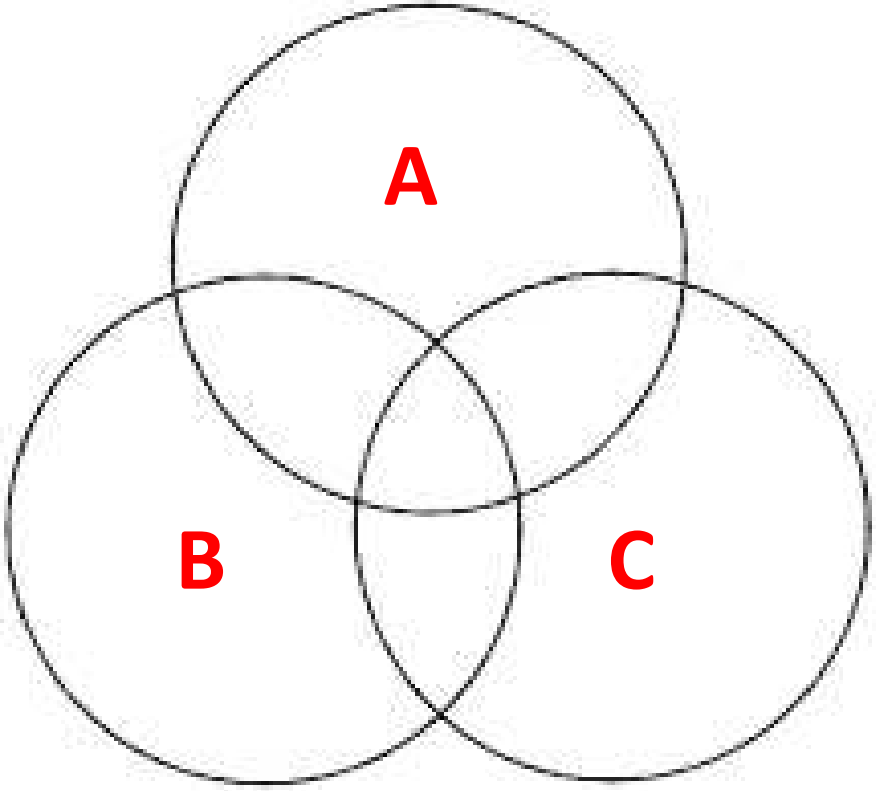
*elements do not need to go in any particular order

*there are many ways to represent certain sets

IV Set Theory and Venn Diagrams

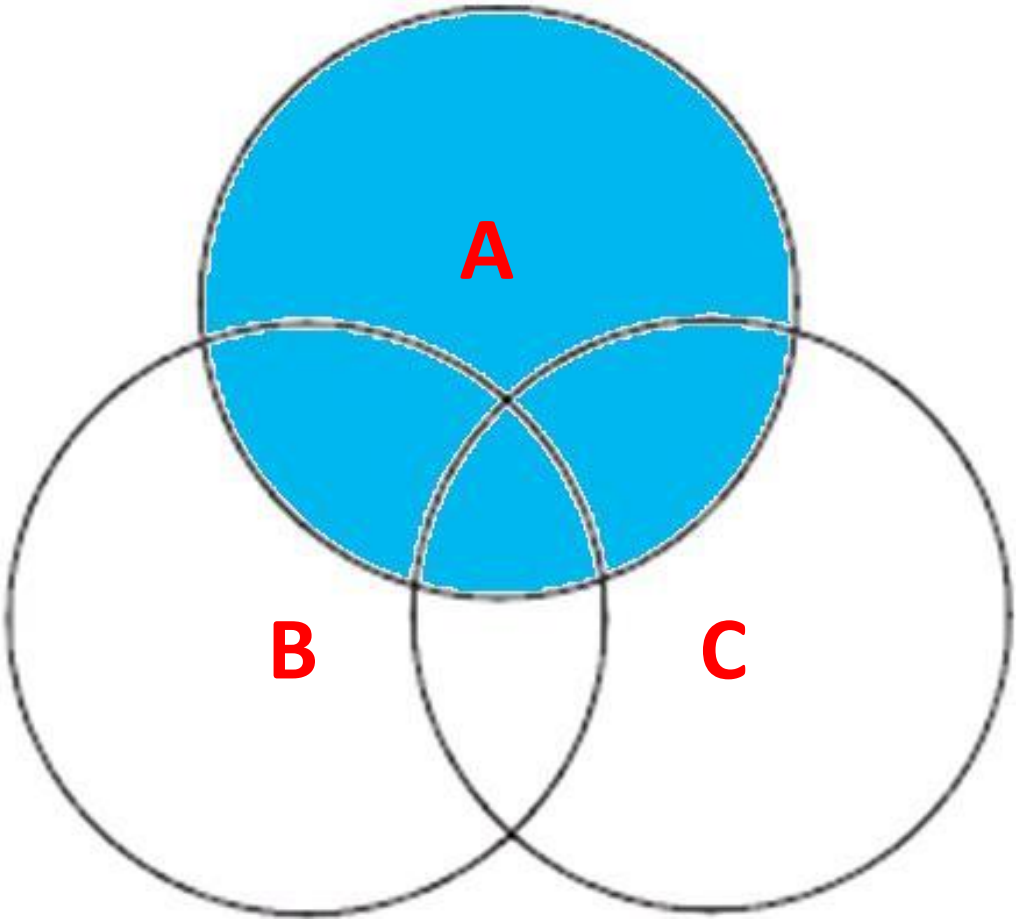
When working with sets, Venn Diagrams become very useful in determining the truth of statements.





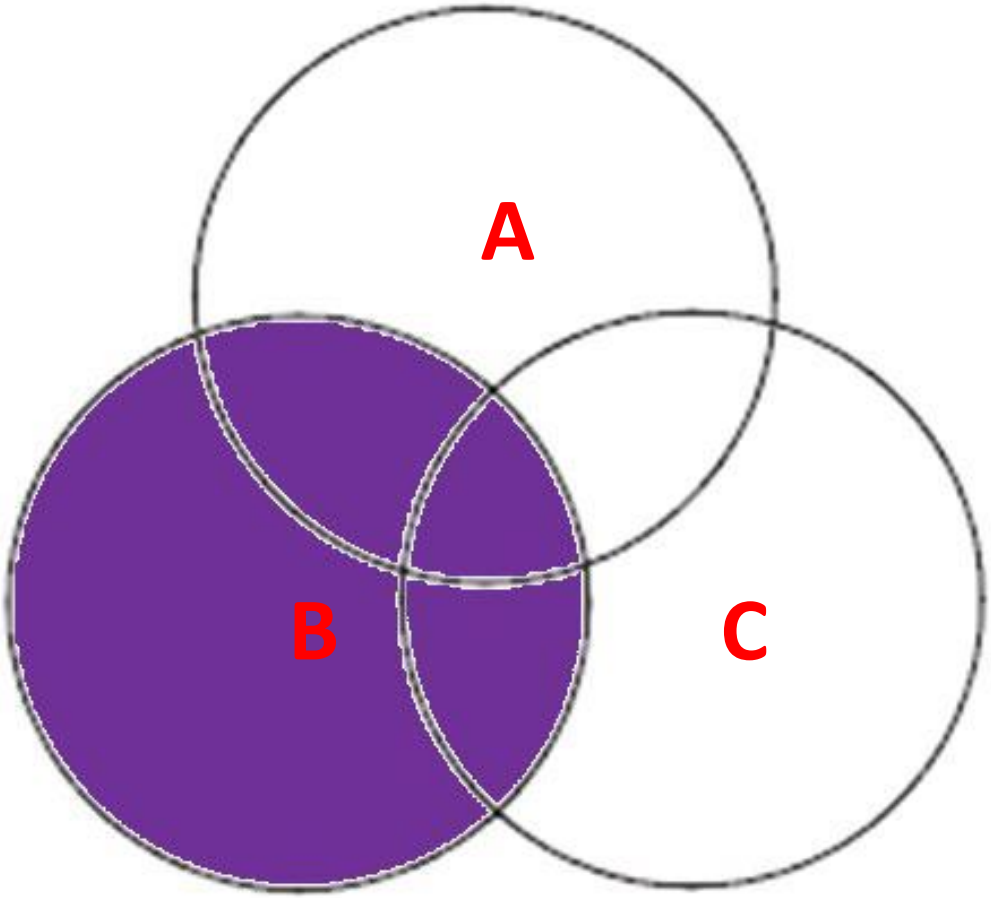
Set Theory and Venn Diagrams

The shaded region represents all of set A.



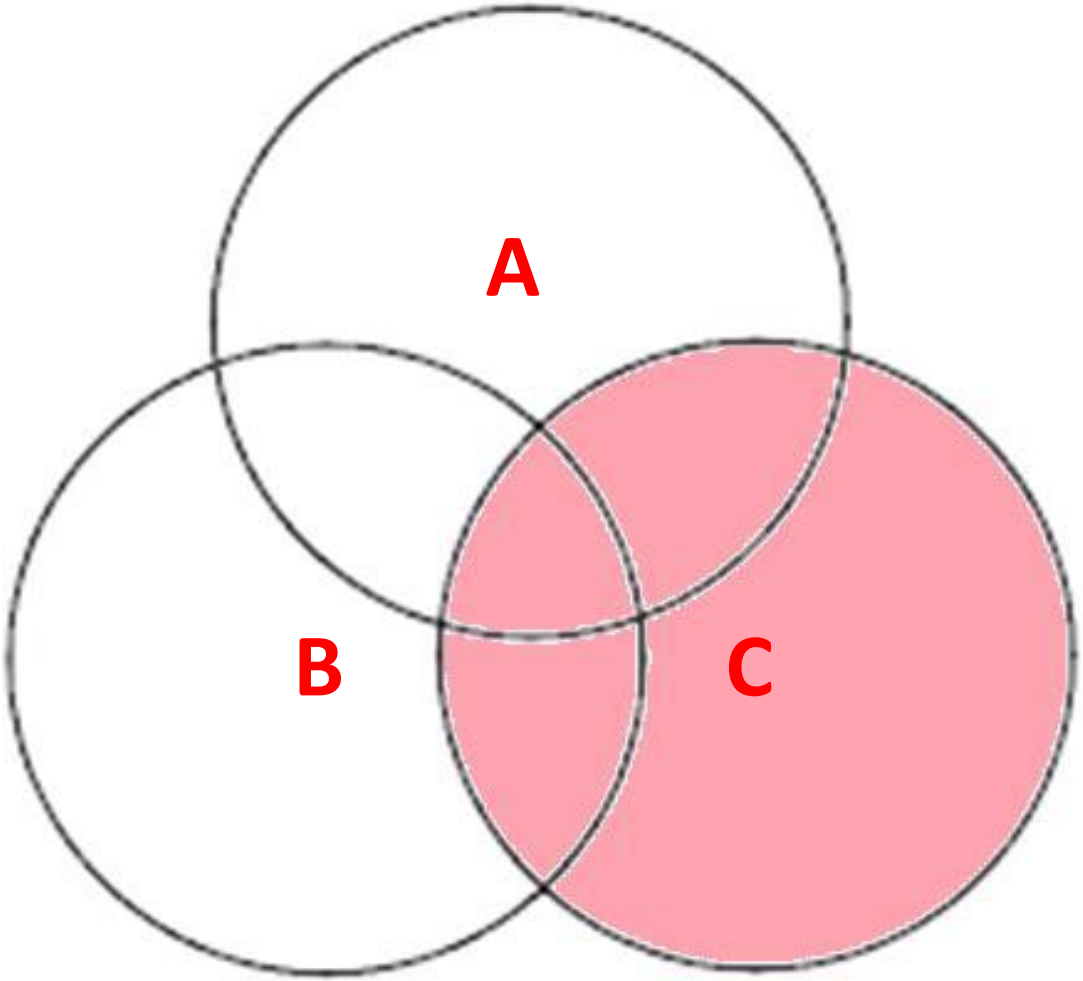
IV Set Theory and Venn Diagrams

The shaded region represents all of set B.



IV Set Theory and Venn Diagrams

The shaded region represents all of set C.



IV Set Theory and Venn Diagrams

A set with no elements is called an empty set (null or void).

$$A = \{\ \} \qquad A = \phi$$

Set A, in either case, represents the empty set.

IV Set Theory and Venn Diagrams

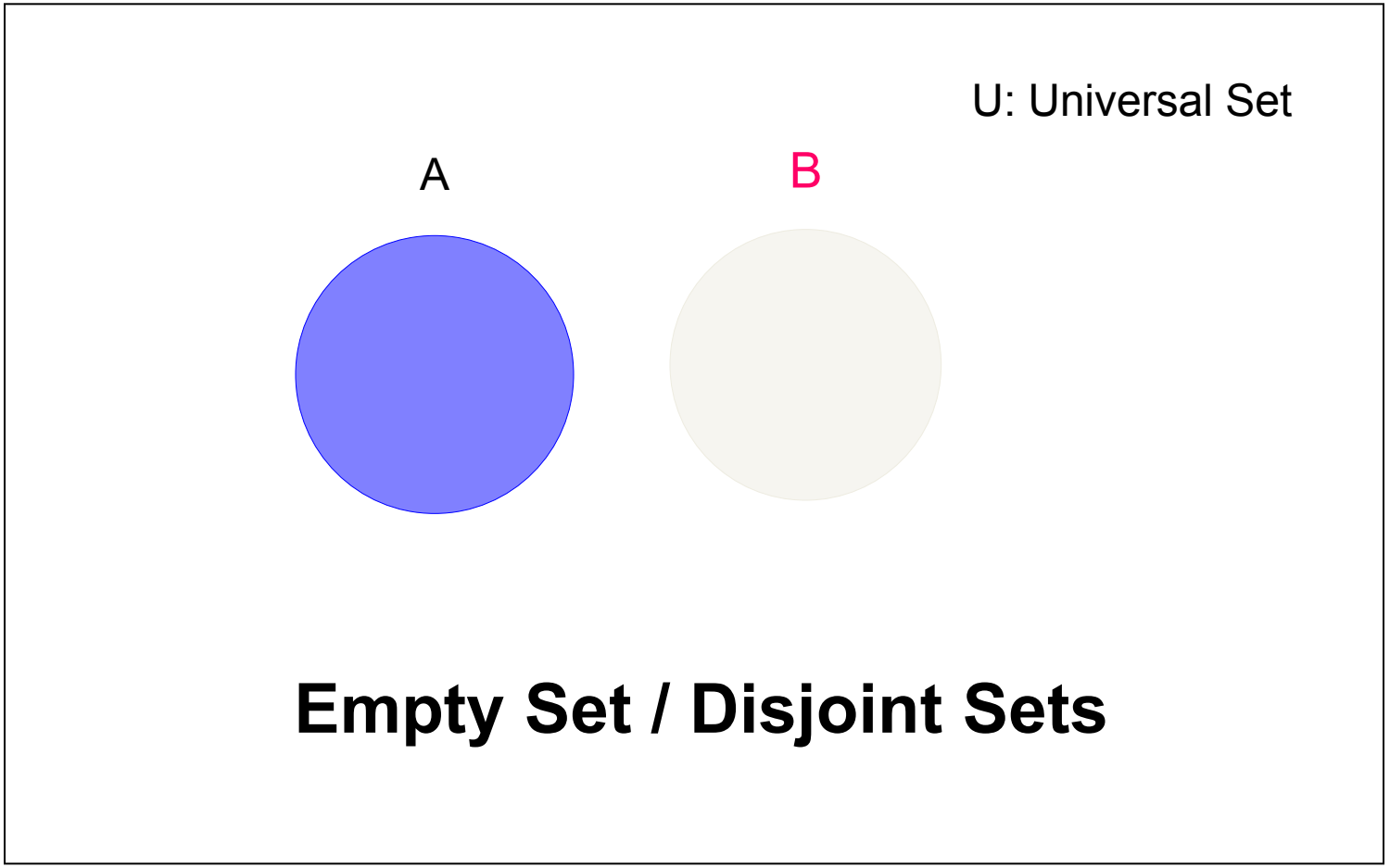
U universal set is the set of ALL elements.

$$U = \{everything\}$$

Set U represents the universal set.
The symbol for the universal is **U**

Set Theory and Venn Diagrams

Set Theory: Using Venn Diagrams



Empty Set / Disjoint Sets

IV Set Theory and Venn Diagrams

A set A is a subset of the set B, if the set of A is also an element of B

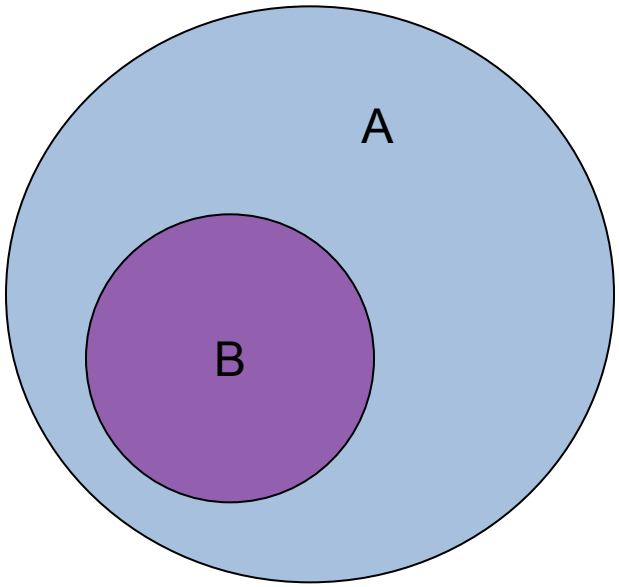
Can write this relation as $A \subseteq B$

$$B = \{-2,-1,0,1,2,3\} \quad A = \{-1,0,2\}$$

$$A \subseteq B$$

Set Theory and Venn Diagrams

A subset



Subset: B ⊆ A

IV Set Theory and Venn Diagrams

The complement of a set is the set of all elements in the universal set that are not in the set . Denotation of a complement by A’

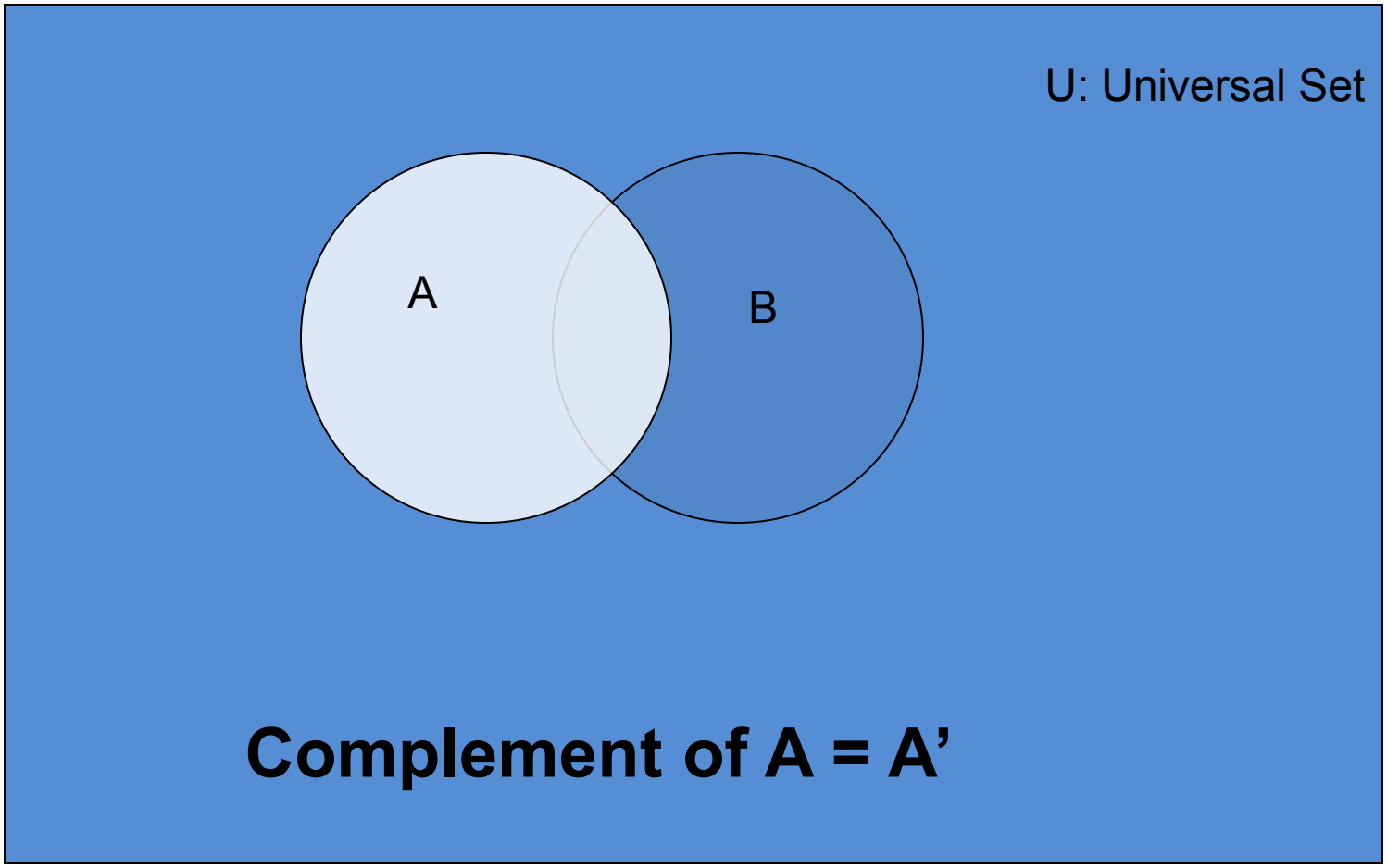
$$\overline{A} \text{ or } A'$$

$$U = \{2,4,6,8,10,12\} \quad A = \{2,4,6\}$$

$$A' = \{8,10,12\}$$

Set Theory and Venn Diagrams

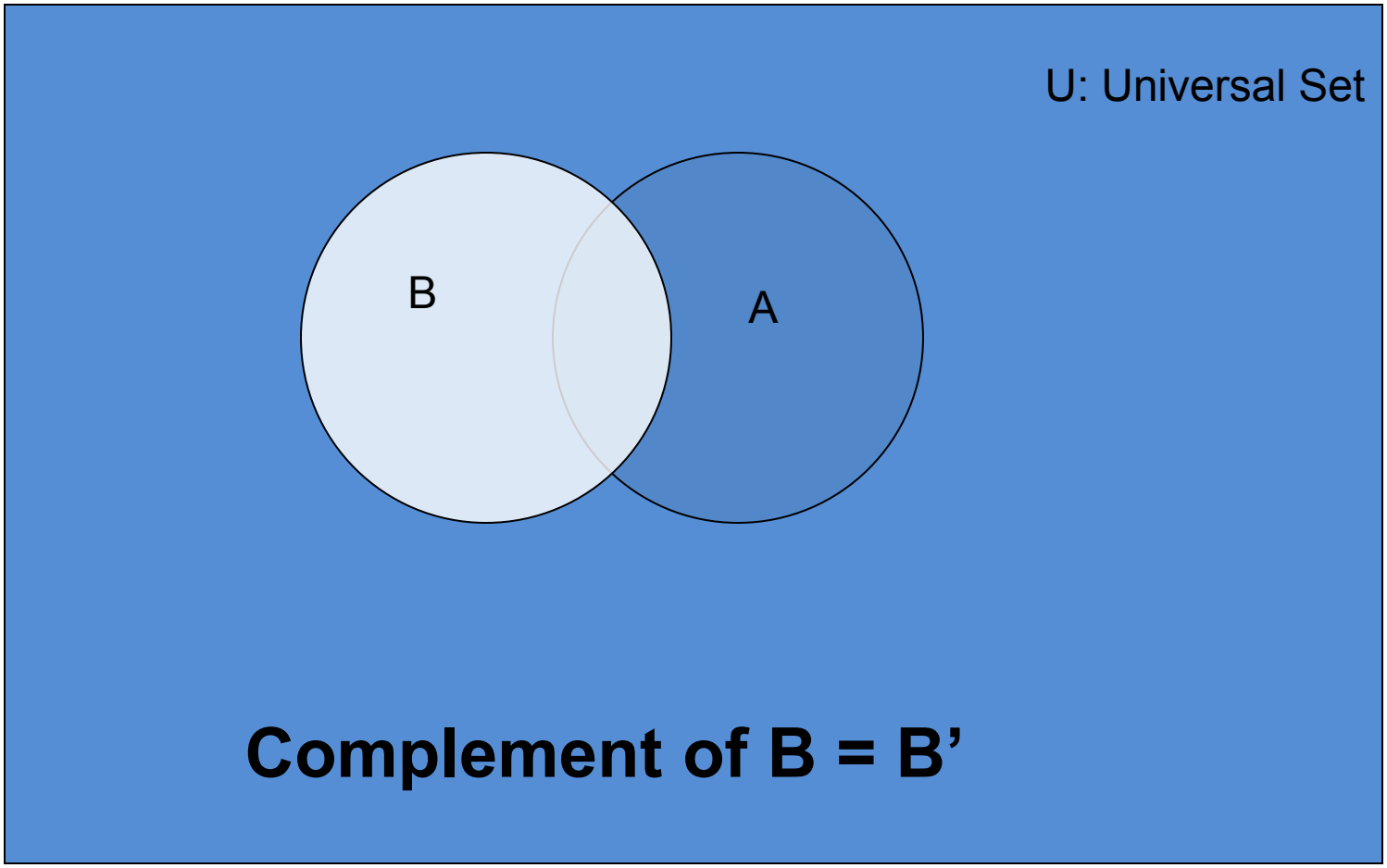
The complement of a set



Complement of A = A’

Set Theory and Venn Diagrams

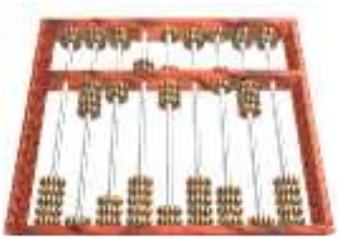
The complement of a set



Complement of B = B’

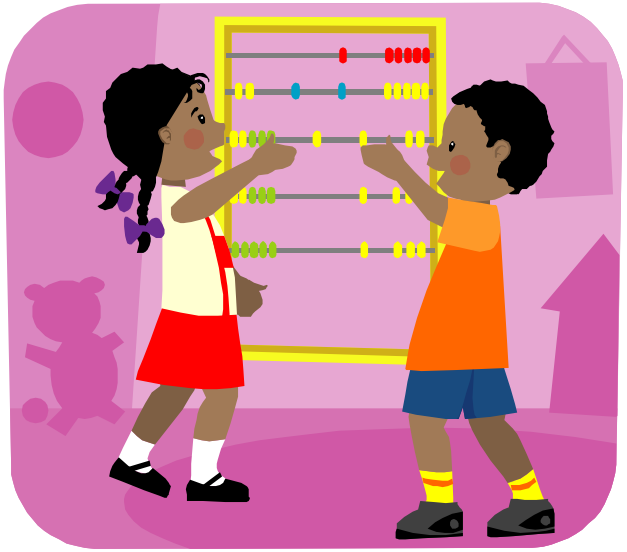
IV Set Theory and Venn Diagrams

The union of sets (A U B) is the set of all elements in A or B.



$$A = \{1,2,5\}$$

$$B = \{1,3,9\}$$

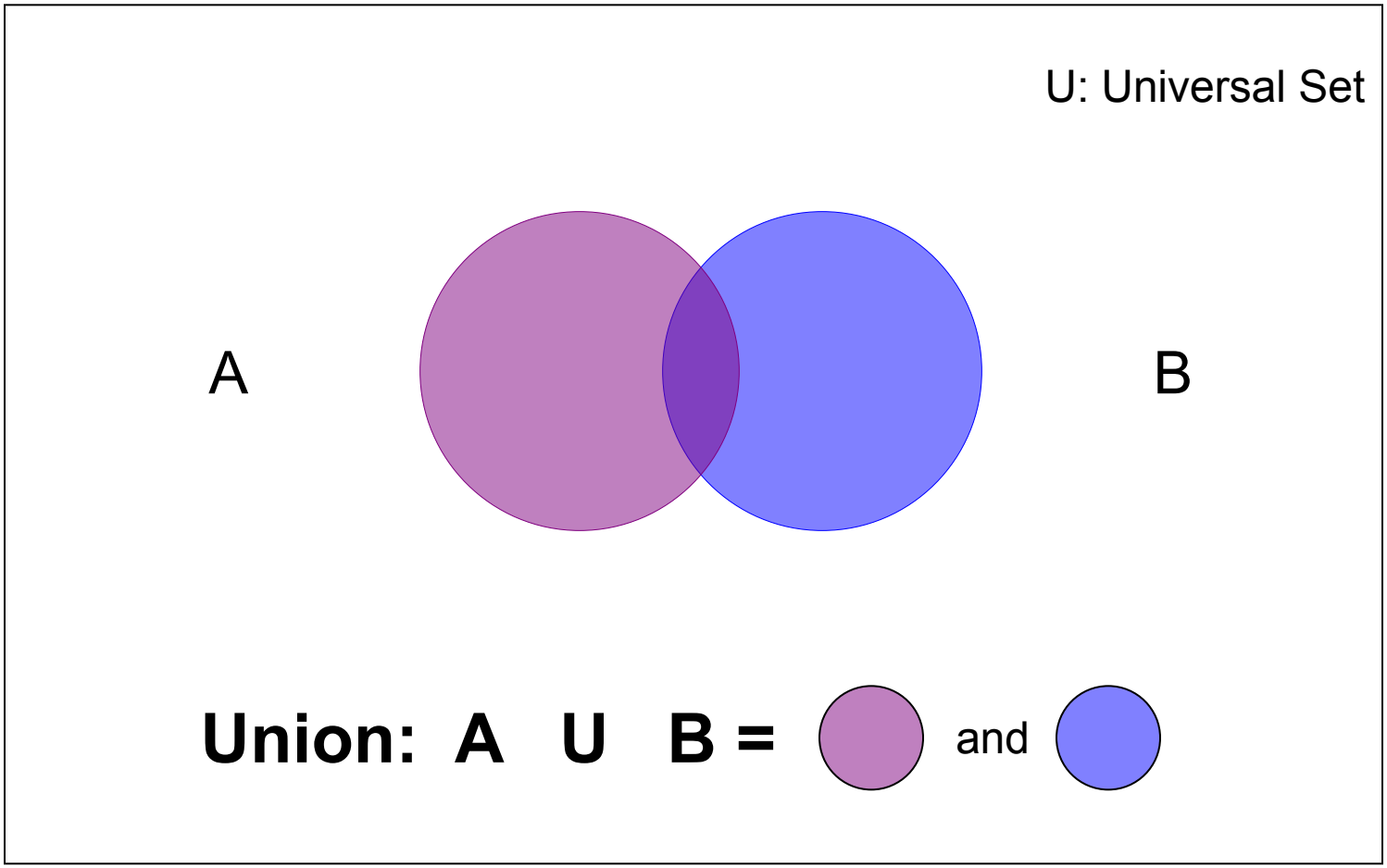


$$AUB = \{1,2,3,5,9\}$$

The union of two students' math skills!

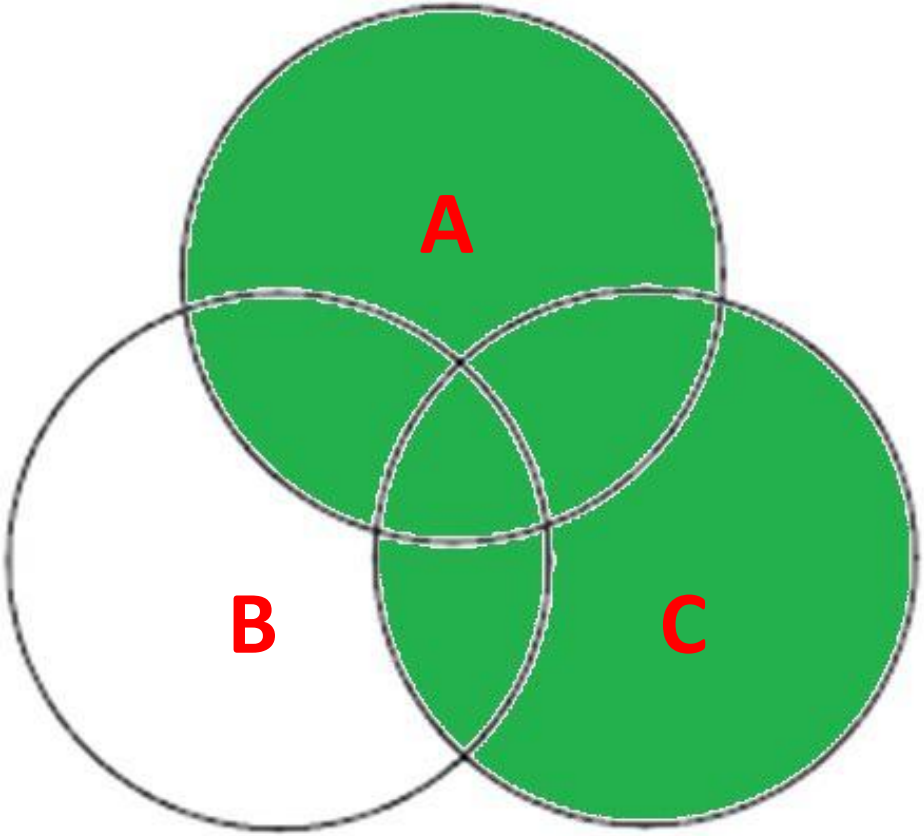
Set Theory and Venn Diagrams

The union of sets



The union of sets

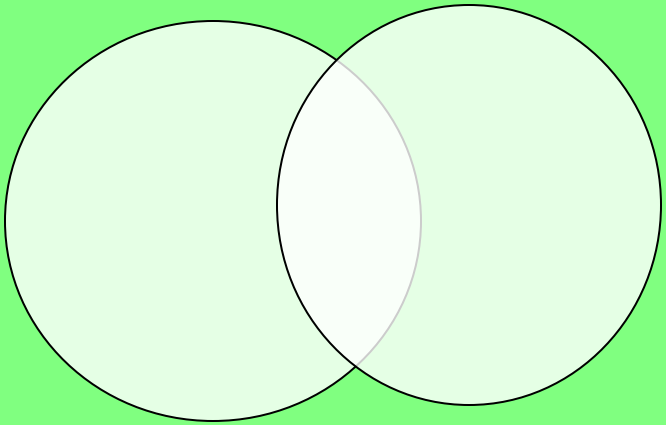
The shaded region represents $A \cup C$



Set Theory and Venn Diagrams

The union & Complement sets

U: Universal Set



Universal Set or complement of (A U B)

noted as (A U B)'

IV Set Theory and Venn Diagrams

The intersection of sets (A ⋂ B) is the set of all elements in A and B.

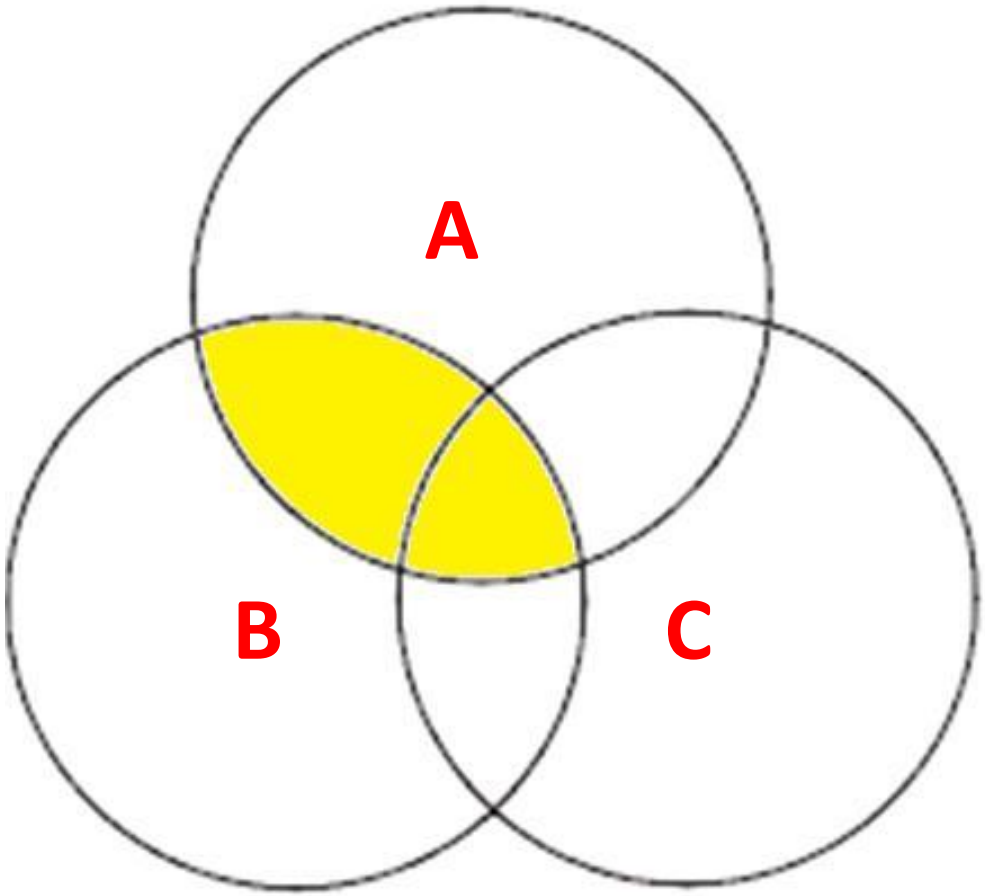
$$A = \{1,2,5\} \qquad B = \{1,3,9\}$$

$$A \cap B = \{1\}$$

Our intersection will be that sandwich if you SHARE it!

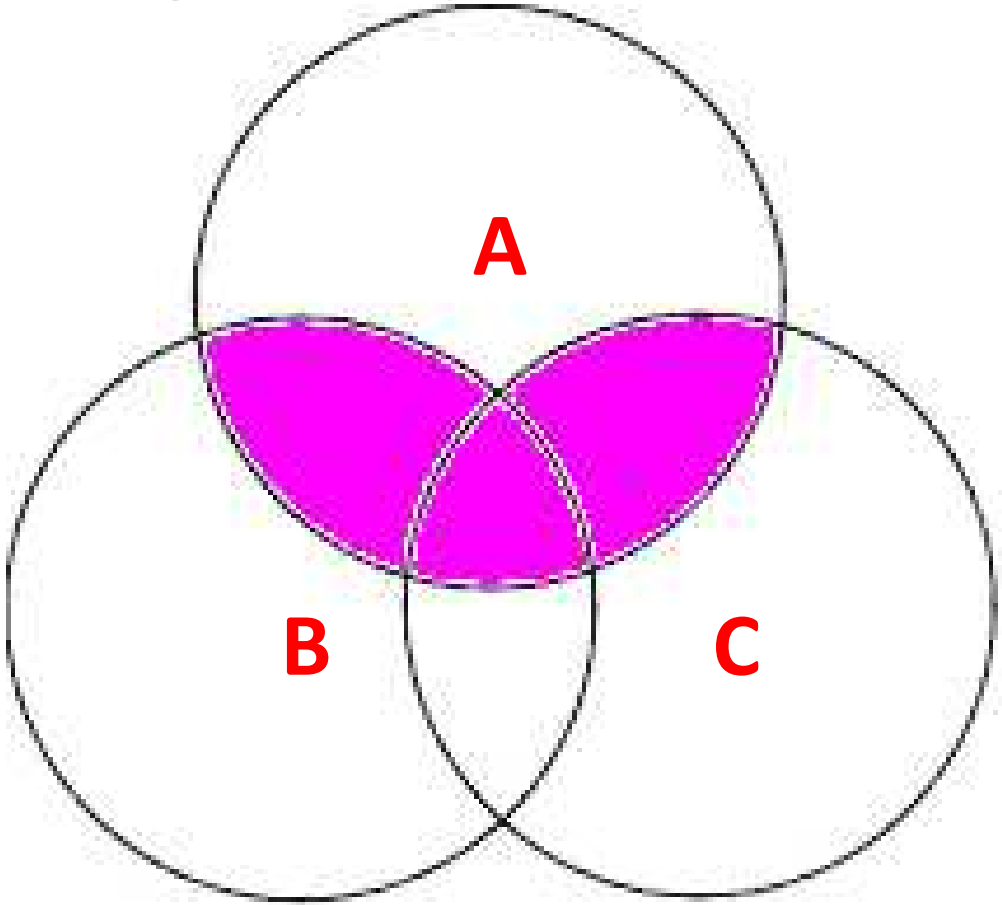
The intersection of sets

The shaded region represents $A \cap B$



The intersection of sets

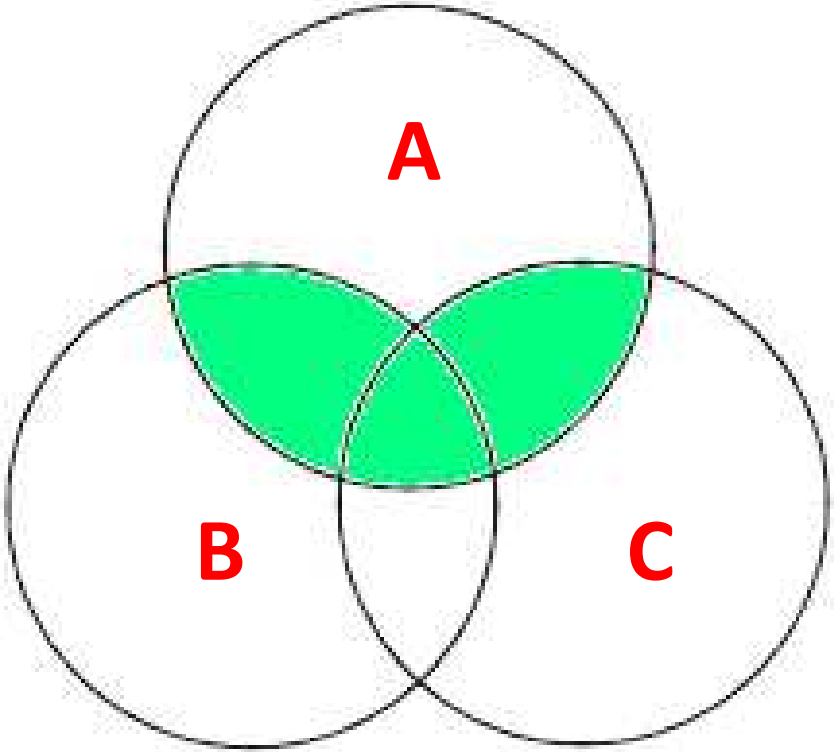
The shaded region represents $A \cap (B \cup C)$



IV Set Theory and Venn Diagrams

The shaded region represents

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

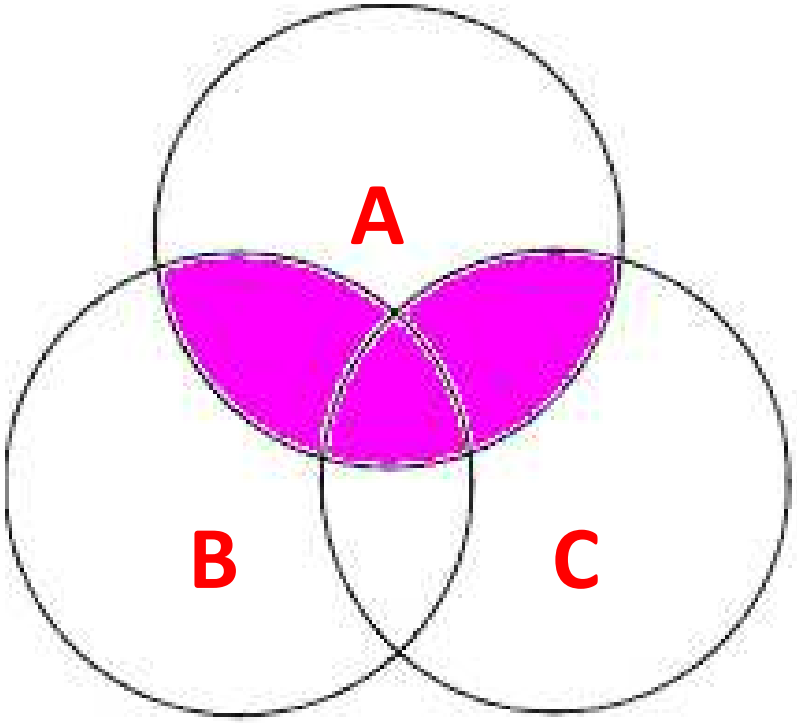


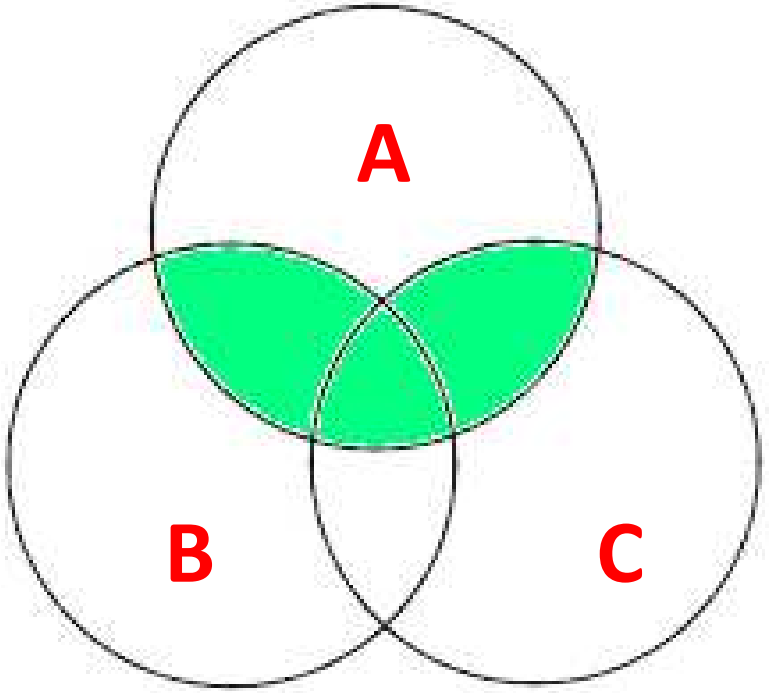
Set Theory and Venn Diagrams

The intersection of sets

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

are the same!





IV Set Theory and Venn Diagrams

When working with sets, Venn Diagrams become very useful in determining the truth of statements.

The Venn Diagrams on the previous slide showed the statement

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

was true.

IV Set Theory and Venn Diagrams

Venn Diagrams also serve as a nice way to represent data..

At a restaurant, Bella, Edward, Jacob, Alice, and Jasper were asked if they had **ordered (not eaten ☺)** any of the following: chicken marsala, lasagna, or coke.

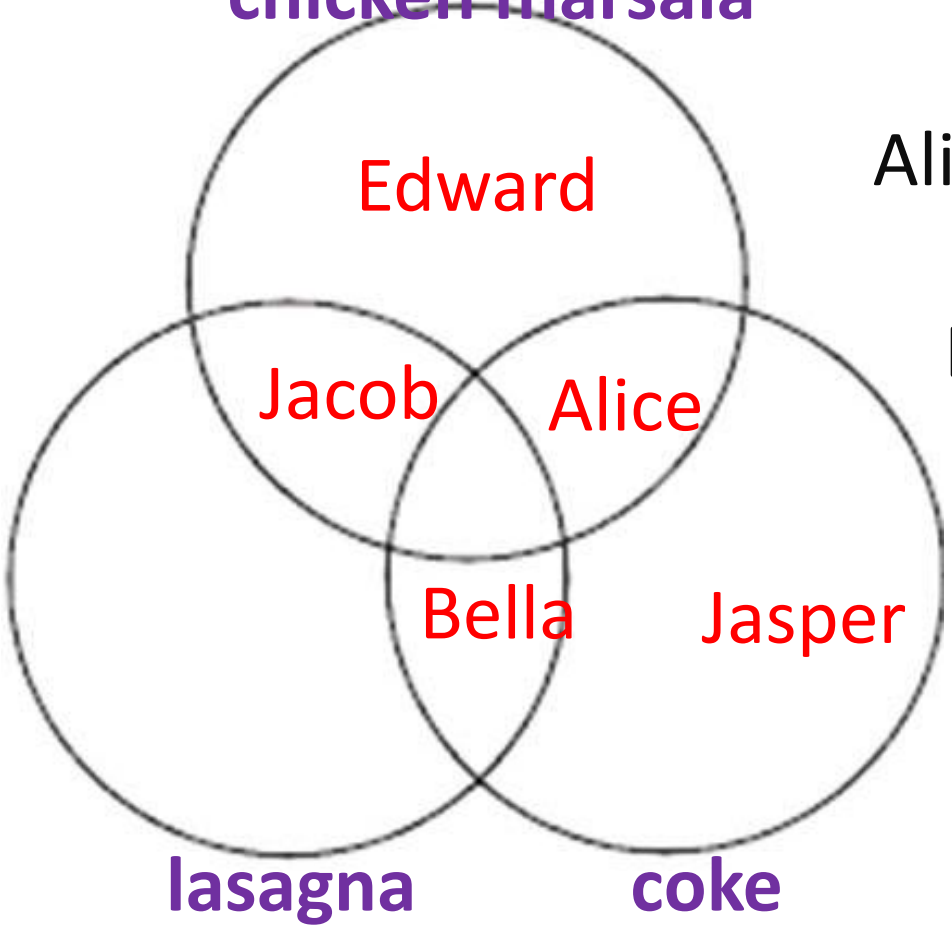
3 people ordered chicken marsala (Edward, Alice, Jacob).
2 people ordered lasagna (Bella and Jacob).
3 people ordered coke (Alice, Bella, and Jasper).
1 person ordered both chicken marsala and lasagna (Jacob).

IV Set Theory and Venn Diagrams

Jasper (coke)

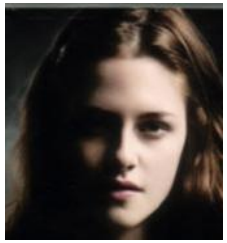
Edward (chicken marsala)

chicken marsala



Alice (chicken marsala, coke)

Bella (lasagna, coke)



Jacob (chicken marsala, lasagna)

IV Set Theory and Venn Diagrams

The cross product of sets A and B, written as $A \times B$ is the set of all ordered pairs (a, b) where a is an element of set A and b is an element of set B.

$A =$ 

$B =$ 

$$A \times B = \{\ldots\ldots\ldots\}$$

IV Set Theory and Venn Diagrams

$A =$ 

$B =$ 

$A \times B = \{$  $\_\_\_\_\_ \}$

IV Set Theory and Venn Diagrams

$A = \{$  $\}$

$B = \{$  $\}$

$A \times B = \{$  _____ $\}$

IV Set Theory and Venn Diagrams

$A = \{$  $\}$

$B = \{$  $\}$

$A \times B = \{$  $\}$

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B$ = {  }

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B$ = {  }

IV Set Theory and Venn Diagrams

$A =$ 

$B =$ 

$A \times B =$ 

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B$ = 

IV Set Theory and Venn Diagrams

A = 

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$A \times B$ = 

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B$ = 

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B =$ 

IV Set Theory and Venn Diagrams

A = 

B = 

$A \times B$ = 

Set Theory and Venn Diagrams

$$A = \{1,2\} \qquad B = \{40,50,60\}$$

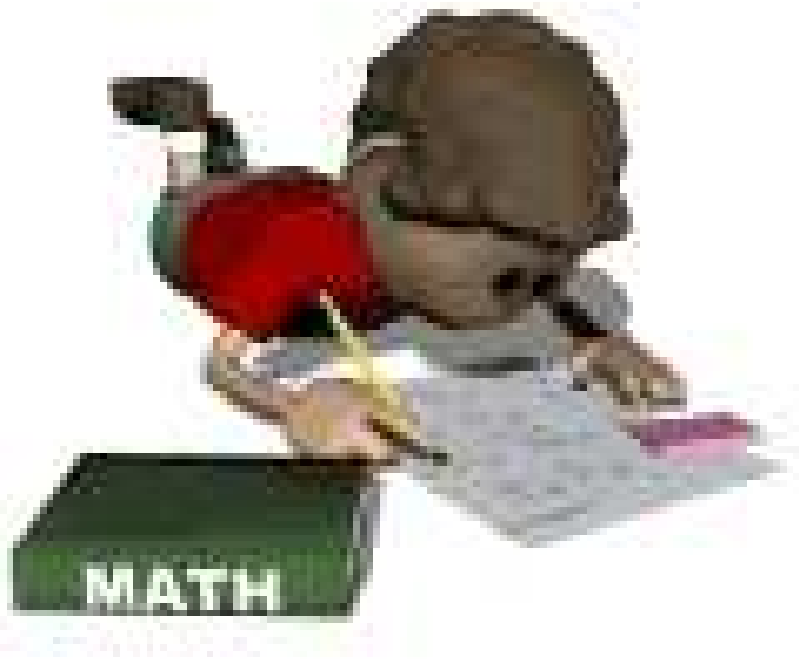
Find $A \times B$

$$A \times B = \{(1,40),(1,50),(1,60),(2,40),(2,50),(2,60)\}$$

IV Set Theory and Venn Diagrams

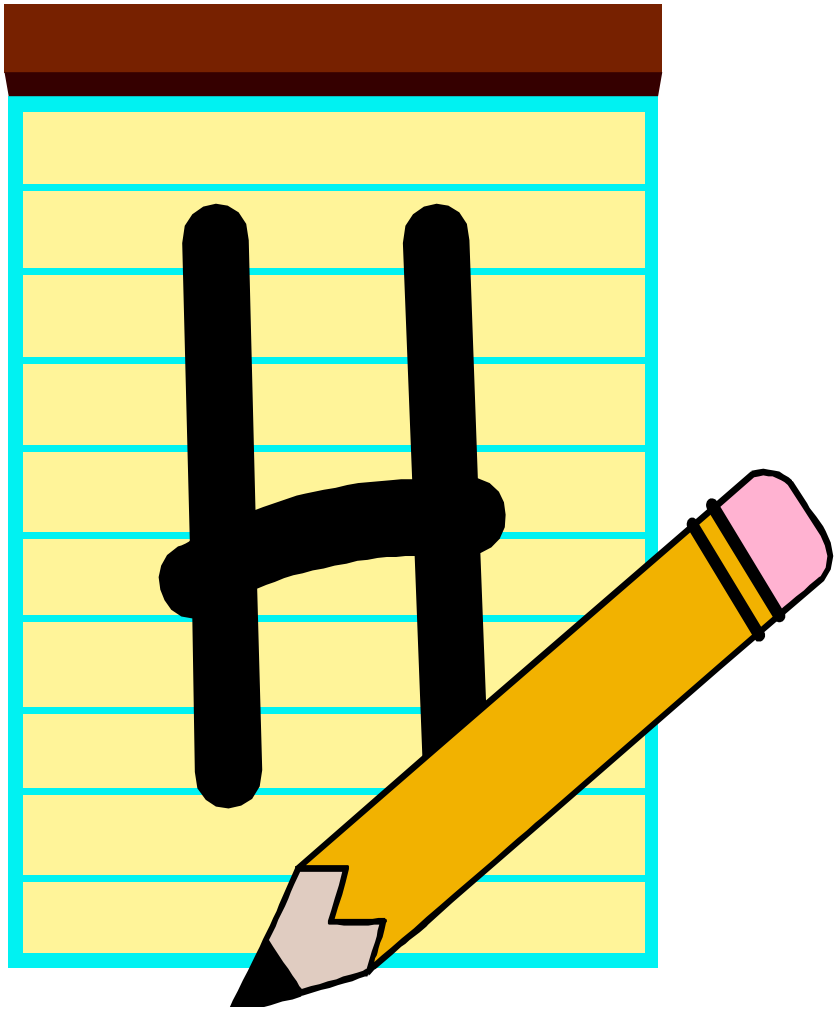
Now

Class work 1st class



Practice time!

IV Set Theory and Venn Diagrams



Homework Topic IV

Name:_____ date:_____

1. If the universal set is $U = \{pennies, nickels, dimes, quarters\}$, what is the complement of the set $N = \{nickels\}$?

   A. $\sim N = \{\emptyset\}$
   B. $\sim N = \{pennies, quarters\}$
   C. $\sim N = \{pennies, dimes, quarters\}$
   D. $\sim N = \{pennies, nickels, dimes, quarters\}$

2. Given: $A = \{2,4,5,7,8\}$
   $B = \{3,5,8,9\}$

   What is $A \cup B$?

   A. $\{5\}$
   B. $\{5,8\}$
   C. $\{2,3,4,7,9\}$
   D. $\{2,3,4,5,7,8,9\}$

3. Which of the following is a member of $M \times N$?

   A. $(20,20)$
   B. $(30,30)$
   C. $(55,60)$
   D. $(30,60)$

4. Given: $A = \{1,3,5,7,9\}$
   $B = \{2,4,6,8,10\}$
   $C = \{2,3,5,7\}$
   $D = \{1,2,3,4,5,6,7,8,9,10\}$

   What statement is false?

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

5. Given: Set $A = \{(-2,-1),(-1,0),(1,8)\}$
   Set $B = \{(-3,-4),(-2,-1),(-1,2),(1,8)\}$.

   What is the intersection of *sets* A and B?

   A. $\{(1,8)\}$
   B. $\{(-2,-1)\}$
   C. $\{(-2,-1),(1,8)\}$
   D. $\{(-3,-4),(-2,-1),(-1,2),(-1,0),(1,8)\}$