

MATH 1342

Section 2.2

Sets and Venn Diagrams

A set is a collection of objects. Two sets are equal if they contain the same elements.

$$A = \{1, 2, 3, 4\} \quad B = \{1, 2, 3, 4, 5\}$$

Set A is a **subset** of set B if every element that is in set A is also in set B . The notation for this is $A \subseteq B$.

$$A \subseteq B$$

Set A is a **proper subset** of set B if every element that is in set A is also in set B and there is at least one element in set B that is not in set A . The notation for this is $A \subset B$.

(A and B are Not Equal)

Sets and Subsets

If Set A contains all dogs, and Set B contains all Golden Retrievers, then $B \subseteq A$.

When using subset notation, you cannot reverse the order (except if the sets are equal)

However, $A \subseteq B$ is not true.

An Example of Sets

To belong to Set A, you must be over the age of 25.

To belong to Set B, you must drive a blue car.

Think about which sets you would belong to.

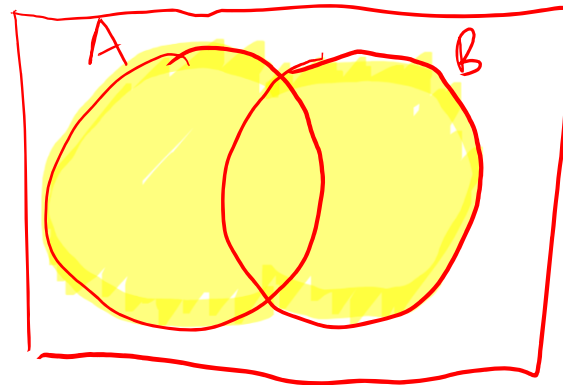
Set Union

"or"

$A \cup B$

The **union** of A and B , which is written as $A \cup B$, is the set of all elements that belong either to set A or to set B (or that belong to both A and B).

If you answered "yes" to either of the questions, you belong in the set union.



Set Intersection

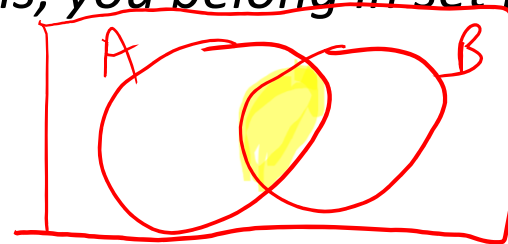
Must be in the overlap of sets A and B

"And"

The **intersection** of A and B , which is written as $A \cap B$, is the set of all elements that belong to both to set A and set B . If the intersection of two sets is empty (the empty set is denoted by \emptyset), then the sets are **disjoint** or **mutually exclusive** and we write $A \cap B = \emptyset$

$\{ \}$ } Disjoint or
 \emptyset } Mutually Exclusive (Nothing in Common)

If you answered, "yes" to both questions, you belong in set intersection.

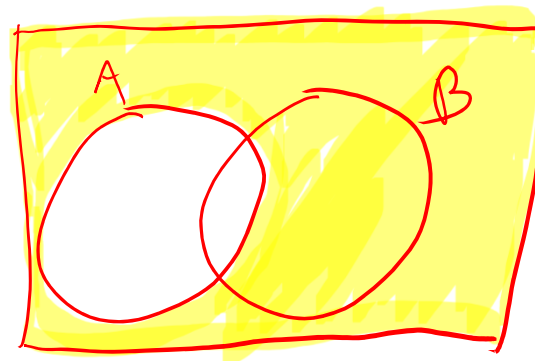


Set Compliment

"Not"

The **complement of set A** , which is written as A^c , is the set of all elements that are in the universal set but are not in set A .

If you answered "no" to question A, you belong in the set compliment.



Examples:

Use the following information to answer the questions:

universe

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

$$A = \{1, 2, 5, 6, 9, 10\}$$

$$B = \{3, 4, 7, 8\}$$

$$C = \{2, 3, 8, 9, 10\}$$

$$B \cup C = \{2, 3, 4, 7, 8, 9, 10\}$$

(B or C)

Find: $\rightarrow A^c = \{3, 4, 7, 8\}$ (Not in A)

$$A \cup C = \{1, 2, 3, 5, 6, 8, 9, 10\}$$
 (A or C)
$$A \cap B = \{\} \text{ or } \emptyset$$
 (A and B)
$$A^c \cap C = \{3, 8\}$$
 (Not in A and in C)
$$(B \cup C)^c = \{1, 5, 6\}$$
 (Not in B or C)
$$A \cap B \cap C = \{\}$$
 (All three)

Venn Diagrams

These are also known as “circle diagrams,” and they can be used to represent sets.

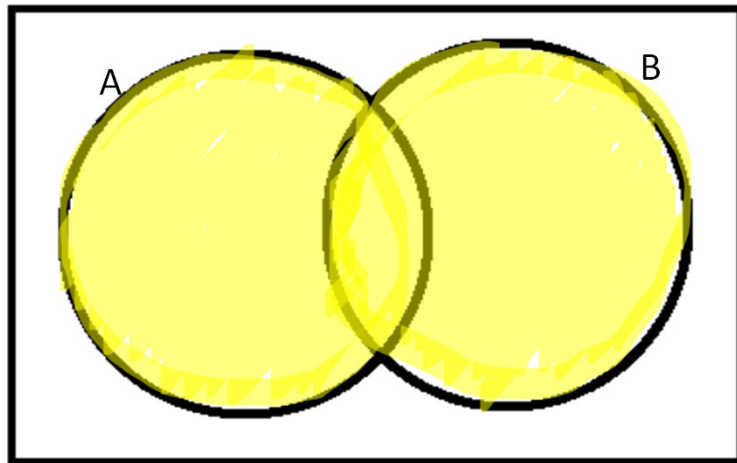
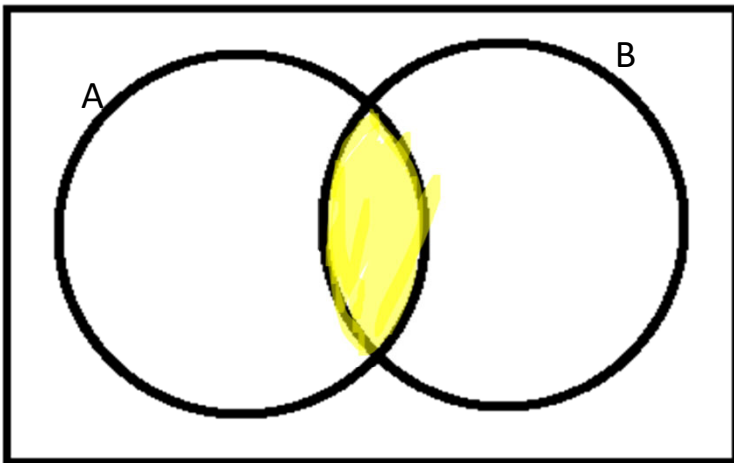
Shade in

and

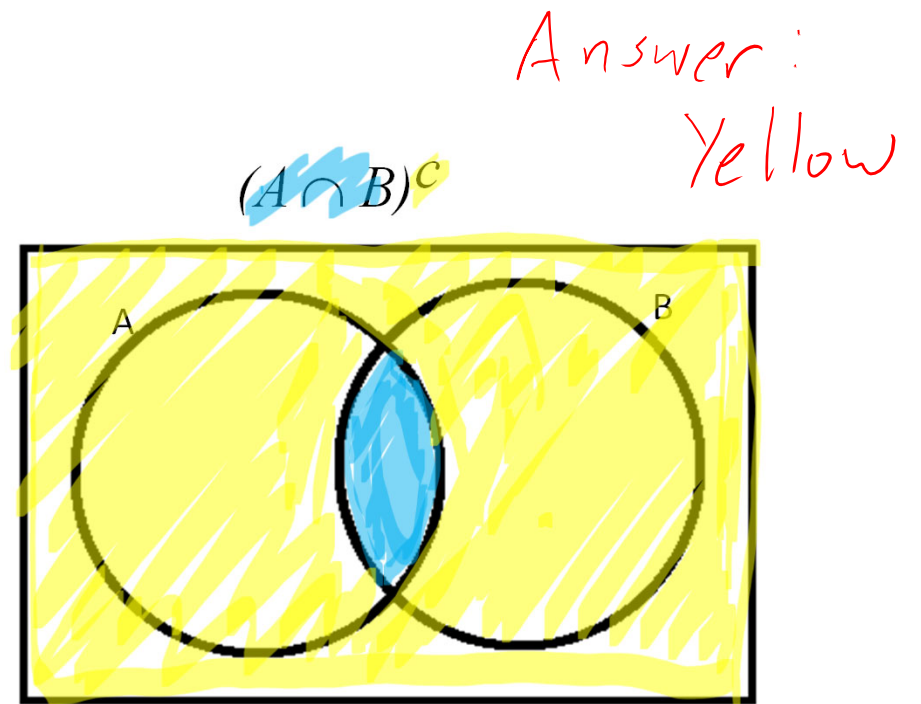
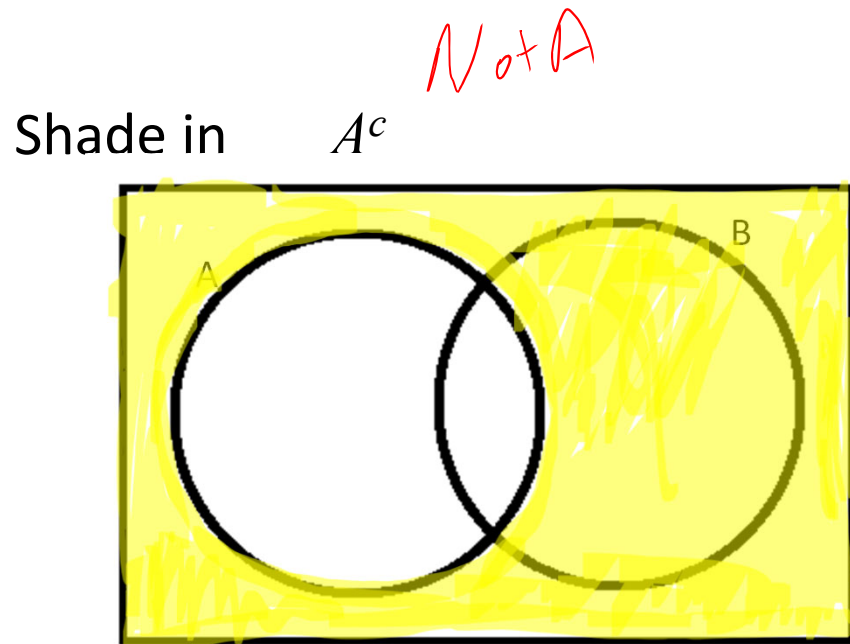
$$A \cap B$$

or

$$A \cup B$$



Venn Diagrams

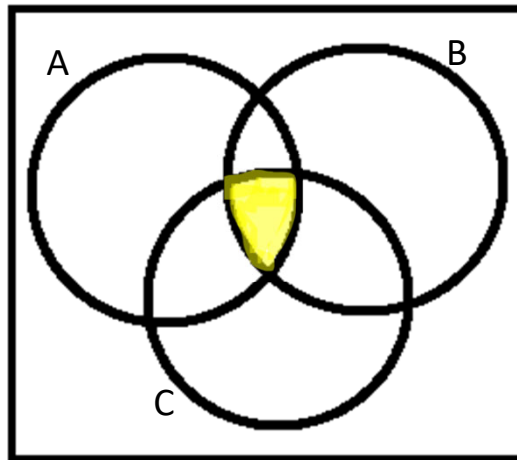


Venn Diagrams

A and B and C

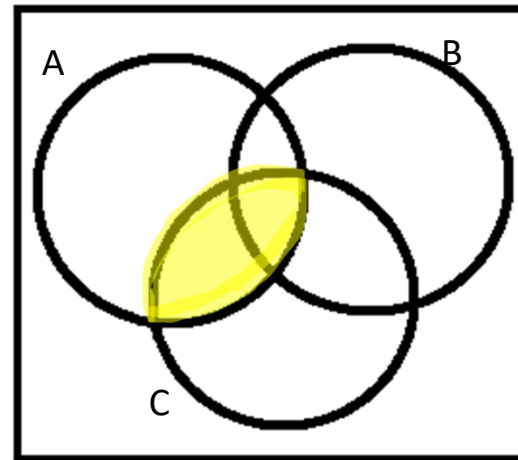
$A \cap B \cap C$

Shade in



A and C

$A \cap C$



Application

Popper 01: Question numbers are in the diagram

- a. 5 b. 10 c. 15 d. 20 e. 25

Draw a Venn Diagram for the following situation:

*Sum of circles: 80
(20 DUP)*

- Q1: A
Q2: C
Q3: D
Q4: D
Q5: D

A group of 100 people are asked about their preference for soft drinks.

The results are as follows:

55 Like Coke 25 Like Diet Coke
45 Like Pepsi

15 like Coke and Diet Coke 5 Like all 3
soft drinks

25 Like Coke and Pepsi 5 Only like
Diet Coke

