

MATH:1260 Pokémath

The Mathematics of Pokémon Go[®]

Week 2 Monday, Spring 24

Popular curve:

Bulbasaur-like curve



Plan for Today

- Syllabus Questions
 - Attendance Policy (Top Hat)
 - Check ICON for details!
- More about Sets

Class Reminders

- Textbook is fixed! Can you access Top Hat?
- GW2 in discussion Thursday
- HW1 is due Wednesday (at 11:59 PM)

■ Late Work Policy : up to 2 days late for -2 points, no submissions accepted after that.

Game Reminders

- My trainer code: 2961 3846 8580
- There's a place for you to share your codes on ICON!

Relationships Between Sets

Definition: Equality

Two sets, A and B , are **equal** if they have the same elements

Notation

$$A = B$$

Definition: Subsets

A is a **subset** of B , if all of the elements of A are elements of B .

Notation

$$A \subseteq B$$

↳ subset or equal to

Definition: Proper Subsets

A is a **proper subset** of B , if all of the elements of A are elements of B and there are elements of B that are not elements of A .

Notation

$$A \subset B$$

Some Special Sets

Definition: Empty Set

The **empty set** is the set with no elements

Notation

$$\emptyset = \{ \}$$













Definition: Universal Set

The **universal set** is the set of all objects of the type being discussed.

Notation

$$\mathcal{U}$$

Some Starter Pokémon: Visualizing Equal, Subset, and Proper Subset

 Chikorita Grass	 Cyndaquil Fire	 Totodile Water
 Treecko Grass	 Torchic Fire	 Mudkip Water
 Turtwig Grass	 Chimchar Fire	 Piplup Water
 Snivy Grass	 Tepig Fire	 Oshawott Water

$$B \subset F$$

$$B \subseteq F$$

$$F \neq G$$

$$G \subseteq G$$

Set Notation Mistakes to Avoid

$W = \{ \text{Pokemon} \}$ \rightarrow list notation

$X = \{ \text{Pokemon} \mid \}$ \rightarrow set builder notation

Let's say a question asked for a set containing all the Pokemon.

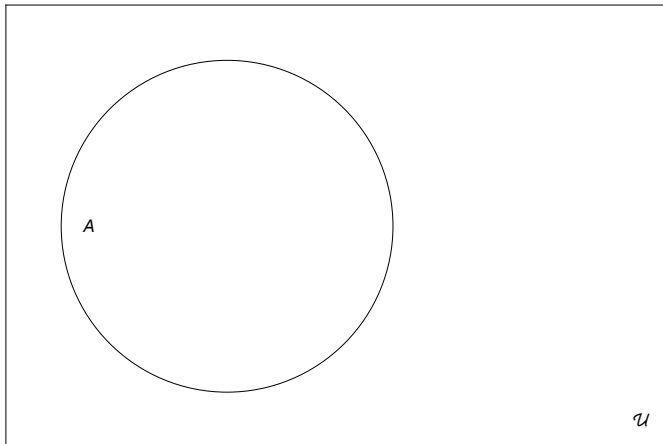
$\{X\}$ \rightarrow this is a set of sets

X \rightarrow this represents the set of all Pokemon as defined above.

Venn Diagrams

A diagram that shows the relationship between sets.

Typically the universal set is a large rectangle and sets within that universal set are circles.



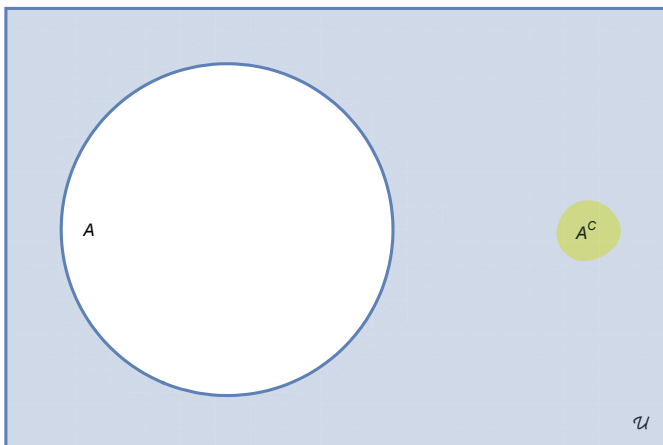
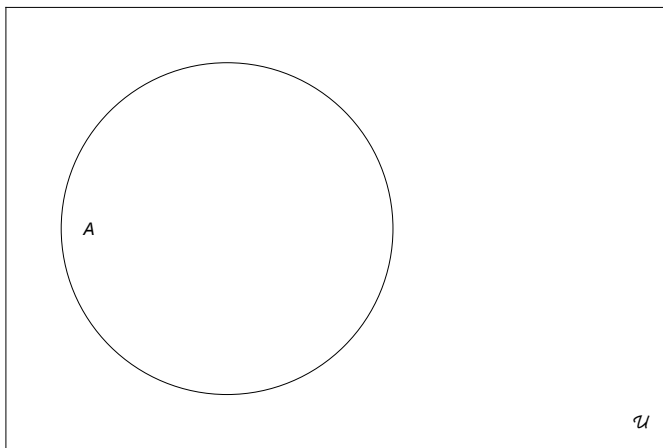
Complements

Definition

The **complement** of a set, A is the set of all elements of \mathcal{U} which are not elements of A .

Notation

A' or A^c



Some Starter Pokémon: Visualizing Complements

A

 Chikorita Grass	 Cyndaquil Fire	 Totodile Water
 Treecko Grass	 Torchic Fire	 Mudkip Water
 Turtwig Grass	 Chimchar Fire	 Piplup Water
 Snivy Grass	 Tepig Fire	 Oshawott Water

Write A^c in
list notation.

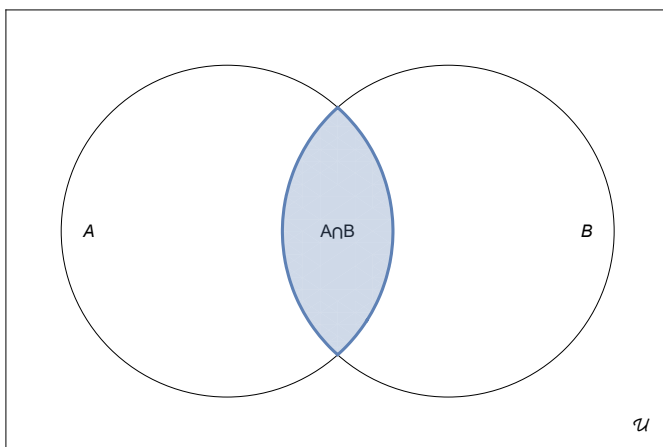
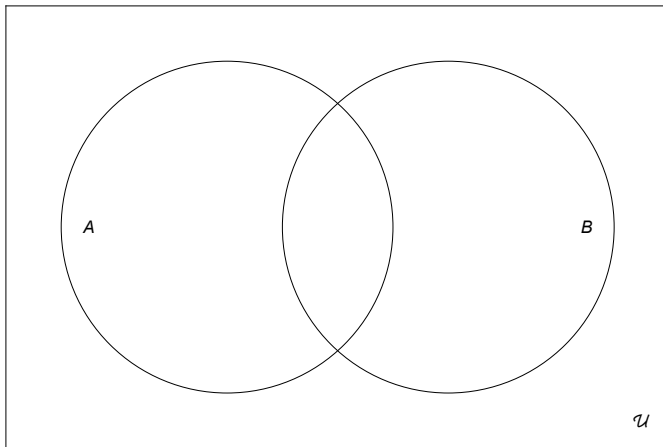
Intersections

Definition

The **intersection** of two sets, A and B , is the set of elements belonging to both.

Notation

$$A \cap B$$



Some Starter Pokémon: Visualizing Intersections



Write in list notation $W \cap M^c$
 $= \{\text{totodile, oshawott}\}$

$$W \cap M^c \neq (W \cap M)^c$$

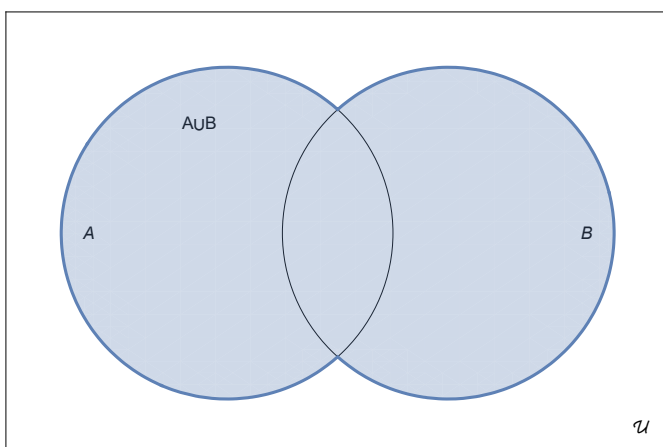
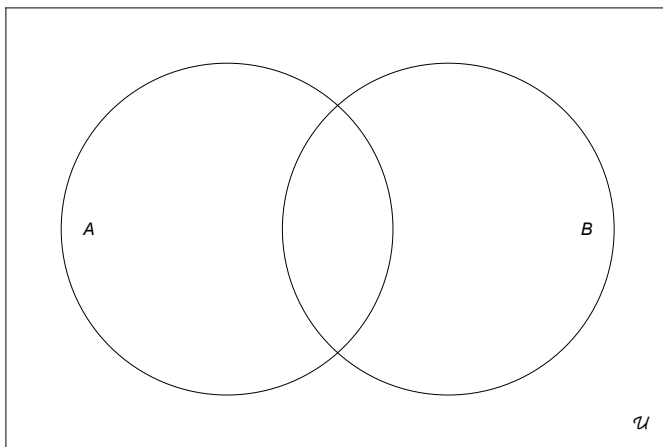
Unions

Definition

The **union** of two sets, A and B , is the set of elements belonging to set A or set B or both.

Notation

$A \cup B$



Some Starter Pokémon: Visualizing Unions

 Chikorita Grass	 Cyndaquil Fire	 Totodile Water
 Treecko Grass	 Torchic Fire	 Mudkip Water
 Turtwig Grass	 Chimchar Fire	 Piplup Water
 Snivy Grass	 Tepig Fire	 Oshawott Water

Disjoint Sets

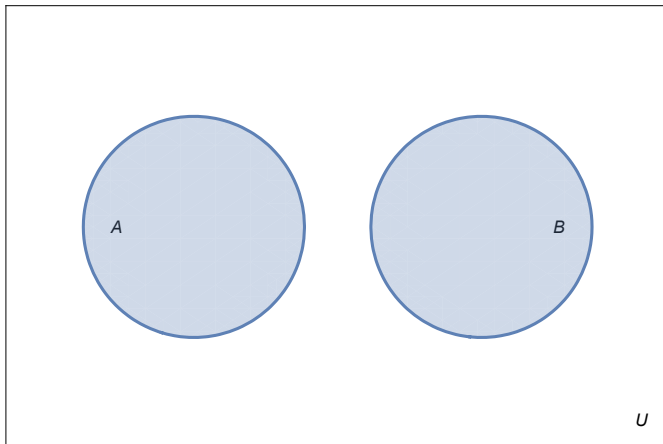
Definition

We say two sets, A and B , are **disjoint** if they have no common elements.

Notation

$$A \cap B = \emptyset$$

Venn Diagrams



Some Starter Pokémon: Visualizing Disjoint



Write in list notation












$$(W \cup T) \cap F$$

$$= \{\text{Oshawott}\}$$

$$T \cap F = \emptyset$$

$$W \cap W^c = \emptyset$$

Some Starter Pokémon: A More Complex Example

 Chikorita Grass	 Cyndaquil Fire	 Totodile Water
 Treecko Grass	 Torchic Fire	 Mudkip Water
 Turtwig Grass	 Chimchar Fire	 Piplup Water
 Snivy Grass	 Tepig Fire	 Oshawott Water

Where the rubber meets the road: Searching in your Pokemon Bag

Intersection: &

Example: Bulbasaur & Shiny

Union: ,

Example Bulbasaur, Shiny

Complement: !

Example Bulbasaur & !Shiny

<https://niantic.helpshift.com/hc/en/6-pokemon-go/faq/1486-searching-filtering-your-pokemon-inventory/>

Top Hat Test!

Counting

Definition

The **size** of a set is the number of elements in the set.

Notation

$n(A)$

Example

$\mathcal{U} = \{\text{Students at Iowa} \mid \text{Enrolled in Pokemath}\}$

$B = \{\mathcal{U} \mid \text{Members of Blue Team}\}$

$D = \{\mathcal{U} \mid \text{Caught a Shiny Pokemon Yesterday}\}$