Combonaitorics

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1 Sets

A set is a collection of unordered distinct elements($\in$). An element can be anything from the number 1, to the baby name Sophia.

When writing a set, the set is given a constant so that one mustn't write the long set repetitively. There are two ways of writing a set. The first is set notation, set notation is when the distinct elements are laid out inside curly braces.

Examples

$S = \{red, yelloe, blue\}$

$T = \{conics, linearequations, combonatorics, quadraticequations\}$

$F = \{4969, 4973, 4987, 4993, 4999, 5003, \}$

Instead of showing every distinct element the second way of defining a set lays out the one or more rules that all of the elements must follow. Below are examples of this,

S is the set consisting of the primary colors

T is the set consisting of 9th grade math blocks at Denver Waldorf School.

1.1 Subsets

If every element in a given set A is also in given set B then set A is a subset of set B written A ⊆ B. If Set A has the same exact elements as set B then they are equivalent.

Examples

$A = \{8, 13, 42\}$

$B = \{4, 8, 9, 13, 33, 42, 89\}$

Due to the fact that all of the elements in set A are also in Set B, $A \subseteq B$

A is the set that includes the colors in the American flag

$B = \{red, white, blue\}$

Because set A and set B both include the same elements A = B. Because they are equal A ⊆ B and B ⊆ A.

$A = \{15, 18, 37\}$

$B = \{15, 18, 89\}$

At first glance it appears as though set A is a subset of set B, however set B dose not include the element 37. This means A ⊈ B.

1.2 Universal Set

The universal set (U) is the set that encompasses every element that is relevant to the topic at hand. Unless further Defined the universal set includes every single element in the universe. U is defined the same way a traditional set.

Examples

U = Every piece of chalk in the United States of America.

U = All of the websites on the world wide web.

All sets are subsets of their respective universal set.

Examples

A = All of the chalk in California $\subseteq$ U = Every piece of chalk in the United States of America

A= { WWW.CNN.com, WWW.Google.com, WWW.Mathis-fun.com} $\subseteq$ U = All of the websites on the world wide web.

1.3 Union

Operations can be applied to sets to create new sets. Two or more sets can be unioned together. Unioning sets together combines all of their distinct elements into a new set. This set consists of all of the elements in each of the sets, but will not repeat any common elements.

Examples

A = {6,42,69}.

B = { 3,41,1738}

$A \cup B$ = {3,6,41,42,69,1738}

When we union the sets A and B we make a new set $A \cup B$. This set consists of all of the distinct elements in set A and B.

A= The set consisting off the primary colors.

B = { Gold,Red,Purple, Teal}

$A \cup B$ = {Red, Yellow, Blue, Gold,Purple, Teal}

When we union the sets A and B we make a new set $A \cup B$. This set consists of all of the distinct element in set A and B. Due to the fact that ”Red” is a primary color, it is an element of set A. It is also a element of set B. even though it is an element of both set A and set B, ”Red”only appears in $A \cup B$ once. This is because when sets are unioned common elements are only listed once, no matter how many times they appear in the sets.

1.4 Intersection

Two or more sets can be intersected to create a new set. This new set is made up of all the elements that belong to each of the original sets. The intrsection of two sets A, B is writen $A \cap B$ If the sets do not share any common elemments there intersection is an empty set writen {}

Examples

A = {126,383,12}.

B = { 113,132,12}

$A \cap B = \{12\}$

The only element shared between sets A and B was 12, thus A interesect B is 12.

A is the set consiting of Beef, Chicken, Turkey, and Lobster.

B = { Oysters, Pork, Lobster ,Lamb, Beef, }

C = { Pork, Turkey}

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

Many elemnts are shared between two of the sets, for example beef is shared between set A and B but not C. Howenver no element is in all A, B, C.

1.5 Complement

The compliment of a set is all the things not in the set. The compliment of a set A is written $\widetilde{A}$. The comliment of a set is also the same thing as the elements in the universal set minus the elemnts in the set. This means that $A \cup \widetilde{A} = U$ and that $A \cap \widetilde{A} = \{\}$

A = {13,14,18}.

U = {10,11,12,13,14,15,16,17,18,19,20}

$\widetilde{A}$ = {10,11,12,15,16,17,19,20}

The compliment of set A is everything that is not in set A that is in the universal set. In this case that is all of the whole numbers between 10 and 20 exept 13, 14, and 18.

Examples

A = {adittion, subtraction}

U = {adition, subtraction, multiplication, division.

$\widetilde{A}$ = {multiplication, division}

In this case the universal set is the 4 base math operations, we then take away the elemnts in set A and are left with the compliment of A which is multiplcation and division.

1.6 Ven Diagrams

Text here...

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B = { 3,41,1738}

$A \cup B$ = {3,6,41,42,69,1738}

Text...

Examples

A= The set consisting off the primary colors.

B = { Gold,Red,Purple, Teal}

$A \cup B$ = {Red, Yellow, Blue, Gold,Purple, Teal}

Text....

2 Addition Principle of Counting

Text here...

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B = { 3,41,1738}

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Text...

Examples

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Text....