Discrete Structures.

Assignment: 2nd

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QUESTION. 1:

What is Venn diagram? Explain in detail the Application of Venn diagram.

ANSWER:

A Venn diagram is an illustration that uses circles to show the relationships among things or finite groups of things. Circles that overlap have a commonality while circles that do not overlap do not share those traits.

Venn diagrams help to visually represent the similarities and differences between two concepts. They have long been recognized for their usefulness as educational tools. Since the mid-20th century, Venn diagrams have been used as part of the introductory logic curriculum and in elementary-level educational plans around the world.

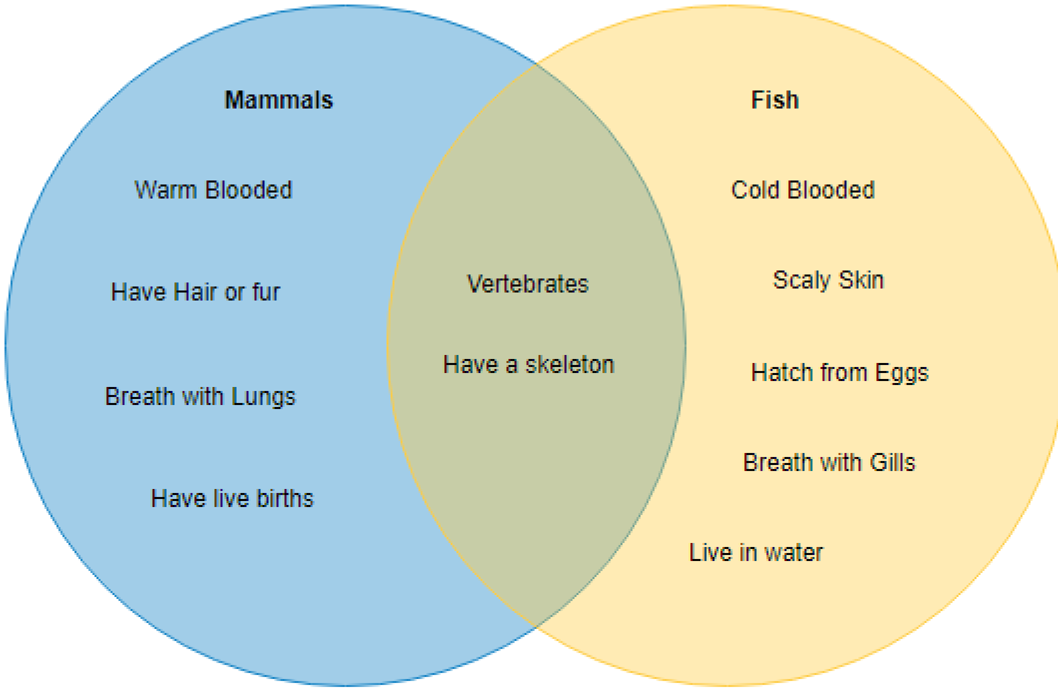
A Venn diagram uses circles that overlap or don't overlap to show the commonalities and differences among things or groups of things.
Things that have commonalities are shown as overlapping circles while things that are distinct stand alone.

APPLICATIONS OF VENN DIAGRAM:

Venn diagrams are used to depict how items relate to each other against an overall backdrop, universe, data set, or environment. A Venn diagram could be used, for example, to compare two companies within the same industry by illustrating the products both companies offer (where circles overlap) and the products that are exclusive to each company (outer circles).

Venn diagrams are, at a basic level, simple pictorial representations of the relationship that exists between two sets of things. However, they can be much more complex. Still, the streamlined purpose of the Venn diagram to illustrate concepts and groups has led to their popularized use in many fields, including statistics, linguistics, logic, education, computer science, and business.

EXAMPLE:



The example above shows the similarities and dissimilarities between mammals and fish. The overlapping part of both the circles represents the traits shared by both mammals and fish, and the rest of the circle shows the uncommon traits among mammals and fish.

QUESTION. 2:

What is Union? Draw Membership table for union using different examples.

ANSWER:

Union of two given sets is the smallest set which contains all the elements of both the sets that are being compared.

To find the union of two given sets A and B is a set which consists of all the elements of A and all the elements of B such that no element is repeated.

The symbol for denoting union of sets is '∪'.

For example:

Let set A = {2, 4, 5, 6}
and set B = {4, 6, 7, 8}

Taking every element of both the sets A and B, without repeating any element, we get a new set = {2, 4, 5, 6, 7, 8}

This new set contains all the elements of set A and all the elements of set B with no repetition of elements and is named as **union of set A and B**.

The symbol used for the union of two sets is 'u'.

Therefore, symbolically, we write union of the two sets A and B is $A \cup B$ which means A union B.

Therefore, $A \cup B = \{x : x \in A \text{ or } x \in B\}$

MEMBERSHIP TABLE:

A membership table is similar to truth table (in propositional logic). A membership table has;

– Columns for different set expressions
– Rows for all combinations of memberships in constituent sets
– "1" = membership , "0" =non-membership
– Two sets are equal, if and only if they have identical columns

- **MEMBERSHIP TABLE OF COMMUTATIVE LAW (AuB = BuA):**

Set Membership Table 1:

A	B	A ∪ B
0	0	0
0	1	1
1	0	1
1	1	1

Set Membership Table 2:

A	B	B ∪ A
0	0	0
0	1	1
1	0	1
1	1	1

- **MEMBERSHIP TABLE OF ASSOCIATIVE LAW ([A∪B]∪C = A∪[B∪C]):**

Set Membership Table 1:

A	B	C	A ∪ B	(A ∪ B) ∪ C
0	0	0	0	0
0	0	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Set Membership Table 2:

A	B	C	B ∪ C	A ∪ (B ∪ C)
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	0	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

QUESTION. 3:

What is Intersection? Draw Membership table for intersection using different examples.

ANSWER:

Intersection of two given sets is the largest set which contains all the elements that are common to both the sets.

To find the intersection of two given sets A and B is a set which consists of all the elements which are common to both A and B.

The symbol for denoting intersection of sets is '∩'.

For example:

Let set A = {2, 3, 4, 5, 6}

and set B = {3, 5, 7, 9}

In this two sets, the elements 3 and 5 are common. The set containing these common elements i.e {3, 5} is the intersection of set A and B.

The symbol used for the intersection of two sets is '∩'.

Therefore, symbolically, we write intersection of the two sets A and B is A ∩ B which means A intersection B.

The intersection of two sets A and B is represented as $A \cap B = \{x : x \in A \text{ and } x \in B\}$

- **MEMBERSHIP TABLE FOR INTERSECTION COMMUTATIVE LAW:**

Set Membership Table 1

A	B	A ∩ B
0	0	0
0	1	0
1	0	0
1	1	1

Set Membership Table 2

A	B	B ∩ A
0	0	0
0	1	0
1	0	0
1	1	1

- ## MEMBERSHIP TABLE FOR INTERSECTION ASSOCIATIVE LAW:

Set Membership Table 1:

A	B	C	A ∩ B	(A ∩ B) ∩ C
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	0
1	0	1	0	0
1	1	0	1	0
1	1	1	1	1

Set Membership Table 2:

A	B	C	B ∩ C	A ∩ (B ∩ C)
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

QUESTION. 4:

What is Difference? Draw Membership table for Set difference using different examples.

ANSWER:

The difference of set *B* from set *A,* denoted by *A-B,* is the set of all the elements of set *A* that are not in set *B*. In mathematical term:

$$A\text{-}B = \{ x: x \in A \text{ and } x \notin B\}$$

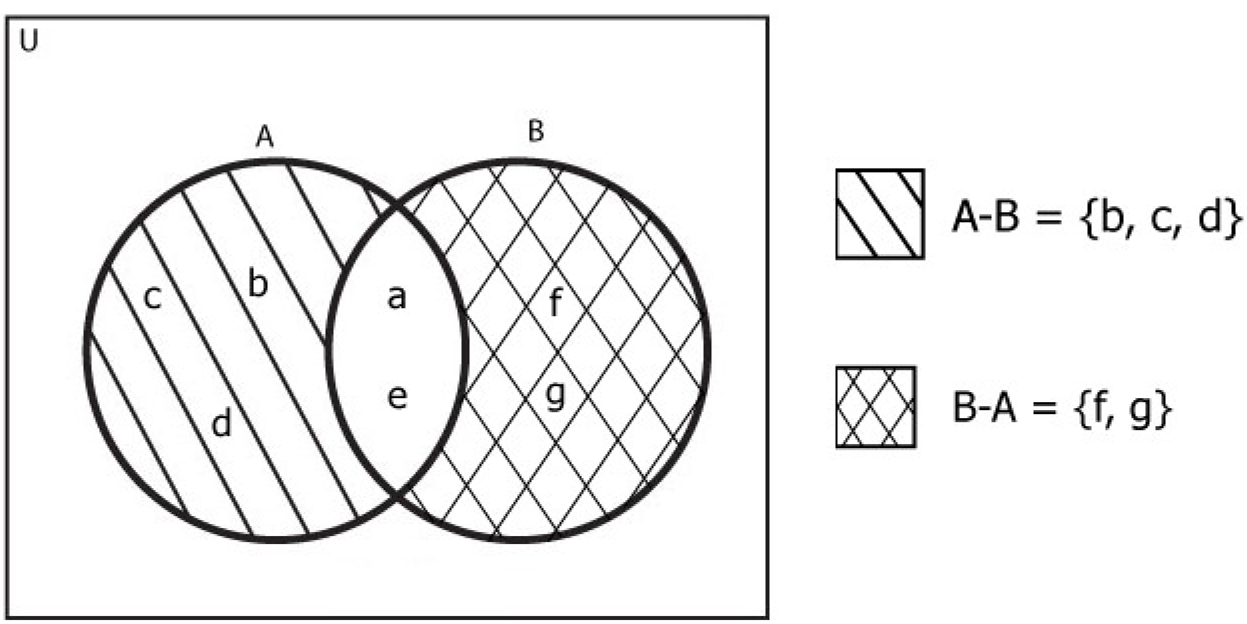
Example:

If A = { a, b, c, d, e } and B = { a, e, f, g}, find A-B and B-A.

The elements in **only A** are **b, c, d** and elements in **only B** are **f, g**. Thus,

A-B = {b, c, d}

and B-A = {f, g}



It is to be noted that A-B may be not equal to B-A.

MEMBERSHIP TABLE FOR DIFFERENCE OF TWO SETS:

A	B	A - B
0	0	0
0	1	0
1	0	1
1	1	0

MEMBERSHIP TABLE FOR SET DIFFERENCE LAW:

Set Membership Table 1:

A	B	A - B
0	0	0
0	1	0
1	0	1
1	1	0

Set Membership Table 2:

A	B	B^C	$A \cap B^C$
0	0	1	0
0	1	0	0
1	0	1	1
1	1	0	0

Where B^C is the complementary set of B.