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CISP - 440

Assignment 3

10/4/2018

Part 0 - Set Operations.

Description:

The goal for this assignment was to perform a multitude of problems related to sets. In these problems we were to practice our skills in set operations and perform the operation on the given sets.

Note: For problems 6-12 the following sets are used.

Universe = U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
A = {1, 4, 7, 10};
B = {1, 2, 3, 4, 5};
C = {2, 4, 6, 8};

Problem 6: U - C

Difference between the Universe and set C.

When this operation is performed the following set is created.

Answer = {1, 3, 5, 7, 9, 10};

Problem 12: A ∩ (B ∪ C)

B union C intersection with A.

When the union operation is performed on B and C the following set is created.

Set BC = {1, 2, 3, 4, 5, 6, 8};

When the intersection operation is performed on set A and BC the following set is created.

Answer = {1, 4};

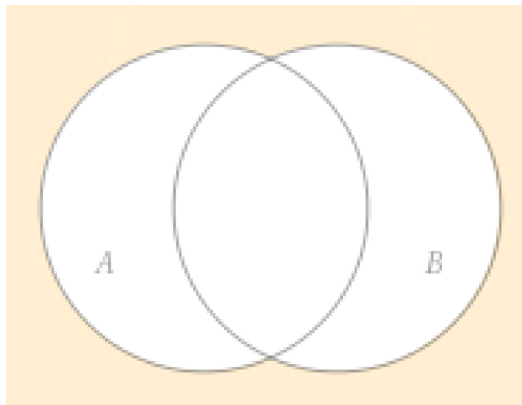
Problem 18:

Draw a Venn diagram and shade the given set for $\bar{A}$ - B.

A's complement would create the following set.
$\bar{A}$ = {2, 3, 5, 6, 8, 9};

If you take the difference of Ā and B you would create the following set.
Answer = {6, 8, 9};

This would create the following Venn Diagram. (colored section is the universe)



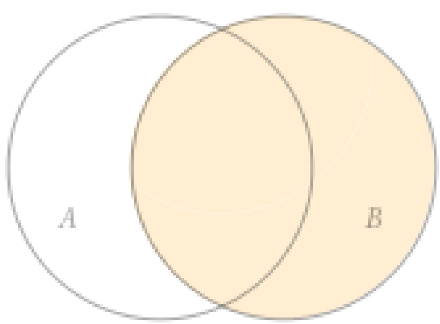
Problem 19:

Draw a Venn diagram and shade the given set for B ∪ (B - A).

B difference A would create the following set.
B - A = {2, 3, 5};

B union with set B - A would create the following set.
Answer = {1, 2, 3, 4, 5};

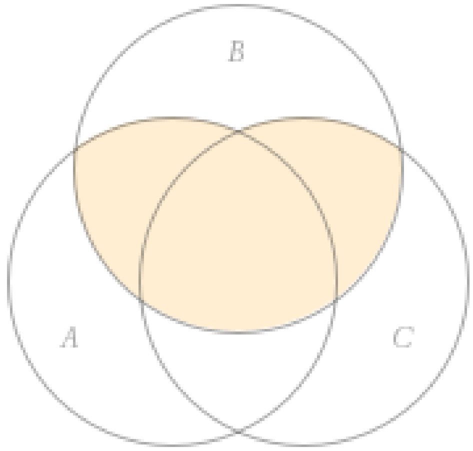
This would create the following Venn Diagram.



Problem 24:

Draw a Venn diagram and shade the given set for (B - C’) ∪ (B - A’) ∩ (C ∪ B).

This operation would create the following Venn Diagram.



Problem 30:

A television poll of 151 person found that 68 watched “M*E*S*S”; 61 watched “Leave It to Seaver”; 52 watched “The Yuppie Hour”; 16 watched both “M*E*S*S” and “Leave it to Seaver”; 25 watched both “M*E*S*S” and “The Yuppie Hour”; 19 watched both “Leave it to Seaver” and “The Yuppie Hour”; and 26 watched none of these shows. How many person watched all three shows?

Let set A = all the people that watched “M*E*S*S”
Let set B = all the people that watched “Leave it to Seaver”
Let set C = all the people that watched “The Yuppie Hour”

Thus:
$|A| = 68$
$|B| = 61$
$|C| = 52$

Since 16 watched both “M*E*S*S” and “Leave it to Seaver” $|A \cap B| = 16$
Since 25 watched both “M*E*S*S” and “The Yuppie Hour” $|A \cap C| = 25$
Since 19 watched both “The Yuppie Hour” and “Leave it to Seaver” $|B \cap C| = 19$

Thus:
$|A - B| = 52$
$|B - C| = 42$
$|C - A| = 27$

If we add all of these together we will get the number of people who watched minus the number who watched all three.

$|(A - B) \cup (B - C) \cup (C - A)| = 121$

The total who watched were 151 minus the 26 who didn't watch anything. So the answer can be found by this following equation.

(151 - 26) - 121 = The number of people who watched all three.

Thus the answer is:

4 people watched all three shows

Problem 40:

List all partitions of the set {1, 2}.

There is one possible partition from this set:

P1 = {{1}, {2}};

Problem 48:

Determine whether each pair of sets is equal. {1, 2, 2, 3} and {1, 2, 3}

Since repeat numbers don't affect the outcome of this operation the sets are…

Equal

Problem 49:

Determine whether each pair of sets is equal. {1, 1, 3} and {3, 3, 1}

Since repeat numbers and the order don't affect the outcome of this operation the sets are…

Equal

Problem 53:

List the members of $\mathscr{P}$({a, b, c ,d}). Which are proper subsets of {a, b, c, d};

The proper subsets are as follows:

Ø

{a}

{b}

{c}

{d}

{a, b}

{a, c}

{a, d}

{b, c}

{b, d}

{c, d}

{a, b, c}

{a, b, d}

{a, c, d}

{b, c, d}

Problem 54:

If X has 10 members. How many members does $\mathscr{P}$(X) have? How many proper subsets does X have?

The answer can be found by raising the 2 to the power of the cardinality of the set.

Thus the answer are:

$\mathscr{P}$(X) has 2^10 members which equals 1024
1024 - 1 equals the number of proper subsets

Problem 58:

Show whether the following statement is true or false. If false give a counterexample.

Statement: $X \cap (Y - Z) = (X \cap Y) - (X \cap Z)$

If we treat X∩ as an operand we can prove this statement with algebra.

$X \cap (Y - Z) = (X\cap) (Y) - (X\cap) (Z) = (X \cap Y) - (X \cap Z)$ ✓

Thus the statement is:

True

Problem 72:

What relation must hold between sets A and B for the following to be true.

$A \cup B = A$

For this statement to remain true all elements of B must already be contained in A.

Problem 73:

What relation must hold between sets A and B for the following to be true.

$\bar{A} \cap \text{Universe} = \emptyset$

For this statement to remain true all elements of A must not exist in the universe. That means that A must equal the universe.

Conclusion

This assignment was relaxing. It was nice to work on a subject that wasn't hard to grasp. I am looking forward to the implementation of this concept.