

1.2 - Set Theory Con't

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Now that we have some experience dealing with set theory and its notation, we can build on what we've learned from the last unit.

Let's use the sets from the last example to discuss today's new ideas:

$$E = \{0, 2, 4, 6, 8\}$$

$$L = \{0, 1, 2, 3, 4, 5, 6\}$$

$$O = \{1, 3, 5\}$$

What we're going to be doing is creating new sets from two or more already existing sets.

Our first new set is the intersection of sets. The intersection of two or more sets creates a new set which contains elements that are members of all intersecting sets.

If we use a 2-set example with sets A and B , it would be denoted as " $A \cap B$ " and be read as "A intersect B," or "A and B."

Write the intersection of sets E and L and list its elements using appropriate terminology:

$$E \cap L = \{0, 2, 4, 6\}$$

The next new set is the union of sets. The union of two or more sets creates a new set which contains elements that are members of any set being united (inclusive use of the word "or").

If we use a 2-set example with sets A and B , it would be denoted as " $A \cup B$ " and be read as "A union B," or, "A or B," (again, inclusive use of the word "or").

Use appropriate set notation to write the union of set E and set L with its elements. Note: do not write the same element more than once:

$$E \cup L = \{0, 1, 2, 3, 4, 5, 6, 8\}$$

The last special set is the disjoint of sets. The disjoint of two or more sets have no elements in common whatsoever. ie, the intersection of two disjoint sets is the empty set (because they have no common elements).

Create two sets which contain 3 single digit elements that are disjoint:

$$A = \{0, 1, 2\}$$

$$B = \{3, 4, 5\}$$

Which two sets from set E , L , and O are disjoint?

E and O , because they have no common elements.

Example

Consider the following sets where the universal set $U = \{\text{natural numbers} < 20\}$

$$A = \{\text{Natural numbers less than 20 that are divisible by 3}\} = \{3, 6, 9, 12, 15, 18\}$$

$$B = \{\text{Natural numbers less than 20 that are divisible by 5}\} = \{5, 10, 15\}$$

$$C = \{\text{Natural numbers less than 20 that are multiples of 6}\} = \{6, 12, 18\}$$

List the elements of the following sets:

$$A \cap B = \{15\}$$

$$A \cup B = \{3, 5, 6, 9, 10, 12, 15, 18\}$$

$$A' \cap B = \{5, 10\}$$

$$A' = \{1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19\}$$

Write a set equivalent to:

$$B \cap C = \emptyset$$

(empty set)

$$A \cup C = A$$

(Because $C \subseteq A$)

$$A \cap C = C$$

(Because $C \subseteq A$)

If $D = \{2, 4, 6, 8, 10, 12, 14, 16, 18\}$, list the elements of the following sets:

$$A \cap \underline{(B \cup D)} \rightarrow \{2, 4, 5, 6, 8, 10, 12, 14, 15, 16, 18\} \quad \underline{(A \cap B)} \cup D$$

$$= \{6, 12, 15, 18\} \quad = \{2, 4, 6, 8, 10, 12, 14, 15, 16, 18\}$$

$$(A' \cap B)'$$

$$= \{3, 5, 6, 9, 10, 12, 15, 18\}$$