Introduction to Logical Reasoning

Workshop on Basic Set Theory

Part I: Consider the following sets:

$\mathcal{U}_1 = \{x \mid x \text{ is a fruit}\}$,

$\mathcal{U}_2 = \{\text{apple, orange, guava, watermelon, kiwi, banana}\}$,

$A = \{\text{apple, orange}\}$,

$B = \{\text{apple, mango, watermelon}\}$,

$C = \{\text{apple, apple, orange, apple}\}$,

$D = \{\text{mango, watermelon}\}$, and

$E = \{x \mid x \text{ is a fruit you had for breakfast this morning}\}$.

Do each of the following problems.

1. Is watermelon $\in A$?

2. Is watermelon $\in B$?

3. How many subsets does A have? Name them all, labeling them $A1$, $A2$, etc.

4. How many proper subsets does A have? Name them all, feeling free to refer to those sets already labeled from problem 3.

5. Is $A \subseteq B$?

6. Is $A \subseteq \mathcal{U}_2$?

7. Is $B \subseteq \mathcal{U}_2$?

8. Is $A \subset C$?

9. Is $A = B$?

10. Is $A = C$?

11. Is $\mathcal{U}_1 \subseteq \mathcal{U}_2$?

12. Is $E \subseteq \mathcal{U}_2$?

13. Specify the intersection of A and B:

    $A \cap B = \{$

14. Specify the union of A and B:

    $A \cup B = \{$

15. Specify the intersection of A and D:

    $A \cap D = \{$

16. Specify the union of A and D:

    $A \cup D = \{$

17. Are A and B disjoint sets?

18. Are A and D disjoint sets?

19. Let $\mathcal{U}_1$ be the universal set for E, specify $\overline{E}$ by the rule method:

    $\overline{E} = \{$

20. Let $\mathcal{U}_2$ be the universal set for A, specify $\overline{A}$ by the roster method:

    $\overline{A} = \{$

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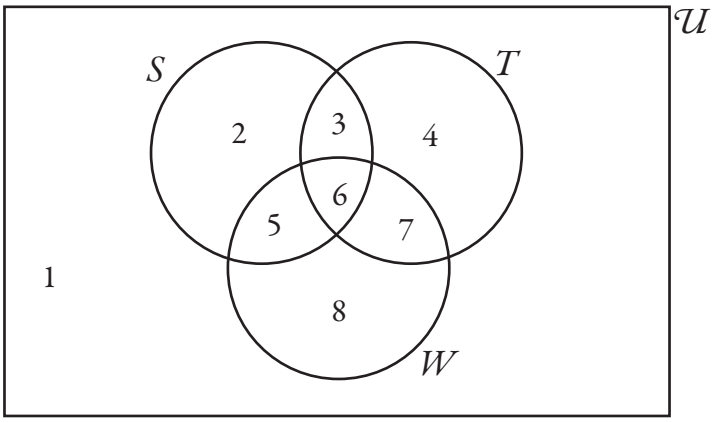
Part II: Consider the following Venn Diagram of sets *S*, *T*, and *W*.



Specify the set denoted by each numbered area, *only* using the operations of set intersection and set-complement on sets *S*, *T*, and *W*. (To help you get started, the first one has been done for you.)

1. $(\overline{S} \cap \overline{T}) \cap \overline{W}$.

2.

3.

4.

5.

6.

7.

8.