Section 3.1 Sets
Math 141

Main ideas

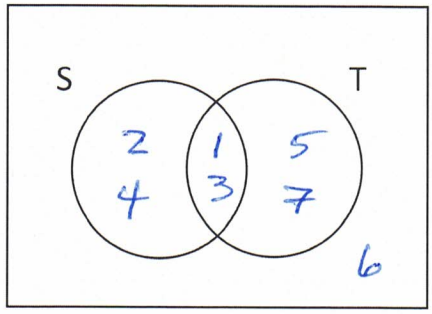
Set	{ }	Universal set	U
Union	∪	Empty set	∅
Intersection	∩	Element of	∈
Complement	′	Subset	⊆

Observations (made from Problem 1):

→ $(S')' = S$
→ $S \cup S' = U$
→ $S \cap S' = \phi$
→ $(S \cap T)' = S' \cup T'$
→ $(S \cup T)' = S' \cap T'$
→ $S \cap T \subseteq S \subseteq S \cup T$
or T

Problems

1. Let U = { 1, 2, 3, 4, 5, 6, 7 }, S = { 1, 2, 3, 4 }, and T = { 1, 3, 5, 7 }.



a. S′ = $\{5, 6, 7\}$
b. T′ = $\{2, 4, 6\}$
c. S ∪ T = $\{1, 2, 3, 4, 5, 7\}$
d. (S ∪ T)′ = $\{6\}$
e. S ∩ T = $\{1, 3\}$
f. (S ∩ T)′ = $\{1, 3\}' = \{2, 4, 5, 6, 7\}$
g. S′ ∪ T′ = $\{5, 6, 7\} \cup \{2, 4, 6\} = \{2, 4, 5, 6, 7\}$
h. S′ ∩ T′ = $\{5, 6, 7\} \cap \{2, 4, 6\} = \{6\}$
i. (S′)′ = $\{5, 6, 7\}' = \{1, 2, 3, 4\} = S$
j. S ∩ T′ = $\{1, 2, 3, 4\} \cap \{2, 4, 6\} = \{2, 4\}$
k. S ∪ S′ = $\{1, 2, 3, 4\} \cup \{5, 6, 7\} = \{1, 2, 3, 4, 5, 6, 7\}$
l. S ∩ S′ = $\{1, 2, 3, 4\} \cap \{5, 6, 7\} = \{\} = \phi$

2. True or false:

$\{3, 5\} \subseteq \{3, 5, 7\}$ T

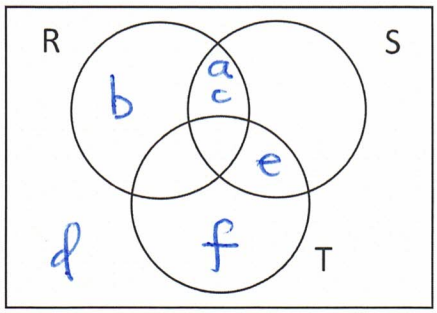
$\{5\} \subseteq \{3, 5, 7\}$ T

$5 \in \{3, 5, 7\}$ T

$0 \in \emptyset$ F

$\{b, c\} \subseteq \{b, c\}$ T

3. Let $U = \{ a, b, c, d, e, f \}$, $R = \{ a, b, c \}$, $S = \{ a, c, e \}$, and $T = \{ e, f \}$.



a. $R \cup S \cup T =$ $\{a, b, c, e, f\}$

b. $(R \cup S \cup T)' =$ $\{d\}$

c. $R' =$ $\{d, e, f\}$

d. $S' =$ $\{b, d, f\}$

e. $T' =$ $\{a, b, c, d\}$

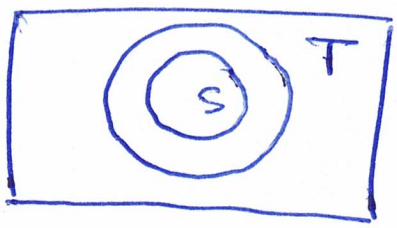
f. $R' \cap S' \cap T' =$ $\{d\}$ which $= (R \cup S \cup T)'$

g. $R \cup (S \cap T) =$ $\{a, b, c\} \cup \{e\} = \{a, b, c, e\}$

h. $(R \cup S) \cap T =$ $\{a, b, c, e\} \cap \{e, f\} = \{e\}$

4. Under what circumstances will $S \cap T = S$?

$S \subset T$



Under what circumstances will $S \cup T = S$?

$T \subset S$