

Ling 320. Assignment 2. Solution. 20 Sept 2007.

1. Given the following sets:

$$\begin{aligned} A &= \{a, b, c, 2, 3, 4\} & E &= \{a, b, \{c\}\} \\ B &= \{a, b\} & F &= \emptyset \\ C &= \{c, 2\} & G &= \{\{a, b\}, \{c, 2\}\} \\ D &= \{b, c\} \end{aligned}$$

classify each of the following statements as true or false.

(a) $c \in A$	T	(g) $D \subset A$	T	(m) $B \subseteq G$	F
(b) $c \in F$	F	(h) $A \subseteq C$	F	(n) $\{B\} \subseteq G$	T
(c) $c \in E$	F	(i) $D \subseteq E$	F	(o) $D \subseteq G$	F
(d) $\{c\} \in E$	T	(j) $F \subseteq A$	T	(p) $\{D\} \subseteq G$	F
(e) $\{c\} \in C$	F	(k) $E \subseteq F$	F	(q) $G \subseteq A$	F
(f) $B \subseteq A$	T	(l) $B \in G$	T	(r) $\{\{c\}\} \subseteq E$	T

2. For any arbitrary set S ,

- (a) is S a member of $\{S\}$? Yes.
- (b) is $\{S\}$ a member of $\{S\}$? No.
- (c) is $\{S\}$ a subset of $\{S\}$? Yes.
- (d) what is the set whose only member is $\{S\}$? $\{\{S\}\}$

4. Consider the following sets:

$S1 = \{\{\emptyset\}, \{A\}, A\}$	$S6 = \emptyset$
$S2 = A$	$S7 = \{\emptyset\}$
$S3 = \{A\}$	$S8 = \{\{\emptyset\}\}$
$S4 = \{\{A\}\}$	$S9 = \{\emptyset, \{\emptyset\}\}$
$S5 = \{\{A\}, A\}$	

- (a) Of the sets $S1 - S9$, which are members of $S1$? $S2, S3, S7$
- (b) which are subsets of $S1$? $S3, S4, S5, S6, S8$
- (c) which are members of $S9$? $S6, S7$
- (d) which are subsets of $S9$? $S6, S7, S8, S9$
- (e) which are members of $S4$? $S3$

[Exercise 4 wasn't assigned, but we went over it in class so it is included here.]

6. Given the sets A, \dots, G as in Exercise 1, list the members of each of the following:

(a) $B \cup C = \{a, b, c, 2\}$	(g) $A \cap E = \{a, b\}$	(m) $B - A = \emptyset$
(b) $A \cup B = \{a, b, c, 2, 3, 4\}$	(h) $C \cap D = \{c\}$	(n) $C - D = \{2\}$
(c) $D \cup E = \{a, b, c, \{c\}\}$	(i) $B \cap F = \emptyset$	(o) $E - F = \{a, b, \{c\}\}$
(d) $B \cup G = \{a, b, \{a, b\}, \{c, 2\}\}$	(j) $C \cap E = \emptyset$	(p) $F - A = \emptyset$
(e) $D \cup F = \{b, c\}$	(k) $B \cap G = \emptyset$	(q) $G - B = \{\{a, b\}, \{c, 2\}\}$
(f) $A \cap B = \{a, b\}$	(l) $A - B = \{c, 2, 3, 4\}$	

7. Given the sets in Exercise 1, assume that the universe of discourse is $\cup\{A, B, C, D, E, F, G\}$. List the members of the following sets:

(a) $(A \cap B) \cup C = \{a, b, c, 2\}$	(h) $D' \cap E' = \{2, 3, 4, \{a, b\}, \{c, 2\}\}$
(b) $A \cap (B \cup C) = \{a, b, c, 2\}$	(i) $F \cap (A - B) = \emptyset$
(c) $(B \cup C) - (C \cup D) = \{a\}$	(j) $(A \cap B) \cup U = U$
(d) $A \cap (C - D) = \{2\}$	(k) $(C \cup D) \cap U = C \cup D = \{b, c, 2\}$
(e) $(A \cap C) - (A \cap D) = \{2\}$	(l) $C \cap D' = \{2\}$
(f) $G' = \{a, b, c, 2, 3, 4, \{c\}\}$	(m) $G \cup F' = U$
(g) $(D \cup E)' = \{2, 3, 4, \{a, b\}, \{c, 2\}\}$	(n) $(B \cap C)' = U$

8. Let $A = \{a, b, c\}$, $B = \{c, d\}$ and $C = \{d, e, f\}$

(a) What are:

(i) $A \cup B = \{a, b, c, d\}$	(v) $B \cup \emptyset = \{c, d\}$
(ii) $A \cap B = \{c\}$	(vi) $A \cap (B \cap C) = \emptyset$
(iii) $A \cup (B \cap C) = \{a, b, c, d\}$	(vii) $A - B = \{a, b\}$
(iv) $C \cup A = \{a, b, c, d, e, f\}$	

(b) Is a a member of $\{A, B\}$? No.

(c) Is a a member of $A \cup B$? Yes.