These questions are for practice, in preparation for Workshop 2.

1. Let $E = \{a,b,c,d,e,f\}$, $A = \{a,b,c\}$, $B = \{d,e\}$, $C = \{\{a,b,c\},\{d,e\}\}$. Are the following statements true or false? Explain your answers.

(a) $A \subseteq E$.

(b) $B \subset E$.

(c) $C \subseteq E$.

(d) $A \subseteq C$.

2. Let $E = \{a,b,c,d,e,f\}$ be a universe of discourse. Let $A = \{a\}$, $B = \{b,c,d\}$, $C = \{f,a,d\}$. Compute the following.

(a) $A \cup B$.

(b) $B \cap C$

(c) B^c.

(d) $A \Delta C$.

(e) $C \backslash A$.

3. Let A, B, C be sets.
Prove that $(A \cap B)^c = A^c \cup B^c$.

4. Is $0 \in \varnothing$? Is $\{\varnothing\} \in \varnothing$?
Explain why.

5. Let $A = \{a,b,c,d\}$, $B = \{c,d,e\}$. Compute the following:

(a) $P(A)$.

(b) $P(A \cap B)$.

6. Let $A = \{a,b\}$, $B = \{1,2\}$. Compute the following:

(a) $A \cap B$.

(b) $P(A \cap B)$.

7. Let $A = \{0,1\}$. Compute $A \times A \times A \times A$.

8. Let $A = \{0, 1\}$ and $B = \{a, b, c\}$. Are the following partitions of $A \times B$? Explain why or why not.

(a) $\{A_1, A_2\}$ where $A_1 = \{(0, a), (0, b), (0, c)\}$ and $A_2 = \{(1, a), (1, b), (1, c)\}$.

(b) $\{A_1, A_2\}$ where $A_1 = \{(0, a), (0, b), (0, c), (0, 0)\}$ and $A_2 = \{(1, a), (1, b), (1, c), (1, 1)\}$.

(c) $\{A_1, A_2, A_3\}$ where $A_1 = \{(0, a), (1, a)\}$, $A_2 = \{(0, b), (1, b)\}$ and $A_3 = \{(0, c), (1, c)\}$.

(d) $\{A_1, A_2, A_3, A_4\}$ where $A_1 = \{(0, a), (0, b), (0, c)\}$, $A_2 = \{(0, a), (1, a)\}$, $A_3 = \{(0, b), (1, b)\}$ and $A_4 = \{(0, c), (1, c)\}$.

9. Prove that $A \cup (B \backslash A) = A \cup B$.

10. Find counterexamples to the following statements.

(a) $A \subseteq B \implies A^c \subseteq B^c$.

(b) $(A \notin B) \wedge (B \notin C) \implies A \notin C$.

(c) $(A \subseteq B) \wedge (B \notin C) \implies A \notin C$