University of Bahrain
Department of Mathematics
MATHS253: Set Theory
Fall 2016
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Homework 8: Sets and Sets Operations

Hand in only problems 4 – 8

Name: _____

1. Suppose that $A := \{2,4,6\}$, $B := \{2,6\}$, $C := \{4,6\}$, and $D : \{4,6,8\}$. Determine which of these sets are subsets of which other of these sets.

2. Let $A := \{a,b,c,d\}$ and $B := \{x,y\}$. Find

   1. $A \times B$.

   2. $B \times A$.

3. Let $U := \{1,2,3,4,5,6,7,8,9\}$, $X := \{2,4,6,8\}$, $Y := \{2,3,4,5,6\}$, and $Z := \{1,2,3,8,9\}$. List the members of each set using set braces.

   1. $X \cap Y$.

   2. $X \cup Y$.

3. X^c.

4. Y^c.

5. $X^c \cap Y^c$.

6. $X^c \cap Z$.

7. $Y \cap (X \cup Z)$.

8. $X^c \cap (Y^c \cup Z)$.

9. $(X \cap Y^c) \cup (Z^c \cup Y^c)$.

10. $(X \cap Y) \cup (X^c \cap Z)$.

4. List all the subsets $\{1, 2\}$, $\{\emptyset, \{\emptyset\}\}$ $\{1, 2, 3\}$, and $\{1, 2, 3, 4\}$. Later, you will show that the number of subsets of a set with n elements is 2^n.

5. In a Venn diagram, shade the region that represents $A^c \cup (B \cap C^c)$.

6. The **symmetric difference** of A and B, denoted by $A \oplus B$ is the set containing those elements in either in A or B, but not in both A and B.

   1. Find the symmetric difference of $\{1,3,5\}$ and $\{1,2,3\}$.

   2. Draw a Venn diagram for the symmetric difference of the sets A and B.

7. Find $\mathcal{P}(\mathcal{P}(\{1\}))$ and its cardinality.

8. For $A = \{1\}$ and $C = \{1,2\}$, give an example of a set B such that $\mathcal{P}(A) \subset B \subset \mathcal{P}(C)$.

9. * Find three sets A, B, and C such that $A \in B$, $B \in C$, and $A \in C$.