1.(1 pt)
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.
Check ALL correct answers below.

- A. $A \subseteq B$
- B. $D \subseteq C$
- C. $B \subseteq D$
- D. $D \subseteq B$
- E. $C \subseteq D$
- F. $D \subseteq A$
- G. $A \subseteq D$
- H. $B \subseteq C$
- I. $A \subseteq C$
- J. $B \subseteq A$
- K. $C \subseteq A$

2.(1 pt) What is the cardinality of each of the following sets?
(a) $\emptyset$

(b) $\{\emptyset\}$

(c) $\{\emptyset, \{\emptyset\}\}$

(d) $\{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}$

3.(1 pt) $A = \{1,3,5\}, B = \{2,3\}$
Check ALL of the following Cartesian products to which the following elements belong:
(a) $(1,2)$

- A. $A \times B$
- B. $B \times A$
- C. $A \times A$
- D. $B \times B$

(b) $(3,1)$

- A. $A \times B$
- B. $A \times A$
- C. $B \times A$
- D. $B \times B$

(c) $(1,1)$

- A. $A \times B$
- B. $B \times A$
- C. $A \times A$
- D. $B \times B$

(d) $(3,3)$

- A. $A \times B$
- B. $A \times A$
- C. $B \times A$
- D. $B \times B$

4.(1 pt) $A = \{1,3,5\}, B = \{2,3\}$
Check ALL elements of the following sets:
(a) $A \cap B$

- A. 3
- B. 1
- C. 2
- D. 5
- E. 4

(b) $A \cup B$

- A. 1
- B. 3
- C. 5
- D. 2
- E. 4

(c) $A \setminus B$

- A. 2
- B. 4
- C. 3
- D. 1
- E. 5

5.(1 pt) Complete the following membership table by filling in the blanks with 1 or 0 as appropriate.

A	B	$B-A$	$A \cup B$	$A \cap (B-A)$	$A \cup (B-A)$
1	1	____	____	________	________
1	0	____	____	________	________
0	1	____	____	________	________
0	0	____	____	________	________

Use the membership table above to answer the following questions.
For each part, check the answer that most completely describes the general situation.
(1) $A - B$

- A. $= A$
- B. $\subseteq A$
- C. $\subseteq B$
- D. $= A - B$

(2) $A \cap (B - A)$

- A. $\emptyset$
- B. $A \cap B$
- C. A
- D. B

(1) $A \cup (B - A)$

- A. $A \cap B$
- B. B
- C. $A \cup B$
- D. A

6.(1 pt) Complete the following membership table by filling in the blanks with 1 or 0 as appropriate.

A	B	$\overline{B}$	$A \cap B$	$A \cap \overline{B}$	$(A \cap B) \cup (A \cap \overline{B})$
1	1	__	____	____	____________
1	0	__	____	____	____________
0	1	__	____	____	____________
0	0	__	____	____	____________

Check the statement above that **MOST COMPLETELY** describes the relationship between the two sets:

- A. $A \subseteq (A \cap B) \cup (A \cap \overline{B})$
- B. $A \subset (A \cap B) \cup (A \cap \overline{B})$
- C. $(A \cap B) \cup (A \cap \overline{B}) = A$
- D. $(A \cap B) \cup (A \cap \overline{B}) \subset A$
- E. $(A \cap B) \cup (A \cap \overline{B}) \subseteq A$

7.(1 pt)

Suppose that the universal set is $U = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10$. Express each of the following subsets with bit strings (of length 10) where the ith bit (from left to right) is 1 if i is in the subset and zero otherwise.

(a) $3, 4, 5$ ____________

(b) $1, 3, 6, 10$ ____________

(c) $2, 3, 4, 7, 8, 9$ ____________

8.(1 pt) $A = \{1, 3, 5\}, B = \{2, 3\}$

Check ALL elements of the following sets:

(a) $A \cap B$

- A. 2
- B. 1
- C. 4
- D. 3
- E. 5

(b) $A \cup B$

- A. 4
- B. 3
- C. 5
- D. 1
- E. 2

(c) $A - B$

- A. 5
- B. 4
- C. 1
- D. 3
- E. 2

(d) The Symmetric difference of A and B, denoted by $A \oplus B$, is the set containing those elements in either A or B, but NOT in both.

Check all elements below that are in $A \oplus B$.

- A. 5
- B. 4
- C. 3
- D. 1
- E. 2

9.(1 pt) Fuzzy sets are used in artificial intelligence. Each element in the universal set U has a degree of membership, which is a real number between 0 and 1 (including 0 and 1 as possiblilities), in a fuzzy set S, The fuzzy set S is denoted by listing the elements with their degrees of membership (elements with 0 degree of membership are not listed).

For example, we write $F = \{0.65\,Alice, 0.95\,Brian, 0.65\,Rita, 0.2\,Oscar,$ for the (fuzzy) set F of famous people to indicate that Alice has a 0.65 degree membership to F, that Brian has a 0.95 membership to F and so on. (for example Brian is the most famous of these people while Oscar is the least famous.)

Also suppose that R is the (fuzzy) set of rich people given by $R = \{0.05Alice, 0.45Brian, 0.25Rita, 0.5Oscar, 0.15Fred\}$. The complement of a fuzzy set$S$ is the fuzzy set $\overline{S}$, where the degree of memebership of an element in $\overline{S}$ is 1 minus the degree of membership of that element in S.

Thus for example we have:

$\overline{F} =$ ___ $Alice$, ___ $Brian$, ___ $Rita$, ___ $Oscar$, ___ $Fred$.

The intersection of two fuzzy sets S and T is the fuzzy set $S \cap T$, where the degree of membership of an element in $S \cap T$ is the minimum of the degrees of membership of this element in S and in T. Thus the fuzzy set $F \cap R$ of the rich and famous people is:

$F \cap R =$ ___ $Alice$, ___ $Brian$, ___ $Rita$, ___ $Oscar$, ___ $Fred$.