

1.(1 pt) (a)

If $n(A) = 14, n(B) = 32$ and $n(A \cap B) = 8$,

then $n(A \cup B) =$ _____

(b)

If $n(A \cup B) = 17, n(A \cap B) = 10$ and $n(A) = n(B)$

then $n(A) =$ _____

2.(1 pt) Let $A = \{0, 1, 5, 6, 7\}$, $B = \{0, 4, 5, 6\}$,
 $C = \{1, 2, 3, 4, 6, 8\}$.

List the elements of the following sets in the increasing order:

$A \cap B = \{ \text{_____}, \text{_____}, \text{_____} \}$

$A \cup B = \{ \text{____}, \text{____}, \text{____}, \text{____}, \text{____}, \text{____} \}$

$(B \cup C) \cap A = \{ \text{____}, \text{____}, \text{____}, \text{____} \}$

$B \cup (C \cap A) = \{ \text{____}, \text{____}, \text{____}, \text{____}, \text{____} \}$

3.(1 pt) Let $U =$ Universal set $= \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 $A = \{1, 2, 5, 7, 8, 9\}$, and $B = \{2, 4, 5, 7\}$.

List the elements of the following sets in the increasing order:

$A' = \{ \text{_____}, \text{_____}, \text{_____}, \text{_____} \}$

$(A \cup B)' = \{ \text{_____}, \text{_____}, \text{_____} \}$

$(A \cup B')' = \{ \text{_____} \}$

$A \cap B' = \{ \text{_____}, \text{_____}, \text{_____} \}$

4.(1 pt) There are a total of 104 foreign language students in a high school where they offer Spanish, French, and German. There are 20 students who take at least 2 languages at once. If there are 44 Spanish students, 38 French students, and 42 German students, how many students take all three languages at once?

Answer: _____

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

6.(1 pt) What is the cardinality of each of the following sets?

(a) \emptyset

(b) $\{\emptyset\}$

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

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

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

(b) (3, 1)

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

(c) (1, 1)

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

(d) (3, 3)

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

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

Check ALL elements of the following sets:

(a) $A \cap B$

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

(b) $A \cup B$

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

(c) $A \setminus B$

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

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

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

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

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

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

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

11.(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 i th 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) $\{2, 3, 4, 7, 8, 9\}$ _____

12.(1 pt) $A = \{1, 3, 5\}, B = \{2, 3\}$

Check ALL elements of the following sets:

(a) $A \cap B$

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

(b) $A \cup B$

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

(c) $A - B$

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

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

13.(1 pt) There are 367 students in a college who have taken a course in calculus, 216 who have take a course in discrete mathematics, and 144 who have taken a course in both calculus and discrete mathematics. How many students at this college have taken a course in either calculus or discrete mathematics?

14.(1 pt) Find the number of elements in $A_1 \cup A_2 \cup A_3$ if there are 100 elements in A_1 , 992 elements in A_2 and 9940 elements in A_3 in each of the following situations:

(a) The sets are pairwise disjoint.

(b) $A_1 \subseteq A_2 \subseteq A_3$.

(c) There are 20 elements common to each pair of sets and 4 elements in all three sets.

15.(1 pt) In a survey of 260 college students, it is found that 63 like brussels sprouts, 99 like broccoli, 57 like cauliflower, 27 like both brussels sprouts and broccoli, 20 like both brussels sprouts and cauliflower, 20 like both broccoli and cauliflower and 12 of the students like all three vegetables.

How many of the 260 college students do not like any of these three vegetables? _____

16.(1 pt) How many elements are in the union of four sets if each of the sets has 98 elements, each pair of sets share 55

elements, each triple of sets shares 21 elements and there are 3 elements in all four sets.
