

Week in Review #1

Section L.1: Introduction to Logic

- A **statement** is a declarative sentence that can be evaluated as either true or false (but not both).
- Connectives
 - conjunction (and), denoted $p \wedge q$
 - disjunction (inclusive or), denoted $p \vee q$
 - negation (not), denoted $\sim p$

1. Which of the following are statements.

- (a) A&M is the friendliest college in the world.
- (b) A&M's Miss Reveille is a German Shepard.
- (c) There are 30 tennis courts on A& M's campus.

2. Use the statements b , s , and n for the following. compound statements in words.

b : The car is blue. s : The car is a saturn. n : The car is new.

- (a) Express the compound statements in words.
 - i. $n \wedge \sim b$
 - ii. $s \vee b$
- (b) Give the symbolic expression for these statements.
 - i. The new saturn was not blue.
 - ii. The saturn was blue or it was not new.

Section L.2: Truth Tables

- Definitions
 - Exclusive Disjunction (exclusive or), denoted $\underline{\vee}$
 - A **tautology** is a compound statement that is always true.
 - A compound statement that is always false is called a **contradiction**.

and

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

or

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

exclusive or

p	q	$p \underline{\vee} q$
T	T	F
T	F	T
F	T	T
F	F	F

3. Construct the following truth tables.

- (a) $\sim p \vee (p \wedge q)$
- (b) $p \wedge (\sim q \underline{\vee} r)$

4. If the truth value of p , q and r is true and the truth value of s is false, what is the truth value of these compound statements.

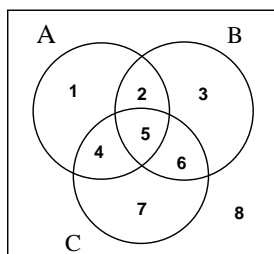
- (a) $(s \vee \sim r) \wedge q$
- (b) $(\sim q \underline{\vee} r) \vee \sim (\sim s \wedge p)$
- (c) $p \vee \left[(\sim r \wedge s) \underline{\vee} \sim (\sim (q \wedge \sim p) \vee r) \right]$

Section 1.1: Set and Set Operations.

- a set is a well defined collection of objects
- roster notation: $A = \{1, 2, 3\}$
- set builder notation: $B = \{x \mid x \text{ is a positive integer} \}$
- Definitions:
 - x is an **element** of set A , $x \in A$, if x is an object in A .
 - set A and B are **equal** if they have exactly the same elements.
 - A is a **subset** of B , $A \subseteq B$, if every element in A is also an element of B
 - A is a **proper subset**, $A \subset B$, if A is a subset of B but is not equal to B .
 - The **empty set**, $\phi = \{ \}$, is a set that contains no elements
 - The **universal set**, U , is the set that contains all of the elements possible in a problem.
- Set A and B are **disjoint** provided that $A \cap B = \phi$ • Set operations:
 - Union, $A \cup B$
 - Intersection, $A \cap B$
 - Compliment, A^C

5. Write the set $\{x \mid x \text{ is a letter in the word } \mathbf{ENCYCLOPEDIA}\}$ in roster notation.
6. $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{0, 3, 6, 9\}$, $B = \{0, 2, 4, 6, 8\}$, and $C = \{1, 3, 5, 7, 9\}$
 Find the following.
- | | |
|-----------------------------|---|
| (a) $n(A) =$ | (f) How many subsets does B have? |
| (b) $A \cup B$ | (g) How many proper subsets does B have? |
| (c) $A \cap C^C =$ | (h) Are A and B disjoint? |
| (d) $A \cap B \cap C =$ | (i) Are B and C disjoint? |
| (e) $(A \cap C)^C \cap B =$ | (j) Give two disjoint proper subsets of B . |
7. Shade the regions of a Venn Diagram that represent the following.
- | | |
|-----------------------|---------------------------|
| (a) $A \cup B \cup C$ | (b) $(A^c \cap B) \cup C$ |
|-----------------------|---------------------------|

8. Indicate the regions of the Venn Diagram that correspond to these set operations.



- (a) $(B \cup C)^c$
- (b) $(A \cap C)^c \cap B$

9. $U =$ the set of A&M students.
 $M = \{x \in U \mid x \text{ is male}\}$
 $F = \{x \in U \mid x \text{ is female}\}$

- $D = \{x \in U \mid x \text{ drinks Dr. Pepper}\}$
 $S = \{x \in U \mid x \text{ drinks Sprite}\}$
 $C = \{x \in U \mid x \text{ drinks coffee}\}$

- (a) Describe each of the given sets in words.
- i. $S \cup C^C$
 - ii. $M \cap (D \cup S)$
- (b) Write the set (use set notation) that represents each of the given statements.
- i. The female students at A&M that drink sprite but do not drink coffee.
 - ii. The students at A&M that drink coffee or do not drink Dr. Pepper.