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) $p \wedge (\sim q \veebar r)$

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) $(\sim q \veebar r) \vee \sim (\sim s \wedge p)$

   (c) $p \vee \Big[(\sim r \wedge s) \veebar \sim (\sim (q \wedge \sim p) \vee r) \Big]$

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 | x 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 | x is a letter in the word **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) $n(A) =$

   (b) $A \cup B$

   (c) $A \cap C^C =$

   (d) $A \cap B \cap C =$

   (e) $(A \cap C)^C \cap B =$

   (f) How many subsets does B have?

   (g) How many proper subsets does B have?

   (h) Are A and B disjoint?

   (i) Are B and C disjoint?

   (j) Give two disjoint proper subsets of B.

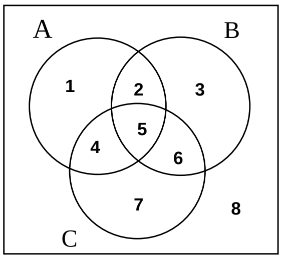
7. Shade the regions of a Venn Diagram that represent the following.

   (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 = $\{\ x \in U | x$ is male$\}$
   F = $\{\ x \in U | x$ is female$\}$

   D = $\{\ x \in U | x$ drinks Dr. Pepper$\}$
   S = $\{\ x \in U | x$ drinks Sprite$\}$
   C = $\{\ x \in U | x$ 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.