1. Determine whether the following are statements (propositions) or not.

(a) It rained today.
(b) Math is awesome!
(c) France is in Africa.
(d) Do your homework.
(e) When is Spring Break?
(f) $4 + 5 = 2$
(g) $x - 8 = 10$

2. Consider the following statements:

$p$: Ben is taking a math class.
$q$: Ben is taking an English class.
$r$: Ben lives in Texas.

(a) Give a symbolic expression for the following compound statements:
   i. Ben lives in Texas and is taking a math class, but is not taking an English class.
   ii. Ben is not taking both an English and a math class or he is taking an English class and lives in Texas.
   iii. Ben is either taking an English class and does not live in Texas or he lives in Texas and is taking a math class.

(b) Express the following in words:
   i. $r \land \sim (p \lor q)$  
   ii. $\sim r \land (p \not\equiv q)$

3. Write negations for the following statements.

(a) The value of Coke stock rose today.
(b) No students study for finals.
(c) Some animals have four legs.

4. Construct truth tables for the following compound statements. Indicate if the statement is a tautology, a contradiction, or neither.

(a) $p \lor \sim (q \land p)$
(b) $(p \land q) \not\equiv (p \lor \sim q)$
(c) $(p \lor \sim q) \land \sim r$
(d) $(p \not\equiv r) \land \sim (q \lor r)$

5. Consider the following statements.

$p$: Earth is the third planet from the sun.
$q$: Green is a primary color.
$r$: Texas is the largest state in the U.S.

Determine the truth value of the following compound statements. (Note that $p$ is true, $q$ is false, and $r$ is false.)

(a) $\sim p \lor \sim q$  
(b) $(q \land \sim r)$  
(c) $(p \not\equiv q) \land \sim r$
6. Let $A = \{1, 3, 5, 7\}$, $B = \{3, 5\}$, and $C = \{3, 7, 5, 1\}$. Determine whether the following statements are True or False.

(a) TRUE FALSE $A = C$
(b) TRUE FALSE $A \subset C$
(c) TRUE FALSE $B \subseteq A$
(d) TRUE FALSE $3 \in B$
(e) TRUE FALSE $B \subseteq B$
(f) TRUE FALSE $\emptyset \subset C$
(g) TRUE FALSE $\{1, 2\} \subset A$
(h) TRUE FALSE $\emptyset \in B$
(i) TRUE FALSE $5 \subset B$
(j) TRUE FALSE $\{1\} \in C$

7. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{x \in U \mid x \text{ is a multiple of } 3\}$, $B = \{2, 3, 6, 7, 10\}$, and $C = \{1, 4, 5, 6, 7, 8\}$. Find the following sets.

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

(f) How many subsets does $A$ have?
(g) How many proper subsets does $B$ have?
(h) Are $A$ and $B$ disjoint sets?

8. Let $U$ be the universal set of all students at Texas A&M. $C = \{x \in U \mid x \text{ listens to country music}\}$, $R = \{x \in U \mid x \text{ listens to rock music}\}$, $P = \{x \in U \mid x \text{ listens to pop music}\}$.

Write the following sets in words:

(a) $(C \cap P)^c$
(b) $R^c \cup P$
(c) $C \cap P \cap R^c$

Write the set that represents the following statements:

(d) The set of students who listen to at least one of the three types of music listed.
(e) The set of students who do not listen to country or rock.
(f) The set of students who listen to rock or pop but not country.
(g) The set of students who only listen to rock.

Note: Shading Venn Diagrams will be covered in next week’s review.