Homework 2 on Sets Due on Monday Feb 22, 2010  Your name:…..

1. Let $A = \{1,3,5,8\}$, $B = \{3,5,7\}$, $C = \{2,4,6,8\}$, find the following:
   a) $(A \cup B)$  b) $A \cap B$  c) $A \setminus B$  d) $A \setminus B \cap A$

   Solution: a) $(A \cup B) = \{1,3,5,7,8\}$; all in A and B
   b) $A \cap B = \{3,5\}$; common elements in A and B
   c) $A \setminus B = \{1,8\}$; elements in A but not in B
   d) $A \setminus B \cap A = \{1,8\}$

2. If the universal set is $U = \{1,2,3,4,5,6,7,8,9\}$ and $A = \{1,3,5,7,9\}$ then find $U \setminus A \cap U$ and $(U \setminus A)^c$

   Solution: $U \setminus A = \{2,4,6,8\}$; and now $U \setminus A \cap U = \{2,4,6,8\}$

3. Use appropriate examples to prove that
   \[ n(A \cap B) = n(A) + n(B) - n(A \cup B) \]

   Solution: We consider $A = \{1,2,3,4,5\}$, and $B = \{3,5,6,7\}$. Then we have the following $A \cup B = \{1,2,3,4,5,6,7\}$ and $A \cap B = \{3,5\}$

   Now \[ n(A \cap B) = n(A) + n(B) - n(A \cup B) \]
   \[ 2 = 5 + 4 - 7 \] is true \(\checkmark\)

4. Prove logically the DeMorgan’s laws: \( (A \cup B) = A \setminus B \) and \( (A \cap B) = A \setminus B \)

   Solution: Check in your note

5. In a consumer survey of 500 people, 200 indicated that they would be buying a major appliance within next month, 150 indicated that they would buy a car, and 25 said that they would purchase both a major appliance and a car. How many will purchase neither? How many will purchase only a car? How many will purchase either a car or a major appliance? What percent of the consumers exactly purchased only one (either a car or a major appliance)?

   Solution: purchase neither = 175
   purchase only a car = 125
   purchase either a car or a major appliance = 125 + 25 + 175 = 325
   percent of the consumers exactly purchased only one = \(\frac{300}{500} = 60\%\)