SOLUTIONS TO SECTION 3.3

1, 2, 6, 7, 8, 9, 10, 17, 20.

1. Let $A =$ those who speak English
   $B =$ those who speak French
   Then $|A \cup B| = 42$, $|A| = 35$, $|B| = 18$.
   $|A \cap B| = |A| + |B| - |A \cup B| = 35 + 18 - 42 = 11

2. Let $A =$ guests who drink coffee
   $B =$ guests who drink tea
   Then $|A| = 13$, $|B| = 10$, and $|A \cap B| = 4$.
   $|A \cup B| = |A| + |B| - |A \cap B| = 13 + 10 - 4 = 19

6. Let $A =$ CS 120 set, $B =$ CS 180 set, $C =$ CS 215 set. Then
   $|A \cup B \cup C| = 32 + 27 + 35 - 7 - 16 - 3 + 2 = 70$. Therefore $83 - 70 = 13$ students
   are not eligible to enroll.

7. Let $A =$ checking account set, $B =$ regular savings set, $C =$ money market savings set.
   a. $|A \cap C| = 93$.

   b. $|A - (B \cup C)| = |A| - |A \cap (B \cup C)|$ by Example 29
      $= |A| - (|A \cap B| \cup (A \cap C))$
      $= |A| - (|A \cap B| + |A \cap C|)$ by Example 28 because $(A \cap B)$ and $(A \cap C)$ are
      disjoint
      $= 189 - (69 + 93) = 27

8. Let $A =$ auto set, $B =$ bike set, $C =$ motorcycle set
   a. $|B - (A \cup C)| = |B| - |B \cap (A \cup C)|$ by Example 29
      $= |B| - (|B \cap A| \cup (B \cap C))$
      $= |B| - (|B \cap A| + |B \cap C|) - |B \cap A \cap C|$
      $= 97 - (53 + 7 - 2) = 39

   b. $|A \cup B \cup C| = 97 + 83 + 28 - 53 - 14 - 7 + 2 = 136$, so $150 - 136 = 14$ do not own
      any of the three.

9. From the Principle of Inclusion and Exclusion,
   $87 = 68 + 34 + 30 - 19 - 11 - 23 + |A \cap B \cap C|$, so $|A \cap B \cap C| = 8$.
10. No. Letting A, B, and C be the odor, lather, and ingredients sets, the Principle of Inclusion and Exclusion says that the union of the three sets would contain 491 people, yet only 450 were surveyed.

17. 367

20. 6