Finite Mathematics (Math 10120), Spring 2017

Quiz 1, Friday February 3

Solutions

1. (5 pts) Let A and B be subsets of some universe set U. If $n(U) = 40$, $n(A \cap B) = 10$, there are 22 elements that are in neither A nor B, and there are 12 elements in A, then how many elements are there in B?

   Solution: Since there are 40 elements in all, and 22 that are neither in A nor B, there are $40 - 22 = 18$ elements in $A \cup B$. 10 of these are in $A \cap B$. Since A has 12 elements in all, there must be two elements in A but not in B. That leaves $18 - 10 - 2 = 6$ elements in B but not in A. Combining these 6 with the 10 elements in $A \cap B$, we get $10 + 6 = 16$ elements in B.

   Notice that the answer is **not** 6; this is the number of elements that are in B **but not** in A; this is not the same as the number of elements in A, which also must include the elements in both B and A.

2. (5 pts) The Senate has 100 members, 52 of whom are Republicans, 46 of whom are Democrats and 2 of whom are independents. In how many ways can a committee of 9 senators be chosen, if five members of the committee should be Republicans, 3 should be Democrats, and 1 should be independent? Put an **X** through the correct answer below.

   (a) $\mathbf{C}(52, 5) + \mathbf{C}(46, 3) + \mathbf{C}(2, 1)$

   (b) $\mathbf{P}(100, 9)$

   (c) $\mathbf{C}(52, 5) \cdot \mathbf{C}(46, 3) \cdot \mathbf{C}(2, 1)$

   (d) $\mathbf{P}(52, 5) \cdot \mathbf{P}(46, 3) \cdot \mathbf{P}(2, 1)$

   (e) $\mathbf{C}(100, 9)$

   (f) $\mathbf{P}(52, 5) + \mathbf{P}(46, 3) + \mathbf{P}(2, 1)$

   Solution: The correct answer is (c): there are $\mathbf{C}(52, 5)$ ways to choose 5 Republican senators for the committee (order of selection doesn't matter), $\mathbf{C}(46, 3)$ ways to choose 3 Democrats, and $\mathbf{C}(2, 1)$ ways to choose 1 independent. We multiply these numbers because we are building up the committee by FIRST choosing the Republicans, AND THEN choosing the Democrats, AND THEN choosing the Independent.