

Finite Mathematics (Math 10120), Spring 2016

Quiz 1, Friday January 29

Solutions

1. (5 pts) Let A and B be subsets of some universe set U . If $n(U) = 36$, $n((A \cup B)^c) = 16$, $n(A \cap B) = 7$ and $n(A) = 14$, how many elements are in B but not in A ?

Solution: There are 16 elements in $(A \cup B)^c$ and 36 elements in U , so there are $36 - 16 = 20$ elements in $A \cup B$. Now use inclusion-exclusion:

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

so

$$20 = 14 + n(B) - 7$$

and so $n(B) = 13$. But if B has 13 elements, and $A \cap B$ has 7, there must be $13 - 7 = 6$ elements that are in B but not in A .

2. (5 pts) A College of Science club has 30 members, 20 which are math majors, 7 physics majors and 3 biology majors. In how many ways can we choose a committee from the club consisting of 4 math majors, 2 physics majors and 1 biology major? Put an **X** through the correct answer below.

- (a) $\mathbf{P}(20, 4) \cdot \mathbf{P}(7, 2) \cdot \mathbf{P}(3, 1)$
- (b) $\mathbf{C}(20, 4) + \mathbf{C}(7, 2) + \mathbf{C}(3, 1)$
- (c) $\mathbf{P}(30, 7)$
- (d) $\mathbf{P}(20, 4) + \mathbf{P}(7, 2) + \mathbf{P}(3, 1)$
- (e) $\mathbf{C}(20, 4) \cdot \mathbf{C}(7, 2) \cdot \mathbf{C}(3, 1)$

Solution: The correct answer is the last one: there are $\mathbf{C}(20, 4)$ ways to choose 4 math majors from the 20, $\mathbf{C}(7, 2)$ ways to choose 2 physics majors from the 7, and $\mathbf{C}(3, 1)$ ways to choose 1 biology majors from the 3. We multiply these numbers because we are building up the committee first by choosing the math majors, AND THEN choosing the physics majors, AND THEN choosing the biology majors.