Chapter 1, Section 3

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Outline

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- Using the Partition Principle
- Counting in the Union of Two Sets
- Counting in the Union of Three Sets

Using the Partition Principle to Count

Exercise

A room is filled with the runners from 4 high school cross country teams. Each runner is wearing a colored T-shirt representing his/her high school. There are 13 wearing a red shirt, 8 wearing a blue shirt, 9 wearing a yellow shirt and 11 wearing a purple shirt. How many runners are in the room?

If E_1, E_2, E_3, E_4, E_5 is a partition of a finite set W, then

$$n(W) = n(E_1) + n(E_2) + n(E_3) + n(E_4) + n(E_5)\,.$$

Counting in the Union of Two Sets

Exercise

A marketing firm called some consumers on the phone to ask them their favorite soft drink. The firm reported the results of all their phone calls. 32 said their favorite drink was Pepsi, 29 said their favorite drink was Sprite, 13 said their favorite drink was Dr. Pepper and 20 refused to answer.
How many consumers did the marketing firm call?

Exercise

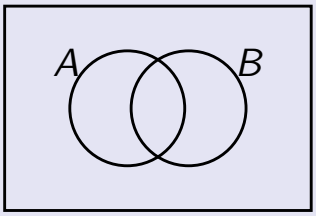
All 26 members of Professor Morton's Finite Mathematics class told her their class schedules. 12 students are taking a music class, 7 are taking a history class and 5 are taking both a music class and a history class. How many of Professor Morton's class are taking neither music nor history?
How many are taking exactly one of music or history?

Counting in the Union of Two Sets

Inclusion-Exclusion

For any finite set A and B, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Inclusion-Exclusion in Venn Diagram



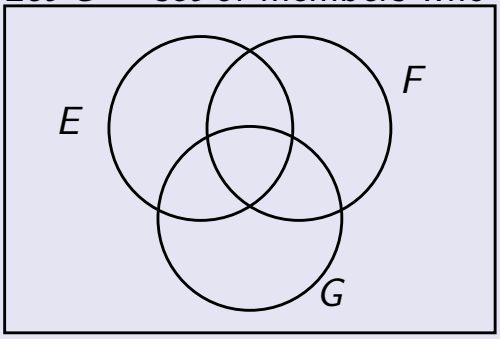
Given: $n(A) = 20$, $n(U) = 30$, $n(B) = 12$, $n(A \cap B) = 4$

Counting in the Union of Three Sets

Exercise #16

A sports enthusiasts' club has 123 members. Of the members, 102 like basketball, 69 like football, 17 like baseball, 7 like basketball and baseball, 9 like football and baseball, 52 like basketball and football, and only 2 like all three sports. How many members of the sports enthusiasts' club like none of these three sports?

Let E = set of members who like basketball
Let F = set of members who like football
Let G = set of members who like baseball



Counting in the Union of Three Sets

Exercise

Suppose A, B and C are subsets of a universal set U with $n(U) = 83$, $n(A) = 50$, $n(B) = 20$, $n(A \cap C) = 30$, $n(A \cap B \cap C) = 5 = n(A \cap B) = n(B \cap C)$, and $n(A' \cap B' \cap C') = 10$.
Find $n(A' \cap B \cap C')$ and $n((A \cup B)')$.