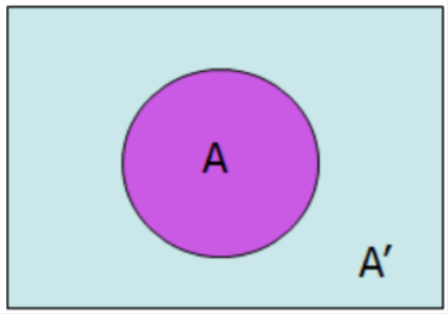
5.4: Rule of Complement

It is sometimes difficult to calculate the probability that an event will occur, but it is much easier to calculate the probability that an event **will not** occur.

For example you may want to determine the probability that a student at California State University – East Bay majors in something other than Business. Instead of adding up all the non-Business major probabilities, it would be much easier to find the chance that a student at CSUEB majors in Business, say 21%. Then you would determine that the probability that a student does not major in Business (all other students) is the remaining 79%.

Rule of Complement

A'(read as “A-complement”) is the event that event A does not occur. In that case, the **Rule of Complement** is:



$$P(A)+P(A')=1 \quad P(A)=1-P(A') \quad P(A')=1-P(A)$$

Example: Die rolling

In a game, you must keep rolling a six-sided die until you get a six. What is the probability that you would need 2 or more rolls to get a six?

Solution

The event A is “2 or more rolls to get a six” which would be a very difficult probability to calculate -- it’s actually an infinite sum!

The event A’ is “do not take 2 or more rolls to get a six” which is the same as saying “get a six on the first roll.” That’s a much easier probability to calculate, $P(A')=1/6$.

So $P(A)=1-P(A')=1-1/6=5/6$

Therefore, the probability of needing two or more rolls to get a six is 5/6 or about 83.3%