Probability using Combination

In some cases, we may need to use more than one combination, permutation or the Fundamental Counting Principle.

A 12 person jury is to be selected from a jury pool consisting of 14 men and 16 women. Suppose the 12 jurors are selected randomly, and let *E* be the event that the jury chosen has exactly 6 women and 6 men. Then we can calculate $P(E)$ by using our counting techniques.

The total number of possible outcomes when 12 people are drawn from a group of 30 is ${}_{30}C_{12} = 86,493,225$. Choosing a jury of 6 men and 6 women can be thought of as a two step process of choosing 6 men followed by choosing 6 women. The number of ways of choosing the 6 men is ${}_{14}C_6 = 3003$, and the number of ways of choosing the 6 women is ${}_{16}C_6 = 8008$. By the Fundamental Counting Principle, the total of number of ways to choose a 6 man and 6 woman jury is: ${}_{14}C_6 \times {}_{16}C_6 = 3003 \times 8008 = 24,048,024$, and so:

$$P(E) = \frac{{}_{14}C_6 \times {}_{16}C_6}{{}_{30}C_{12}} = \frac{24,048,024}{86,493,225} \approx .278$$