Recall, the probability is defined as the number of favorable outcomes divided by the total number of outcomes. Sometimes we will have to determine the number of outcomes using combinatorics.

Example 1: Jamaal, Ethan, and Alberto are competing with seven other boys to be on their school's cross-country team. All the boys have an equal chance of winning the trial race. Determine the probability that Jamaal, Ethan, and Alberto will place first, second, and third, in any order.

$$\frac{1}{{}_{10}C_3} = \frac{1}{120}$$

Example 2: Determine the probability of out of five children all of them are boys.

$$\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{32}$$

Example 3: A morning radio show is holding a contest at a local mall. The host spells out VANCOUVER with letter tiles. He then turns the tiles face down and mixes them up. If the contestant arranges the tiles in a row and turns them face up and spells VANCOUVER they win. Determine the probability that you will win the contest.

$$\#\text{ of arrangements} = \frac{9!}{2!} = 181440$$

$$\text{probability} = \frac{1}{181440}$$

Example 4: Four boys and seven girls have signed up for a trip. Only four students will be selected to go on the trip. Determine the probability for the following:

a) Only girls will be on the trip.

$$\frac{{}_7C_4}{{}_{11}C_4} = 0.106 \quad (10.6\%)$$

b) There will be equal numbers of boys and girls on the trip.

$$\frac{({}_4C_2)({}_7C_2)}{{}_{11}C_4} = 0.382 \quad (38.2\%)$$

c) There will be more girls than boys on the trip.

$$\frac{({}_7C_3)({}_4C_1)}{{}_{11}C_4} = 0.424 \quad (42.4\%)$$