Lesson 4-5

Example 1

> **A bag contains 3 yellow marbles, 6 purple marbles, 3 orange marbles, and 4 green marbles. One marble is taken at random and then replaced. Then another marble is taken at random. Find the probability that the first marble is green and the second marble is purple.**

Solution

Because the first marble is replaced, the sample space of 16 marbles does not change for each event. The two events are independent.

$$
\begin{aligned}
P(\text{green, then purple}) &= P(\text{green}) \cdot P(\text{purple}) \\
&= \frac{4}{16} \cdot \frac{6}{16} \\
&= \frac{1}{4} \cdot \frac{3}{8} \\
&= \frac{3}{32}
\end{aligned}
$$

The probability of picking green, then purple is $\frac{3}{32}$.

Example 2

A bag contains 3 yellow marbles, 6 purple marbles, 3 orange marbles, and 4 green marbles. One marble is taken at random from the bag. It is not replaced. Then another marble is taken at random. Find the probability that the first marble is green and the second marble is purple.

Solution

Because the first marble is not replaced, the second event is dependent on the first event. Find the probability of the first event.

$$P(\text{green}) = \frac{4}{16} = \frac{1}{4}$$

On the next selection, there are only 15 marbles. Assuming that a green marble was removed, there are still 6 purple marbles in the bag.

$$P(\text{purple after green}) = \frac{6}{15} = \frac{2}{5}$$

Multiply the two probabilities together.

$$P(\text{green, then purple}) = \frac{1}{4} \cdot \frac{2}{5}$$
$$= \frac{1}{10}$$

The probability of picking green, then purple is $\frac{1}{10}$.

Example 3

A bag contains 3 yellow marbles, 6 purple marbles, 3 orange marbles, and 4 green marbles. Two marbles are taken at random from the bag. Find the probability that both marbles are green.

Solution

Consider that one of the marbles must be taken before the other. Since the first marble is not replaced, the second event is dependent on the first event.

$$P(\text{first green marble}) = \frac{4}{16} = \frac{1}{4}$$

$$P(\text{second green marble}) = \frac{3}{15} = \frac{1}{5}$$

Multiply the two probabilities together.

$$P(\text{green, then green}) = \frac{1}{4} \cdot \frac{1}{5}$$

$$= \frac{1}{20}$$

The probability of picking green, then green is $\frac{1}{20}$.