Independent Events

Events are **independent events** if the occurrence of one event does not affect the probability of the other.

- If a coin is tossed twice, its landing heads up on the first toss and landing heads up on the second toss are independent events. The outcome of one toss does not affect the probability of heads on the other toss.
- To find the probability of tossing heads twice, multiply the individual probabilities.
  - Multiply when events are "simultaneous"

Probability of Independent Events

If A and B are independent events, then $P(A \text{ and } B) = P(A) \cdot P(B)$.

Example #1: A six-sided cube is labeled with the numbers 1, 2, 2, 3, 3, and 3. Four sides are colored red, one side is white, and one side is yellow.

a) Find the probability of rolling a 2, and then 2.

b) Find the probability of rolling a white and then a red.

You try: Find the probability of tossing heads, then heads, and then tails when tossing a coin 3 times.

The **complement** of an event E is the set of all outcomes in the sample space that are not in E.

P(not E) = 1- P(E).

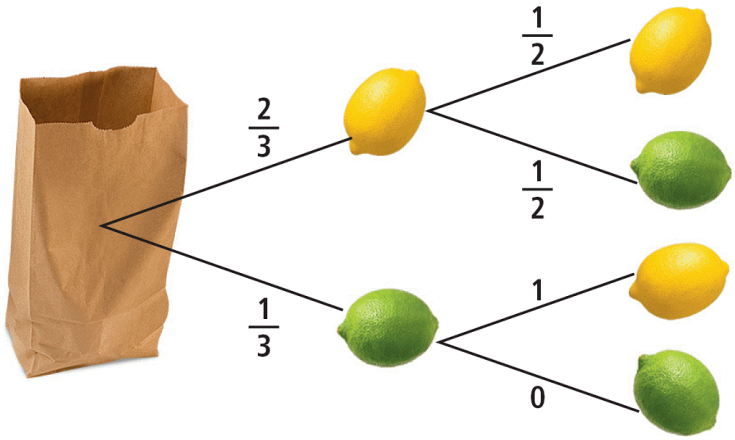
Example #5: In a box of 25 switches, 3 are defective. What is the probability of randomly selecting a switch that is not defective?

Dependent Events

Events are **dependent events** if the occurrence of one event affects the probability of the other.

Example #1:

Suppose that there are 2 lemons and 1 lime in a bag. If you pull out two pieces of fruit, the probabilities change depending on the outcome of the first.



The probability of a specific event can be found by multiplying the probabilities on the branches that make up the event.

To find the probability of dependent events, you can use **conditional probability** $P(B|A)$, the probability of event B, given that event A has occurred.

Probability of Dependent Events

If A and B are dependent events, then $P(A \text{ and } B) = P(A) \cdot P(B \mid A)$, where $P(B \mid A)$ is the probability of B, given that A has occurred.

Example #2: A drawer contains 8 blue socks, 8 black socks, and 4 white socks. Socks are picked at random one at a time.

a) What is the probability of picking a blue sock and then a blue sock?

b) What is the probability of choosing a white sock and then a white sock?

c) What is the probability of picking exactly 4 black socks?

You try: **A bag contains 10 beads—2 black, 3 white, and 5 red. A bead is selected at random. Determine whether the events are independent or dependent. Find the indicated probability.**

a) selecting a white bead, replacing it, and then selecting a red bead

b) selecting a white bead, not replacing it, and then selecting a red bead

Example #3: A committee to organize the school prom has 8 seniors and 4 juniors. If a subcommittee of 4 students is selected at random to choose the music for the prom, what is the probability that the committee will contain 2 seniors and 2 juniors?

What is the probability that the subcommittee will have only juniors?

You try: What is the probability that the subcommittee will have 3 seniors and 1 junior?

Example #4:
Tessa must select 5 desserts out of 8 options for a school dinner. Two of the desserts are gluten-free. What is the probability that she choose to include both of the gluten-free desserts?

You try: Justin is carrying 6 pages of math homework and 10 pages of history homework as he walks to school. A gust of wind comes and blows the papers out of his hand. He is able to gather 8 pages off the ground. What is the probability that all of the math homework is found?