

#17 Independent Events



Lets flip a coin.

What are the possible outcomes? *heads, tails*

What is the probability of tossing tails? *1/2*

What is the probability of tossing heads? *1/2*

When flipping a coin, the outcomes are equally likely to occur.

If the outcomes in a sample space are equally likely to occur, the **probability** of an event P(event) is a numerical value from 0 to 1 that measure the likelihood of an event.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Example:

There are 5 blue, 4 red, 1 yellow, and 2 green beads in a bag. Find the probability that a bead chosen at random from the bag is:

- 1. blue $\frac{5}{12}$
- 2. green $\frac{2}{12}$
- 3. not red $\frac{8}{12}$
- 4. not yellow $\frac{11}{12}$
- 5. blue or red $\frac{9}{12}$
- 6. blue or yellow $\frac{6}{12}$

Example:

A bag contains letter tiles that spell the name of the state MISSISSIPPI. Find the probability of drawing one tile at random for each of the following.

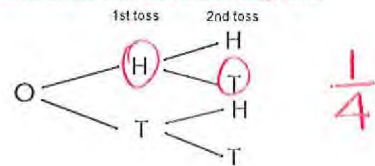
1. P(not M) $\frac{10}{11}$

2. P(not P) $\frac{9}{11}$

What is the probability that a coin will land on heads after its first toss and then land on tails after its second toss?



We can demonstrate this with a tree diagram...



The outcome of one toss does not affect the outcome of the other toss.

To find the probability of tossing heads twice, multiply the individual probabilities...

$$\frac{1}{2} \cdot \frac{1}{2} \text{ or } \frac{1}{4}$$

Probability of Independent Events

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

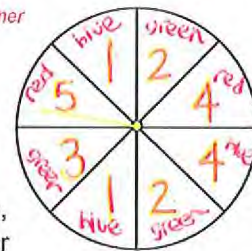
Definition:

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

Example: *each sector of the spinner is the same size

Find each probability.

1. spinning 4 and then 4 again on the spinner
2. spinning red, then green, and then red on the spinner



$$1. \frac{2}{8} \cdot \frac{2}{8} = \frac{4}{64}$$

$$2. \frac{2}{8} \cdot \frac{3}{8} \cdot \frac{2}{8} = \frac{12}{512}$$

Example:

Find each probability.

1. rolling a 6 on one number cube and a 6 on another number cube $\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

2. tossing heads, then heads, and then tails

$$\text{when tossing a coin 3 times } \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$$

Example:

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. Find each probability.

1. tossing 2, then 2 $\frac{2}{6} \cdot \frac{2}{6} = \frac{4}{36}$

2. tossing red, then white, then yellow

$$\frac{4}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{4}{216}$$