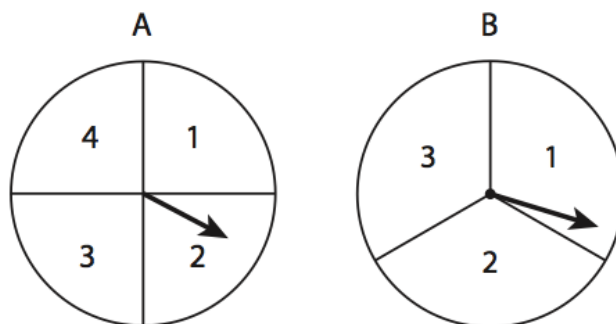


NOTES: MATH 2 HONORS
Unit 7: Conditional Probability

Example 1: Howard is playing a carnival game. The object of the game is to predict the sum you will get by spinning spinner A and then spinner B. Howard predicts he will get a sum of 5.



1. List the sample space.

2. What is the probability that Howard gets a sum of 5? Explain.

3. Suppose Howard gets a 3 on spinner A. Now what is the probability that Howard gets a sum of 5? Explain.

4. How does getting a 3 on spinner A affect the probability that Howard gets a sum of 5? Explain.

Recall: Events are **dependent** if the occurrence of one changes the probability of another event occurring. For example, drawing marbles from a bag with replacement is independent, while drawing marbles from a bag without replacement is dependent.

The **conditional probability of B given A** is the probability that event B occurs, given that event A has already occurred and is denoted as $P(B|A)$.

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

If A and B are independent, then the formula for $P(A \text{ and } B)$ is the equation used in the definition of independent events:

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

formula for $P(A \text{ and } B)$

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

formula for $P(A \text{ and } B)$ if A and B are independent

Example 2: Alexis rolls a pair of number cubes. What is the probability that both numbers are odd if their sum is 6?

Example 3: Hamid rolls a number cube 3 times. Consider the following events.

A: The first roll is an odd number.

B: There are exactly 2 consecutive odd numbers.

Determine if *A* and *B* are independent events.

Example 4: A vacation resort offers bicycles and personal watercrafts for rent. The resort's manager made the following notes about rentals:

- 200 customers rented items in all – 100 rented bicycles and 100 rented personal watercrafts.
- Of the personal watercraft customers, 75 customers were young (30 years old or younger) and 25 customers were older (31 years old or older).
- 125 of the 200 customers were age 30 or younger. 50 of these customers rented bicycles, and 75 of them rented personal watercrafts.

Consider the following events that apply to a random customer.

Y: The customer is young (30 years old or younger)

W: The customer rents a personal watercraft.

Are Y and W independent? Compare $P(Y|W)$ and $P(W|Y)$ and interpret the results.

Example 5: Last year at All Technical High School, 20% of the students received an academic award. That same year, 16% of the students at the school received an academic award and a service award. What is the probability that a student who receives an academic award also receives a service award?