**Independence**

Determining the independence of events can sometimes be done by becoming familiar with the context in which the events occur and the nature of the events. There are also some ways of determining the independence of events based on equivalent probabilities.

* Two events, A and B, are independent if P(A and B) = P(A)  P(B)
* A and B are also independent if $P\left(B\right)= \frac{P (A and B)}{P(B)}=P(A)$, also $P(B|A)=P(B)$

Using these two concepts, determine if the following events are independent.

1) P (A and B) = 3/5; P (A) = 1/2; P (B) = 3/10

2) P (A) = 1/5; P (A and B) = 1/6; P (B) = 1/3

3) P (A) = 1/2; P (A and B) = 1/5; P (B) = 2/5

4) P (A and B) = 3/5; P (A) = 1/2; P (B) = 3/10

**Probabilities from a Two-Way Table**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Survived** | **Did not survive** | **Total** |
| **Men** | 146 | 659 | 805 |
| **Women** | 296 | 106 | 402 |
| **Total** | 442 | 765 | 1207 |

P (w) = P (s) = P (s|w) = P (w or s) =

P (w or m) = P (ns|w) = P(m $∩$ ns) =

**Interpreting Data**

Out of the 2000 students who attend a certain high school, 1400 students own cell phones, 1000 own a tablet, and 800 have both. Suppose a student is randomly selected. Create a Venn Diagram and use notation to answer the following questions.

a) What is the probability that a randomly selected student owns a cell phone?

b) What is the probabilitiy that a randomly selected students owns both a cell phone and a tablet?

c) If a randomly selected student owns a cell phone (was one of the 1400 with a phone), what is the probability that this student also owns a tablet?

d) How are questions b and c related?

e) Are the outcomes *owns a cell phone* and *owns a tablet* independent? Explain.

**Independent or Dependent?**

Determine whether the second scenario would be dependent or independent of the first scenario.

a) Rolling a six-sided die, then drawing a card from a deck of 52 cards.

b) Drawing a card from a deck of 52 cards, then drawing another card from the same deck.

c) Rolling a six-sided die, then rolling it again.

d) Pulling a marble out of a bag, replacing it, then pulling a marble out of the same bag.

e) Having 20 treats in five different flavors for a soccer team, with each player taking a treat.

**Conditional Probability and Independence**

**Data gathered on the shopping patterns during the months of April and May of high school students from Peanut Village revealed the following: 38% of students purchased a new pair of shorts (event H), 15% of students purchased a new pair of sunglasses (event G) and 6% of students purchased both a pair of shorts and a pair of sunglasses.**

1) Find the probability that a student purchased a pair of sunglasses given that you know they purchased a pair of shorts.

 P (G|H) =

2) Find the probability that a student purchased a pair of shorts or purchased a new pair of sunglasses.

P (H $∪$ G) =

3) Given the condition that you know a student has purchased at least one of the items, what is the probability that they purchased *only* one of the items?

P(no G |H or no H|G) =

4) Are the two events independent of one another? Why or why not?

**Given the data collected from 200 individuals concerning whether or not to extend the length of the school year in the table below answer the questions.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **For** | **Against** | **No Opinion** |  |
| **Youth (5 to 19)** | 7 | 35 | 12 |  |
| **Adults (20 to 55)** | 30 | 27 | 20 |  |
| **Seniors (55+)** | 25 | 16 | 28 |  |
|  |  |  |  | 200 |

5) What is the conditional probability that if a person is an adult they are also in favor of extending the school year?

6) Given that a person is against extending the school year, what is the probability they are a Senior?

7) What is the probability that if a person is a youth, they also have no opinion?