Basic Probability Examples

Example 1

Procedure: You randomly **select one marble** from a bag that contains
3 Red marbles (**R**), 2 Green marbles (**G**), 4 Blue marbles (**B**) and 1 Violet marble (**V**).

Sample Space: { **R R R G G B B B B V** }

A) Find **P(B)** which means find the probability the marble selected is **Blue.**

Sample Space: { **R R R G G B B B B V** }

The number of **Blue Marbles** in the sample space **is 4**

$$P(B) = \frac{\text{the number of ways that 1 blue marble can be selected}}{\text{the total number of outcomes in the sample space}} = \frac{4}{10} = \frac{2}{5}$$

B) Find **P(R or G)** which means find the probability the marble selected is **Red or Green.**

Sample Space: { **R R R G G B B B B V** }

The number of **Red Marbles** in the sample space **is 3**
The number of **Green Marbles** in the sample space **is 2**

$$P(R \text{ or } G) = \frac{\text{the number of ways that a red OR green marble can be selected}}{\text{the total number of outcomes in the sample space}} = \frac{5}{10} = \frac{1}{2}$$

C) Find **P($\overline{V}$)** which means find the probability the marble selected is **NOT Violet.**

Sample Space: { **R R R G G B B B B V** }

The number of marbles in the sample space that are **NOT Violet is 9**

$$P(\overline{V}) = \frac{\text{the number of ways that a NOT Viloet can be selected}}{\text{the total number of outcomes in the sample space}} = \frac{9}{10}$$

D) Find **P(A)** which means find the probability the marble selected is **Aqua.**

Sample Space: { **R R R G G B B B B V** }

The number of **Aqua Marbles** in the sample space **is 0**

$$P(A) = \frac{\text{the number of ways that an Aqua marble can be selected}}{\text{the total number of outcomes in the sample space}} = \frac{0}{10} = 0$$

Example 2

Procedure: You randomly select one day from all the days in the week.

Sample Space: { Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday }

A. Find **P(starts with an S)** which means find the probability the day selected starts with a S.

Sample Space: { Monday, Tuesday, Wednesday, Thursday, Friday, **S**aturday, **S**unday }

$$\text{P(starts with an S)} = \frac{\text{the number of days that starts with an S}}{\text{the total number of outcomes in the sample space}} = \frac{2}{7}$$

B) Find P(ends in a y) which means find the probability the word selected ends in a y.

Sample Space: { Monda**y**, Tuesda**y**, Wednesda**y**, Thursda**y**, Frida**y**, Saturda**y**, Sunda**y** }

The word you select **MUST end in a y** because **all the outcomes outcomes end in a y.**

$$\text{P(ends in a Y)} = \frac{\text{the number of ways at the days end in Y}}{\text{the total number of outcomes in the sample space}} = \frac{7}{7} = 1$$

C. P(contains the letter Z) which means find the probability the word contains the letter z.

Sample Space: { Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday }

$$\text{P(contains the letter Z)} = \frac{\text{the number of days spelled with the letter Z}}{\text{the total number of outcomes in the sample space}} = \frac{0}{7} = 0$$

D. P(spelled with more than 6 letters)

Sample Space: { Monday, **Tuesday**, **Wednesday, Thursday,** Friday, **Saturday,** Sunday }

$$\text{P(spelled with more than 6 letters)} = \frac{\text{the number of days spelled with more than 6 letters}}{\text{the total number of outcomes in the sample space}} = \frac{4}{7}$$

Example 3

Procedure: Have 3 single births and record the gender of the babies in birth order.

Sample Space: { BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG }

A) Find P(3G) which means find the probability of **having 3 girls.**

Sample Space: { BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG }

$$P(3G) = \frac{\text{the number of outcomes with 3 girls}}{\text{the total number of outcomes in the sample space}} = \frac{1}{8}$$

B) Find P(at most 1 boy) which means find the probability of **none or 1 boy.**

Sample Space: { BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG }

$$P(\text{at most 1 boy}) = \frac{\text{the number of outcomes with 0 or 1 boy}}{\text{the total number of outcomes in the sample space}} = \frac{4}{8} = \frac{1}{2}$$

C) Find P(at least 1 girl) which means find the probability of **1 , 2 or 3 girls.**

Sample Space: { BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG }

$$P(\text{at least 1 girl}) = \frac{\text{the number of outcomes with 1, 2 or 3 girls}}{\text{the total number of outcomes in the sample space}} = \frac{7}{8}$$

D) Find P(4G) which means find the probability of **4 girls.**

Sample Space: { BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG }

The number of outcomes with 4 girls is **0** (there is no way to have 4 girls if you only have 3 children)

$$P(\text{ 4 girls }) = \frac{\text{the number of ways at most 4 girls can occur}}{\text{the total number of outcomes in the sample space}} = \frac{0}{8} = 0$$

