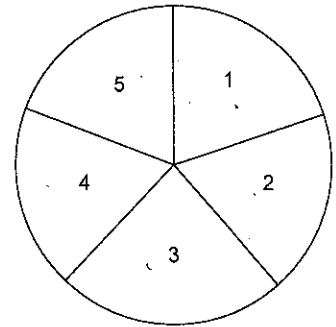


Probability

1. All of the sections on the circular spinner are equal in size.

- a) If the spinner is spun 3 times, what is the probability that an even number is spun all 3 times?

$$\frac{2}{5} \cdot \frac{2}{5} \cdot \frac{2}{5} = \frac{8}{125}$$



- b) If the spinner is spun 3 times, what is the probability that you will get an even number AT LEAST one time?

$$P(\geq 1 \text{ even}) = 1 - P(\text{all odds})$$

$$P(\text{no evens}) = \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{3}{5} = \frac{27}{125}$$

$$P(\geq 1 \text{ even}) = 1 - \frac{27}{125} = \frac{98}{125}$$

2. A bag contains 8 red marbles, 12 blue marbles, and 17 green marbles.

- a) If one marble is randomly selected from the bag, what is the probability that the marble is red or green?

$$\frac{8+17}{37} = \frac{25}{37}$$

- b) What is the probability you will select red, not red, then green?

$$\frac{8}{37} \cdot \frac{12}{36} \cdot \frac{17}{35} + \frac{8}{37} \cdot \frac{17}{36} \cdot \frac{12}{35} = \frac{1632}{46620} + \frac{2176}{46620} = \frac{3808}{46620} = \frac{136}{1665}$$

- c) What is the probability you will select blue, red or blue, then green?

$$B, R, G + B, B, G$$

$$\frac{12}{37} \cdot \frac{8}{36} \cdot \frac{17}{35} + \frac{12}{37} \cdot \frac{11}{36} \cdot \frac{17}{35} = \frac{3876}{46620} = \frac{323}{3885}$$

3. In a standard deck of 52 cards, find the probability that you will choose

a) two aces when two cards are randomly drawn from the deck

$$\frac{4}{52} \cdot \frac{3}{51} = \frac{12}{2652} = \frac{1}{221}$$

b) an ace or a black card, when one card is randomly drawn

$$P(\text{Ace}) + P(B) - P(A \cap B) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

c) four of a kind (i.e. four jacks or four tens, etc.) when you are dealt five cards

$$P_{\text{Ace}} = \left(\frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} \cdot \frac{1}{49} \cdot \frac{48}{48} \cdot {}_5C_4 \right) = \text{one non-ace can be in many places}$$

$$P_{\text{4 of kind}} = \frac{13}{4765} = \frac{1}{4165}$$

4. If two people are randomly selected from a class that has 6 sophomores, 12 juniors, and 7 seniors, find the probability that exactly one of them is a senior.

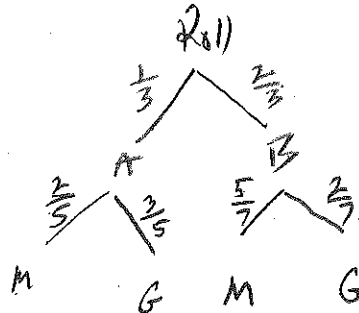
$$\frac{7}{25} \cdot \frac{18}{24} \quad \text{or} \quad \frac{3}{25} \cdot \frac{7}{24} = \frac{21}{100} + \frac{21}{100} = \frac{42}{100} = \frac{21}{50}$$

5. There are 38 members on the basketball teams and 54 members on the track teams at Central High. There are 13 people who are on both a basketball team and a track team. If one member of these teams is randomly selected, find the probability that the person is on a track team given that the person is on a basketball team. (Hint: draw a Venn Diagram with this info)



6. Bin A contains four metal balls and six glass balls. Bin B contains five metal balls and two glass balls. In a game a person rolls a die to determine which bin to pull a ball out of. If the die comes up a 1 or 2, the ball is pulled from Bin A. Otherwise, the ball is pulled from Bin B.

a) Draw a tree diagram that illustrates this situation with probabilities:



b) Find the probability of selecting a metal ball

$$\frac{1}{3} \cdot \frac{2}{5} + \frac{2}{3} \cdot \frac{5}{7} = \frac{2}{15} + \frac{10}{21} = \frac{64}{105}$$

c) If a metal ball is selected, what is the probability it was pulled from Bin B?

$$\frac{P(\text{Bin B})}{P(\text{metal})} = \frac{\frac{2}{3} \cdot \frac{5}{7}}{\frac{64}{105}} = \frac{5}{28} \cdot \frac{105}{64} = \frac{25}{32}$$

d) If two balls are pulled from Bin B without replacement, what is the probability they are both made of the same material?

$$\frac{5}{7} \cdot \frac{4}{6} \quad \text{or} \quad \frac{2}{7} \cdot \frac{1}{6}$$

$$\frac{20}{42} + \frac{2}{42} = \frac{22}{42} = \frac{11}{21}$$

7. For medical purposes, the managers of a company decide to record the blood type of all the employees. The results are shown in the table below.

	O	A	B	AB	totals
Women	8	5	4	2	19
Men	12	6	2	1	21
totals	20	11	6	3	40

- a. Find the probability that the person has type B blood or type O blood.

$$\frac{6}{40} + \frac{20}{40} = \frac{26}{40} = \frac{13}{20}$$

- b. Find the probability that the person is a man or has type AB blood.

$$P(M) + P(AB) - P(\text{both}) = \frac{21}{40} + \frac{3}{40} - \frac{1}{40} = \frac{23}{40}$$

- c. Find the probability that a person has type A blood, given that the person is a woman.

$$\frac{5}{19}$$

8. You pick an integer choosing from 1-9, what is the probability that you pick a number that is even and a multiple of 3?

must be 6

$$\frac{1}{9}$$

9. A bag contains 6 red marbles and 11 blue. Suppose you are selecting 5 marbles. What is the probability that you get exactly 2 red?

$$\frac{{}^6C_2 \cdot {}^{11}C_3}{{}^{17}C_5} = \frac{2475}{6186}$$

1,1	1,2	1,3	1,4	1,5	1,6
2,1	2,2	2,3	2,4	2,5	2,6
3,1	3,2	3,3	3,4	3,5	3,6
4,1	4,2	4,3	4,4	4,5	4,6
5,1	5,2	5,3	5,4	5,5	5,6
6,1	6,2	6,3	6,4	6,5	6,6

10. Two dice are rolled. Find the probability of rolling each of these below:

a. A sum of 7

$\frac{6}{36} = \frac{1}{6}$
 1,6 3,4
 6,1 4,3
 2,5
 5,2

b. A sum of 7 or 8

$\frac{1}{6} + \frac{5}{36} = \frac{11}{36}$
 2,6 4,4
 6,2 5,3
 3,5
 5,1

c. A sum of less than 5 or greater than 10

$P(<5) + P(>10)$
 $\frac{6}{36} + \frac{2}{36} = \frac{8}{36} = \frac{2}{9}$

d. A 2 on one die and a 4 on the other

$\frac{1}{6} \cdot \frac{1}{6} + \frac{1}{6} \cdot \frac{1}{6} = \frac{2}{36} = \frac{1}{18}$
 2 4 or 4 2

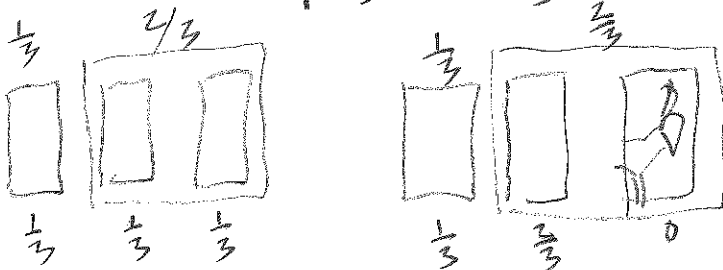
e. A sum of at least 4

$1 - P(\text{sum} \leq 3) = 1 - \frac{3}{36} = \frac{33}{36} = \frac{11}{12}$

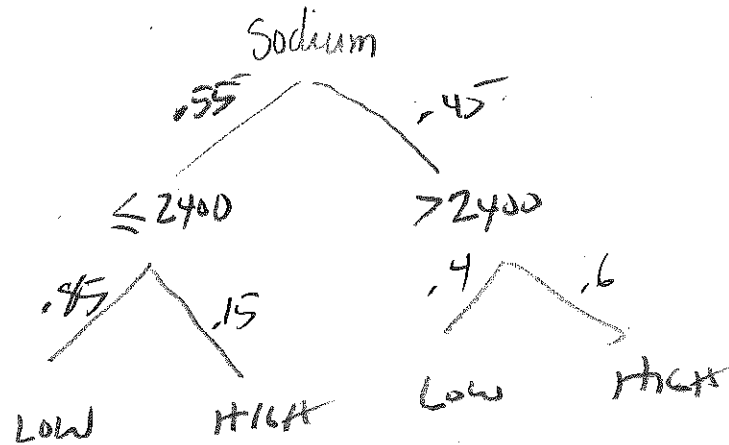
11. In the game show hosted by Monty Hall, when given the choice to stay with the door you chose or switch to the other, which choice is better? Use probability when explaining your answer.

Switch!

Prob is $\frac{2}{3}$ when switching vs. $\frac{1}{3}$ if not



12. A test of 100 adults showed that 45 of them consumed more than the recommended average of 2400 mg of sodium per day. Of those with high sodium consumption, 60% had higher than normal blood pressure. Of the adults whose sodium intake was at or below 2400 mg per day, only 15% had higher than normal blood pressure. Using this data as a sample of the general population, find the probability that a person's daily intake of sodium is at or below 2400 mg, given that their blood pressure is higher than normal. (Hint: a tree diagram would be helpful)



$$\begin{aligned}
 P(\text{HIGH BP}) &= (.55)(.15) + (.45)(.6) \\
 &= \frac{141}{400} = 35.25\%
 \end{aligned}$$

$$\begin{aligned}
 \frac{P(\leq 2400 \text{ \& HIGH BP})}{P(\text{HIGH BP})} &= \frac{(.55)(.15)}{\frac{141}{400}} = \frac{\frac{33}{400}}{\frac{141}{400}} = \frac{33}{141} \\
 &= \frac{11}{47} \approx 23.4\%
 \end{aligned}$$