Compound Probability

Independent v. Dependent Events

Independent Events

- **Two events A and B, are independent if the fact that A occurs does not affect the probability of B occurring.**
- **Examples- Landing on heads from two different coins or rolling a 4 on a die, then rolling a 3 on a second roll of the die.**
- **Probability of A and B occurring:**

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

Experiment 1

- A coin is tossed and a 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling a 3 on the die.

- P (head)=1/2
- P(3)=1/6
- P (head and 3)=P (head)*P(3)

  =1/2 * 1/6

  = 1/12

Experiment 2

- A card is chosen at random from a deck of 52 cards. It is then replaced and a second card is chosen. What is the probability of choosing a jack and an eight?

- P (jack)= 4/52
- P (8)= 4/52
- P (jack and 8)= 4/52 * 4/52

  = 1/169

Experiment 3

- A jar contains three red, five green, two blue and six yellow marbles. A marble is chosen at random from the jar. After replacing it, a second marble is chosen. What is the probability of choosing a green and a yellow marble?

- P (green) = 5/16
- P (yellow) = 6/16
- P (green and yellow) = P (green) x P (yellow)
  = 15 / 128

Experiment 4

- A school survey found that 9 out of 10 students like pizza. If three students are chosen at random with replacement, what is the probability that all three students like pizza?

- P (student 1 likes pizza) = 9/10
- P (student 2 likes pizza) = 9/10
- P (student 3 likes pizza) = 9/10
- P (student 1 and student 2 and student 3 like pizza) = 9/10 x 9/10 x 9/10 = 729/1000

Dependent Events

- Two events A and B, are dependent if the fact that A occurs affects the probability of B occurring.
- Examples- Picking a blue marble and then picking another blue marble if I don't replace the first one.
- Probability of A and B occurring:

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

Experiment 1

- A jar contains three red, five green, two blue and six yellow marbles. A marble is chosen at random from the jar. A second marble is chosen without replacing the first one. What is the probability of choosing a green and a yellow marble?

- P (green) = 5/16
- P (yellow given green) = 6/15
- P (green and then yellow) = P (green) x P (yellow) = 1/8

Experiment 2

- An aquarium contains 6 male goldfish and 4 female goldfish. You randomly select a fish from the tank, do not replace it, and then randomly select a second fish. What is the probability that both fish are male?

- P (male) = 6/10
- P (male given male) = 5/9
- P (male and then, male) = 1/3

Experiment 3

- A random sample of parts coming off a machine is done by an inspector. He found that 5 out of 100 parts are bad on average. If he were to do a new sample, what is the probability that he picks a bad part and then, picks another bad part if he doesn't replace the first?

- P (bad) = 5/100
- P (bad given bad) = 4/99
- P (bad and then, bad) = 1/495