Introducing Probability

Problem Set 1 - Due Friday, September 27

Consider the seven sided die (with sides 0, 1, 2, 3, 4, 5 and 6). You roll this die once. Let:

- A be the event that a given roll yields an even number.
- B be the event that a given roll is greater than or equal to three.
- C be the event that the number is a prime number (only divisible by 1 and itself).

1. Find P(A), P(B) and P(C)

2. Find P($A \cup B$).

3. Find P($B \cap C$)

4. Find P($A \cap B^C$).

We use Ω "omega" to denote the outcome space (e.g. for a coin toss this would be $\Omega = H, T$).

5. What was the outcome space in our beano game? The outcome space for a coin toss is H, T what would be the outcome space for Beano?

2. Mutually exclusive events are events that cannot happen at the same time. List a few examples of mutually exclusive events.

6. True or False. For two mutually exclusive events, the probability that either of the two events might occur is the sum of their probabilities.

TAB puts together a mystery box of baked goods. In the mystery box, there are 35 chocolate dipped macaroons (my favorite), 50 snickerdoodles, and 30 ginger molasses cookies.

7. What is the probability that you choose the macaroon if you are equally likely to pick any cookie?

8. What is the probability you don't choose a macaroon?

9. If the probability of choosing a macaroon is known as event A, what notation would you use to write its complement? What would its complement be the equivalent of?

One ticket will be drawn at random from each of the two boxes below:

A : [1] [2] [3] B : [1] [2] [3] [4]

10. What is the probability the number drawn from A is greater than the one drawn from B?

11. What is the probability that the number drawn from A is equal to the one drawn from B?

12. What is the probability the number drawn from A is smaller than the one drawn from B?

Consider an outcome space Ω with events A, B that are *not* mutually exclusive. Let $P(A) = 0.5, P(B) = 0.7$ and $P(A \cap B) = .4$.

13. Draw a Venn Diagram containing two circles, one representing A and the other B.

14. Shade in the space in the diagram above corresponding to event A.

15. Shade in the space in the diagram above corresponding to event B in a way that is different than the way you shaded in the space for event A.

16. Based on your shading, calculate the probability $P(A \cup B)$. Explain why you cannot add $P(A)$ and $P(B)$ directly to obtain this answer.

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