

Classwork 23

April 25, 2021

Beginning of Probability.

$$P(A) = \frac{\text{number of outcomes giving A}}{\text{total number of possible outcomes}}$$

- The box contains 10 blue, 10 green, 10 yellow candies. What is the probability to pull 1 green?
- The standard card deck has 4 suits (hearts, diamonds, spades, and clubs); each suit has 13 different card values: 2 through 10, jack, queen, king, and ace. If you randomly draw one card, what is the probability of getting
 - A queen of spades?
 - A red card?
 - A heart card?
 - A green card?
 - A red queen?
- Addition rule
- Suppose we are drawing a card from the deck of 52 cards and ask: what is the probability of getting either queen or king. Since there are 4 queens and 4 kings, which makes it 8 cards total, we can write
 - $P(\text{queen or king}) = \frac{4+4}{52} = \frac{8}{52} = \frac{2}{13}$
 - We can also write it as follows:
 - $P(\text{queen or king}) = \frac{4+4}{52} = \frac{4}{52} + \frac{4}{52} = P(\text{queen}) + P(\text{king})$
 - In general, we have the following rule:
 - $P(A \text{ or } B) = P(A) + P(B)$
 - if A and B can't happen together. This rule only applies if A and B **do not** happen together. For example, there are 26 red cards in the deck, so the probability of drawing a red card is $\frac{26}{52} = \frac{1}{2}$. However, if we need to get a red card or a queen, then using the addition formula would give $\frac{26}{52} + \frac{4}{52} = \frac{30}{52}$, **which is incorrect: this way, we have counted red queens twice.** The correct answer is $\frac{28}{52}$: 26 red cards plus two black queens (no need to count red queens, they have already been counted).
- Complement rule
- $P(\text{not } A) = 1 - P(A)$
- For example, probability of drawing a queen from a deck of cards is $\frac{1}{13}$; thus, the probability of drawing something other than a queen is $1 - \frac{1}{13} = \frac{12}{13}$.

Homework

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- In the game of roulette, there are 37 slots, numbered 0 through 36. Of numbers 1–36, half are red, the other half are black (zero has no color). What is the probability of hitting
 - A number between 1–12 including 1 and 12
 - An even number other than zero
 - A red number or zero
 - If you bet \$15 on odd numbers (i.e., you win if you roll one of odd numbers), what is the probability of losing?
- You roll two dice, one red, and one black. What is the probability of rolling two ones? Of rolling a 4 and a 6?
- The standard card deck has 4 suits (hearts, diamonds, spades, and clubs); each suit has 13 different card values: 2 through 10, jack, queen, king, and ace. If you randomly draw one card, what is the probability of getting
 - The queen of spades
 - A face card (i.e., jack, queen, or king)
 - A black king
 - Anything but the queen of hearts
- I had drawn a card from the deck, and it turned out to be an ace. Now I am drawing one more card from the same deck. What is the probability that it will be an ace again?
- Suppose we have a box of 500 candies of different colors and sizes. We know that there are 100 large ones and 400 small ones; we also know that there are 70 red ones, 11 of which are large. From this information, can you compute the probability that a randomly chosen candy will be either red or large? Both red and large?
- Solve equation: $5^{-8n} = \frac{1}{625}$
- Add or subtract fractions:
 - $\frac{2}{x} + \frac{1}{y} =$
 - $\frac{1}{(x-1)} - \frac{1}{x} =$