STAT 20 Lec 001 Worksheet 9/26/2019

- A is an event, S is the sample space
- $0 \leq P(A) \leq 1$; $P(S) = 1, P(\emptyset) = 0$
- Write down the multiplication rule:
- Write down the addition rule when $A \cap B \neq \emptyset$:
- A standard deck of cards has 4 suits: hearts (♡), diamonds (♢), clubs (♣), and spades (♠). Each suit has 13 cards: Ace, 2 -10, and three face cards of Jack, Queen, and King.

1. A 5-card poker hand is dealt from a standard deck of cards (with 4 suits - ♡, ♠, ♣, ♢), and 13 kinds for each suit (2, 3, 4, 5, 6, 7, 8 , 9, 10, Jack, Queen, King, Ace). How many distinct ways are there to form a **full house** (three cards of one kind, and two of another)?
   (a) $\binom{13}{3} \times \binom{12}{2}$
   (b) $\binom{13}{3} \times \binom{12}{2} \times \binom{4}{1} \times \binom{4}{3}$
   (c) $\binom{13}{1} \times \binom{12}{1} \times \binom{4}{3} \times \binom{4}{2}$
   (d) None of the above.

2. A 5-card poker hand is dealt from a standard deck of cards (with 4 suits - ♡, ♠, ♣, ♢), and 13 kinds for each suit (2, 3, 4, 5, 6, 7,8 , 9, 10, Jack, Queen, King, Ace). How many distinct ways are there to deal a 5-card hand with 2 pairs?
   (a) $\binom{13}{1} \times \binom{12}{1} \times \binom{4}{2} \times \binom{4}{2}$
   (b) $\binom{13}{1} \times \binom{12}{1} \times \binom{4}{2} \times \binom{4}{2} \times \binom{11}{1} \times \binom{4}{1}$
   (c) $\binom{13}{2} \times \binom{11}{1} \times \binom{4}{2} \times \binom{4}{2} \times \binom{4}{1}$
   (d) None of the above.

3. Suppose that A, B and C are three events with probabilities 0.6, 0.53 and 0.25 respectively.
   (a) What is the largest that $P(A \cap B)$ can be? (1 point)
   (b) What is the smallest that $P(A \cap B)$ can be? (1 point)
   (c) What is the smallest that $P(A \cap B \cap C)$ can be? (1 point)
   (d) What is the largest that $P(A \cap B \cap C)$ can be? (1 point)

4. Suppose A and B are two events with $P(A) = 0.4$, and $P(A \cup B) = 0.7$,

   (a) For what value of $P(B)$ would A and B be independent?

   (b) Are A and B also mutually exclusive, if they are independent? Explain.

   (c) Suppose now that $P(B) = 0.6$ (but we make no assumptions about independence). What would $P(A \cap B)$ be?

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5. Aren is taking part in four competitions. If the probability of him winning any competition he participates in is 0.3, find the probability of him winning *at least one* competition.

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6. A deck is well shuffled and two cards are dealt. Find the chance that the 1st card is a heart and the second card also is a heart.

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7. Every week you buy a ticket in a lottery that has one chance in a million of winning. What is the chance that you *never* win, if you keep this up for ten years? Assume that the event of you winning is independent from week to week.

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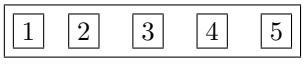
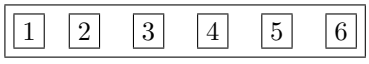
8. One ticket is drawn at random from each of the two boxes below:

   Find the chance that:

   (a) One of the numbers is 2 and the other is 5.

   (b) The sum of the numbers is 7.

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9. A coin is tosses 10 times. Find the chance of getting 7 heads and 3 tails.