

Quiz 3

Make sure to put all your answers in the space provided. You are allowed to have only a writing utensil. **No** calculators, cell phones, scrap paper, etc. Also, be sure to give complete answers and to show your work. In other words, you need to not only answer the questions, **but also to convince me of your answer.**

1. (5 pts) A total of 48 percent of the women and 37 percent of the men that took a certain “quit smoking” class remained non-smokers for at least one year after completing the class. These people then attended a success part at the end of a year. If 62 percent of the original class was male,
- what percentage of those attending the party were women?
 - what percentage of the original class attended the party?

solution: Define $S = \{smoking\}$ and $S^c = \{non - smoking\}$ after a year with no category for “I only smoke when I drink”. Taking a somewhat provincial view that humans may be neatly sorted into two sexes, we define $M = \{male\}$ and $M^c = \{female\}$. We see from the statement of the problem that $P(S^c|M^c) = 0.48$ and $P(S^c|M) = 0.37$. Also, $P(M) = 0.62$.

- (a) The percentage is

$$P(M^c|S^c) = \frac{P(S^c|M^c)P(M^c)}{P(S^c|M^c)P(M^c) + P(S^c|M)P(M)} = \frac{0.48(0.38)}{0.48(0.38) + 0.37(0.62)}$$

- (b) By the law of total probability, the percentage is

$$P(S^c) = P(S^c|M^c)P(M^c) + P(S^c|M)P(M) = 0.48(0.38) + 0.37(0.62)$$

2. (5 pts) Show that if $P(A) > 0$, then

$$P(A \cap B|A) \geq P(A \cap B|A \cup B)$$

solution:

$$P(A \cap B|A) = \frac{P(A \cap B)}{P(A)} \geq \frac{P(A \cap B)}{P(A \cup B)} = \frac{P((A \cap B) \cap (A \cup B))}{P(A \cup B)} = P(A \cap B|A \cup B)$$

The inequality is true since $P(A) \leq P(A \cup B)$.