Week 3: Discussion

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Remarks ::

- Variation – use the IQR or standard deviation. The range is not a good measure of overall spread and variation.
- Reminder: observational studies do **not** imply causation.
- Discuss what happens to a distribution when all values are multiplied/divided by values, values are added, etc.

Quiz 3, attempt 1 ::

- Whenever solving a normal problem, draw the picture of the normal model. Label the center and, in addition, ±1 and ±2 standard deviation. Shade the region of interest.
- Problems have two possible 'directions':

$$x, \mu, \sigma \stackrel{Z-formula}{\Rightarrow} Z \stackrel{Z-table}{\Rightarrow} probability$$

$$probability \stackrel{Z-table}{\Rightarrow} Z \stackrel{Z-formula}{\Rightarrow} x, \mu, \sigma$$

x is typically a cutoff or observation. *probability* may be a flat-out probability or a percentile. (A percentile says what percent of people/subjects/units fall *below* the particular measurement.)

Probability example ::

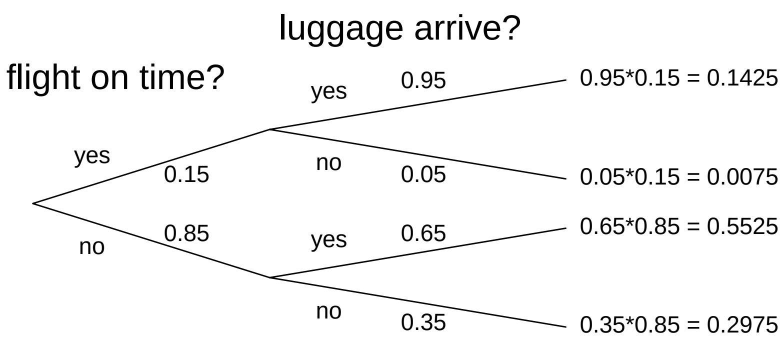
- p335, #23b. M&M's with
  - yellow and red: 20%
  - orange, blue, and green: 10%
  - remainder are brown (30% = 100% - 20% - 20% - 10% - 10% - 10%)
- Pick 3 M&M's. What is the probability that
  - they are all brown? (0.027)
  - the third one is the first that is red? (0.128)
  - none are yellow? (0.512)
  - at least one is green? (0.271)
- For the respective problems,
  - use independence
  - think carefully about what information is available on each M&M
  - use the complement and independence
  - use independence and the complement

Notice that in each problem, it is best to try to identify and classify every M&M (if possible), using the when appropriate. Independence is crucial to determining the probabilities in all cases. In lecture another type of problem has been or will be discussed: finding the probability exactly 2 of the 3 M&M's are a particular color.

Question :: Assume M&M's are produced with the probabilities above. If we had a bag of M&M's directly from the factory, would the draws be independent?

YES. If we knew the proportions in the bag, then they would not be independent. However, since drawing M&Ms from the bag (without knowing the exact inner proportions) is just like getting them directly from the M&M factory, they will have the associated probabilities.

Probability tree example (time permitting) :: p360, #35 (the problem provides the probabilities in the 'yes' branches)



(a) Are the first flight leaving on time and the arrival of the luggage independent events?
No. If so, the conditional probabilities would have been equal.

(b) What is the probability the luggage arrives on time?
$0.1426 + 0.5525 = 0.6951$

#37 If the luggage is late, what are the chances the first flight was delayed?
$0.5525/0.6951 = 0.7949$

Points to emphasize from the last problems ::

$$P(A|B) \equiv \frac{P(A\&B)}{P(B)}$$
$$P(A\&B) = P(A|B)P(B)$$