Math 263: Spring 2014
Quiz 11 **Name**_____

Daniela is taking a flight from Boston to Tucson with a change of planes in Chicago. There is a 20% chance that her first flight to Chicago is on time. If the plane is on time, there is a 90% chance that her luggage makes it onto the second flight with her. If the first flight is late, there is a 60% chance that her luggage gets onto the second flight with her.

Let T be the event that the first flight is on time; let L be the event that her luggage gets onto the second flight with her.

(a) Using these events and their complements (the complements are "not T" and "not L"), write the three probabilities that you are given as unconditional probabilities (that is, as $P(\text{Event})$) or as conditional probabilities (that is, as $P(\text{Event}_1|\text{Event}_2)$)

(i) $20\% = P($_____

(ii) $90\% = P($_____

(iii) $60\% = P($_____

(b) Using the probabilities given, fill in the table for 100 such flights:

	Flight 1 on Time	Flight 1 Not on Time	Total
Luggage on second flight			
Luggage not on second flight			
Total			100

(c) If you pick up Daniela at the Tucson airport and she has her luggage with her, what is the probability that her first flight was on time? (*Leave your answer as a fraction*.)

(d) If the probability *increases* of the luggage getting on to the second flight if the first flight is late, what happens to your answer to part (c)? Does it
Increase_____ or Decrease _____or Stay the same_____? (*check one)*
Reason:

ANSWER

(a) Using these events and their complements, not T and not L, write the three probabilities that you are given as unconditional probabilities (that is, as $P(\text{Event})$) or an conditional probabilities (that is, as $P(\text{Event}_1|\text{Event}_2)$)

(i) $20\% = P(T) = P(\text{Flight 1 on Time})$
(ii) $90\% = P(L|T) = P(\text{Luggage on second flight} \mid \text{Flight 1 on Time})$
(iii) $60\% = P(L \mid \text{Not } T\} = P(\text{Luggage on second flight} \mid \text{Flight 1 not on Time})$

(b) We have

	Flight 1 on Time	Flight 1 Not on Time	Total
Luggage on second flight	18	48	66
Luggage not on second flight	2	32	34
Total	20	80	100

(c) The probability we want is

$$P(\text{First flight on Time} \mid \text{Luggage on second flight}) = \frac{18}{66} = 0.273 = 27.3\%$$

(d) Increase_____ or Decrease __X____or Stay the same_____?
Reason:
The probability that is the answer to part (c) is larger than 20% because the luggage is more likely to make it if the first plane is on time. Thus, knowing the luggage is with her increases the chances the first plane was on time. However, this effect is reduced if the chance of the luggage getting onto the second plane when the first plane is late is increased.

Alternatively

$$P(\text{Luggage on second flight} \mid \text{Flight 1 on Time}) = \frac{18}{66} = \frac{18}{18+48}.$$

If the 60% increases, the 48 increases, so the probability decreases.