Part 2: Free Response

Answer completely, but be concise. Write sequentially and show all steps.

11. Many fire stations handle emergency calls for medical assistance as well as those requesting fire fighting equipment. A particular station says that the probability that an incoming call is for medical assistance is 0.85. This can be expressed as P(call is for medical assistance) = 0.85.

(a) Give a relative frequency interpretation of the given problem.

IF WE KEEP TRACK OF THE REASON FOR MANY, MANY CALLS, THE PROPORTION OF THESE MANY CALLS THAT ARE FOR MEDICAL ASSISTANCE IS CLOSE TO .85.

(b) What is the probability that a call is not for medical assistance?

P(CALL IS NOT FOR MEDICAL ASSISTANCE) = .15

(c) Assuming that successive calls are independent of one another, calculate the probability that two successive calls will both be for medical assistance.

P(2 CALLS FOR M.A.) = (.85)(.85) = 0.7225

(d) Still assuming independence, calculate the probability that for two successive calls, the first is for medical assistance and the second is not for medical assistance.

P(1ST FOR M.A., 2ND IS NOT) = (.85)(.15) = 0.1275

(e) Still assuming independence, calculate the probability that exactly one of the next two calls will be for medical assistance.

P(EXACTLY 1 CALL FOR M.A) = (.85)(.15) + (.15)(.85) = 0.255

(f) Do you think that it is reasonable to assume that the requests made in successive calls are independent? Explain briefly. A LOCAL FIRE STATION HANDLES CALLS FOR LOCAL EVENTS. TWO PEOPLE COULD REASONABLY BE CALLING TO REPORT THE SAME EVENT SO IT IS NOT REASONABLE TO ASSUME THAT THE REASONS FOR CALLS ARE INDEPENDENT.

12. Approximately 30% of the calls to an airline reservation phone line result in a reservation being made.

(a) Suppose that an operator handles 10 calls. What is the probability that none of the 10 results in a reservation? P(NO RESERVATION) = .7

SO P(NO RESERVATIONS IN 10 CALLS) = $(.7)^{10}$ = 0.028

(b) What assumptions did you make in order to calculate the probability in (a)?

I ASSUMED THE CALLS ARE INDEPENDENT. THAT IS WHETHER A CALLER MAKES A RESERVATION DOES NOT DEPEND ON THE PREVIOUS CALLS' OUTCOME.

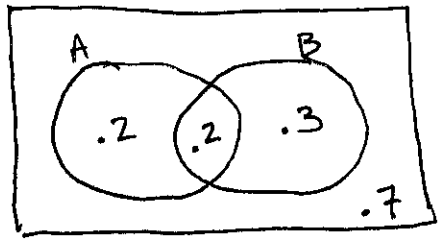
(c) What is the probability that at least one call results in a reservation being made?

P(AT LEAST 1 RESERVATION) = 1 − P(NO RESERVATIONS)

= 0.972

13. May has applied to both Harvard and the University of Florida. She thinks the probability that Harvard will admit her is 0.4, the probability that Florida will admit her is 0.5, and the probability that both will admit her is 0.2.

(a) Make a Venn diagram with the probabilities given marked.



A = THE EVENT HARVARD ADMITS
B = THE EVENT FLORIDA ADMITS

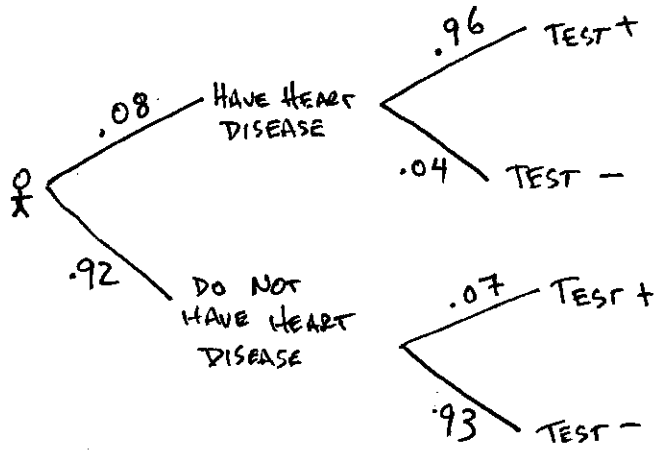
(b) What is the probability that neither university admits May?

$P(\text{NEITHER ADMITS}) = .7$

(c) What is the probability that she gets into Florida but not Harvard?

$P(\text{FLORIDA, NOT HARVARD}) = .3$

14. Heart disease is the #1 killer today. Suppose that 8% of the patients in a small town are known to have heart disease. And suppose that a test is available that is positive in 96% of the patients with heart disease, but is also positive in 7% of patients who do not have heart disease. If a person is selected at random and given the test and it comes out positive, what is the probability that the person actually has heart disease?



$$P(\text{HAVE HEART DIS} \mid \text{TEST}^+) = \frac{P(\text{H.D.}, \text{TEST}^+)}{P(\text{TEST}^+)}$$

$$= \frac{(.08)(.96)}{(.08)(.96) + (.92)(.07)}$$

$$= 0.544$$

I pledge that I have neither given nor received aid on this test: _____