MTH 341 Probability First Exam Practice

Name ______________________________

Review First Quiz questions also!

1. The formula for defining the conditional probability P(A | B) is given by

a) $P(A \mid B) = P(B) / P(AB)$

b) $P(A \mid B) = P(AB) / P(A)$

c) $P(A \mid B) = P(A) / P(AB)$

d) $P(A \mid B) = P(AB) / P(B)$

2. The equation for the Law of Total Probability when the partition involves 3 events is:

a) $P(A) = P(A \mid B_1) P(B_1) + P(A \mid B_2) P(B_2) + P(A \mid B_3) P(B_3)$

b) $P(A) = P(A) / P(B_1) + P(A) / P(B_2) + P(A) / P(B_3)$

c) $P(A) = P(A) P(B_1) + P(A) P(B_2) + P(A) P(B_3)$

d) $P(A) = P(A \mid B_1) + P(A \mid B_2) + P(A \mid B_3)$

3. The definition for independence of two events A and B is

a) The probability of A is not influenced by the fact that B has occurred.

b) Neither event influences each other.

c) The events cannot happen simultaneously.

d) $P(AB) = P(A)P(B)$.

4. Let A and B be events that have the following probabilities

$P(A) = 0.3$; $P(B) = 0.5$, $P(AB) = 0.15$.

a) Compute the following probabilities:

$P(B^c)$

$P(A \cup B)$

$P(A \mid B)$

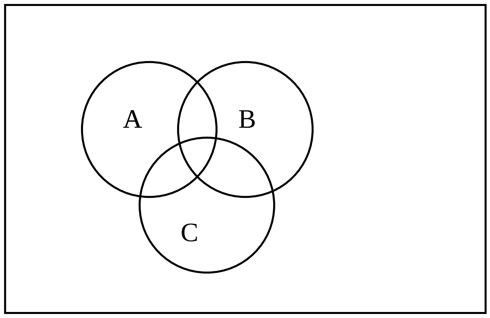
$P(B \mid A)$

$P(A - B)$

b) Are A and B independent events? Explain.

c) Are A and B mutually exclusive events? Explain.

5.



On the Venn Diagram above shade the set $(AB) \cup C^{c}$

6. Pick a real number at random from the interval [2,5].

a) What is the probability of picking a number in the interval (3,4)?

b) What is the probability of picking the number 3?

7. Compute the following (You may give your answer in factorial (!) notation if you wish). Suppose there are 15golfers who are competing in a tournament. They need to have their picture taken. (You may leave your answers in factorial notation if you so choose).

a) How many different ways can we line them up for their group picture (from left to right)?

b) Only golfers with the lowest scores will win medals (1^{st} place, 2^{nd} place, 3^{rd} place, and 4^{th} place). How many different ways can the medals be awarded amongst these 15 golfers.

c) Six of these 15 golfers will be selected for the varsity team. How many different ways can we choose six of them for the varsity team (order not being important).

d) If we want to select golfers deserving of recommendations for scholarships, how many different groups of these 15 golfers can we select (assuming that we may in fact recommend none of the golfers?

8. Suppose we have a group of 8 fuses, five good fuses and three defective. If we test three of them one-by-one at random and without replacement, what is the probability that we find exactly two good fuses and one bad fuse?

9. Suppose that events A, B, and C are independent with probabilities 1/2,1/4, and 1/3. Compute the probabilities of the following:

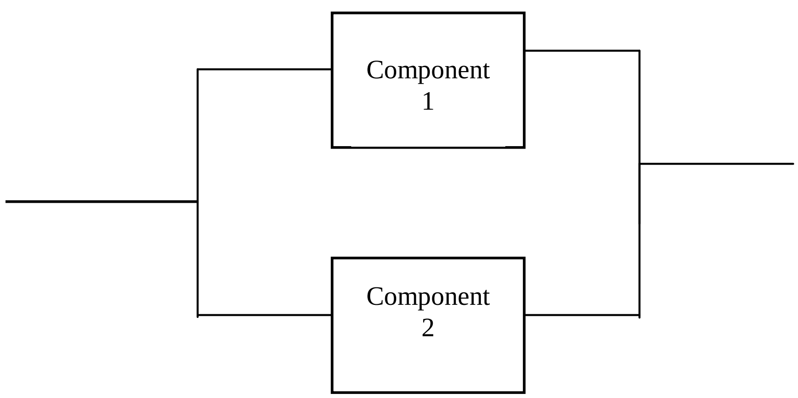
a) P(ABC)

b) $P(A^{c}B^{c}C^{c})$

10. Suppose we deal three cards (without replacement) from a well shuffled deck of 52 cards. Calculate the probability that the first card dealt is an Ace , the second card dealt is a king, and the third card is a queen (Recall there are 4 aces , 4 kings and 4 queens in the deck.)

11. Apply the Law of Total Probabilty to solve the following problem:
Suppose that in a pediatric care unit, we have 30% under the age of 2, and 15% of this age group has cancer, 50% are over 2 and under 5 (20% of this age group has cancer), and the rest are 5 years old or over (of which 25% have cancer). What is the percentage of patients in the unit that have cancer?

12. Suppose the following electrical circuit has two ***independent*** components connected in parallel. Suppose that component 1 works with probability 3/4 and component 2 works with probability 4/5. What is the probability that the circuit works?

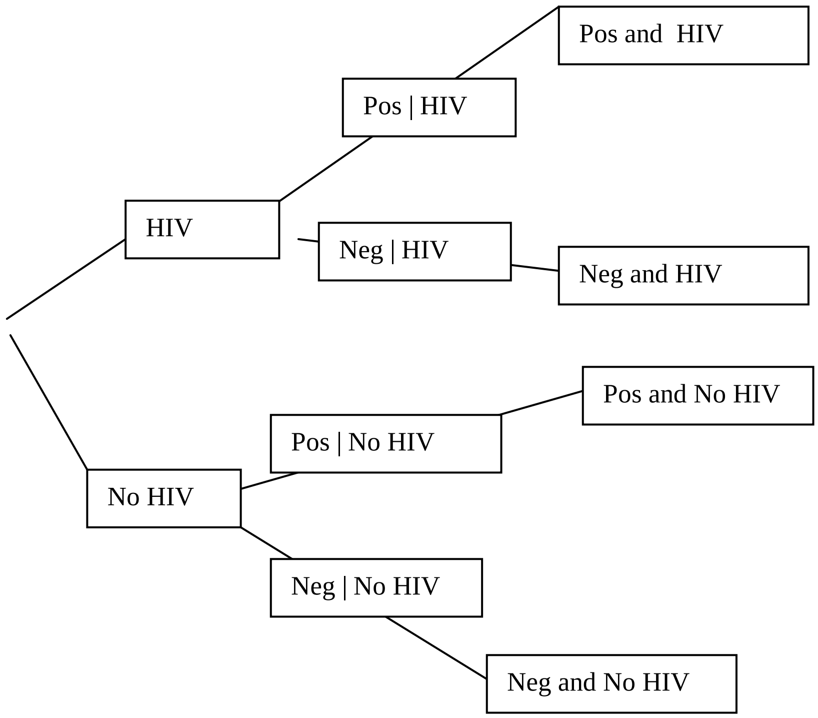


Answer:

13. Answer same question as above for two independent circuits in serial

13. Conditional Probability (Bayes' Theorem): Assume a laboratory performs a test for a HIV. Given that a person has the HIV virus, he/she will test positive with probability .95. Given that a person does not have the virus, he/she will test positive with probability .02. Assume the 10% of the population has the HIV virus(and 90% do not). Assume we pick a person at random from the population and then test them for the virus.

a) Draw the tree diagram representing this two stage experiment, filling in the probabilities of ALL the labeled events below the label.



b) What is the probability not having the HIV virus given that one has tested positive?