

A13

Extra credit module 13

Extended Probability Topics

Stat 251

Instructions:

Only upload in BbLearn. Follow directions on Assignments link on class website for BbLearn submissions; deviation from instructions will result in no earned points.

This assignment is worth up to 3.5 points **if and only if you complete ALL problems**

- (1) A special deck of cards has ten cards. Four are green, three are blue, and three are red. When a card is picked, its color of it is recorded. An experiment consists of first picking a card and then tossing a coin
 - (a) List the sample space
 - (b) Let A be the event that a blue card is picked first, followed by landing a head on the coin toss. Find $P(A)$
 - (c) Let B be the event that a red or green is picked, followed by landing a head on the coin toss. Are the events A and B mutually exclusive? Explain your answer in one to three complete sentences, including numerical justification
 - (d) Let C be the event that a red or blue is picked, followed by landing a head on the coin toss. Are the events A and C mutually exclusive? Explain your answer in one to three complete sentences, including numerical justification

- (2) A box of cookies contains three chocolate and seven butter cookies. Miguel randomly selects a cookie and eats it. Then he randomly selects another cookie and eats it. (How many cookies did he take?)
 - (a) Draw the tree that represents the possibilities for the cookie selections. Write the probabilities along each branch of the tree
 - (b) Are the probabilities for the flavor of the SECOND cookie that Miguel selects independent of his first selection? Explain
 - (c) For each complete path through the tree, write the event it represents and find the probabilities
 - (d) Let S be the event that both cookies selected were the same flavor. Find $P(S)$
 - (e) Let T be the event that the cookies selected were different flavors. Find $P(T)$ by two different methods
 - (1) by using the complement rule and
 - (2) by using the branches of the tree (your answers should be the same with both methods)
 - (f) Let U be the event that the second cookie selected is a butter cookie. Find $P(U)$

- (3) An underwriter of home insurance policies studies the problem of home fires resulting from wood-burning furnaces. Of all homes having such furnaces, 30% own a type A furnace, 25% a type B furnace, 15% a type C, and 30% other types. Over three years, 5% of type A furnaces, 3% of type B, 2% of type C and 4% of other types have resulted in fires
 - (a) What is the probability of a fire?
 - (b) If a fire occurs in a particular home, what is the probability that a type A furnace is in the home?

- (4) A genetic test is used to determine if people have a predisposition for thrombosis, which is the formation of a blood clot inside a blood vessel that obstructs the flow of blood through the circulatory system. It is believed that 3% of people actually have this predisposition. The genetic test is 99% accurate if a person actually has the predisposition, meaning that the probability of a positive test result when a person actually has the predisposition is 0.99. The test is 98% accurate if a person does not have the predisposition.
- (a) Draw the tree that represents the possibilities for the predisposition for thrombosis of selections. Write the probabilities along each branch of the tree
 - (b) What is the probability that a randomly selected person who tests positive for the predisposition by the test actually has the predisposition?