MAT 2377 3X (Spring 2011)

Assignment 1
Deadline : Thursday, May 19 in class.

Note : You must give complete details in your solutions. To receive points for the question, you must clearly justify your final answer.

Please answer the following 6 questions.

1. If the probabilities are 0.87, 0.36, and 0.29 that, while under warranty, a new car will require repairs on the engine, drive train, or both.
   (a) What is the probability that a car will require at least one of the types of repairs under warranty ?
   (b) What is the probability that a car will not require engine repairs under warranty ?
   (c) What is the probability that a car will not require engine repairs under warranty or will not require drive train repairs under warranty ?
2. Strands of copper wire from a manufacturer are analyzed for strength and conductivity. The results from 102 strands are as follows :

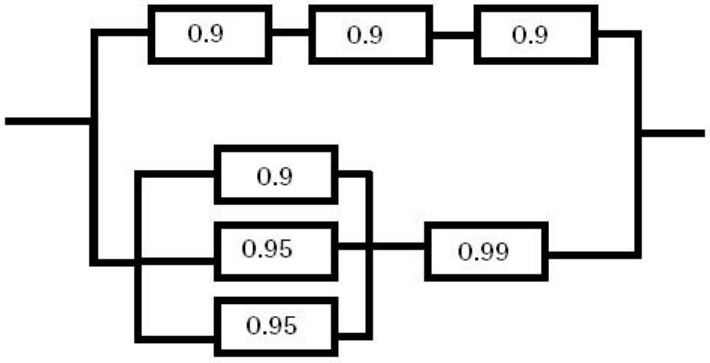
	strength	
	high	low
high conductivity	74	8
low conductivity	16	4

   (a) If a strand is randomly selected, what is the probability that its conductivity is high and its strength is high ?
   (b) If a strand is randomly selected, what is the probability that its conductivity is low or the strength is low ?
   (c) Given that a randomly selected strand has low conductivity, what is the probability that it will have low strength ?
   (d) Consider the event that a strand has low conductivity and the event that the strand has a low strength. Are these events mutually exclusive ?
   (e) Consider the event that a strand has low conductivity and the event that the strand has a low strength. Are these events independent ?
3. Refer to Question 2. Suppose that we randomly select 3 of the 20 strands of wire with low conductivity.
   (a) What is the probability that all three have high strength ?
   (b) What is the probability that at most one will have high strength ?
4. An insurance company believes that people can be divided into two classes – those that are accident prone and those that are not. Their statistics show that an accident-prone person will have an accident at some time within a fixed 1-year period with probability 0.35, whereas this probability decreases to 0.05 for a non-accident-prone person.
   a) If we assume that 30 percent of the population is accident prone, what

is the probability that a new policy holder will have an accident within a year of purchasing a policy ?

b) Suppose that a new policy holder has an accident within a year of purchasing his policy. What is the probability that he is accident prone ?

5. The following circuit operates only if there is a path of functional devices from left to right. The probability that each device functions is shown on the graph. Assume that devices fail independently. What is the probability that the circuit operates ?



6. A Web as can be designed from four different colours, three font types, five font sizes, three images, and five text phrases. A specific design is randomly generated by the Web server when you visit the site. Let A denote the event that the design colour is red and let B be the event that the font size is not the smallest one. Use the addition rules to compute the following probabilities.

   (a) $P(A \cup B)$
   (b) $P(A' \cup B')$
   (c) $P(A \cup B')$