Statistics 13V NAME:____________________________________
Sample Quiz 5 Last six digits of student ID#:____________

Show all work. Each question is worth 10 points, *unless otherwise specified.*

Scenario for Questions 1 to 5: An herbal treatment is being tested to see if it will help people who are suffering from seasonal allergies. Suppose the truth is that the treatment actually will help 60% of people who take it, and results are independent from one person to the next.

1. If the treatment is given to two people, what is the probability that they are both helped by it?

   The probability for each person is .6, and we are told that the results are independent from one person to the next. Therefore, using Rule 3b, the probability that the first person is helped AND the second person is helped is ***(.6)(.6) = .36.***

2. Define these two events: **A** = the first person is helped by the treatment
   B = the second person is helped by the treatment.
   Which of the following is true about the events A and B?
   A. They are independent events but not mutually exclusive events.
   B. They are mutually exclusive events but not independent events.
   C. They are both independent events and mutually exclusive events.
   D. They are neither independent events nor mutually exclusive events.

3. Event **A** is defined in Question 2 as "the first person is helped by the treatment." Explain in words the event $\mathbf{A}^C$ and give the probability $P(A^C)$.

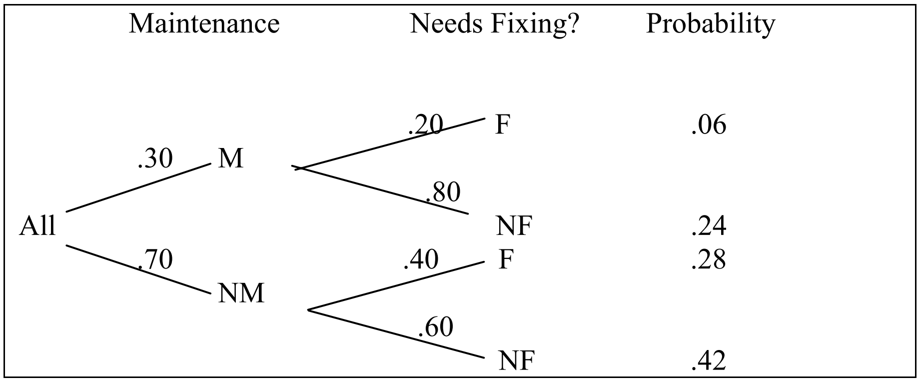
   The complement of A is that the first person is not helped by the treatment. Using Rule 1, the probability is $P(A^C) = 1 – P(A) = 1 - .6 =$ ***.4***.

4. Which of the following sequences resulting from tossing a fair coin 5 times is *most* likely, where H=head and T=tail?
   A. HHHHH
   B. HTHHT
   C. HHHTT
   D. They are equally likely

5. (From CyberStats Unit B2) In a group of 250 students, 25 are biology majors. If a student is randomly selected from this group, what is the probability that the student is <u>not</u> a biology major?
   A. .10
   B. .25
   C. .75
   D. ***.90***

Scenario for Questions 6 to 8: An automobile company has noticed that 30% of people who buy a new car get regular maintenance for it. For people who do get regular maintenance, the probability is 0.20 that they will need something fixed during the warranty period. For people who don't get regular maintenance, the probability is 0.40 that they will need something fixed during the warranty period.

6. (**20 points**) Draw a tree diagram for this situation ***or*** construct a "hypothetical hundred thousand" table. (To save time, you can use the abbreviations M = regular maintenance and NM = no regular maintenance; F = need something fixed and NF = no need to have something fixed during warranty.)



Hypothetical hundred thousand table:

	F	NF	Total
M	6,000	24,000	30,000
NM	28,000	42,000	70,000
Total	34,000	66,000	100,000

7. (**15 points**) What is the overall probability that someone who buys one of these cars will need something fixed during the warranty period? (Your results from Part (a) should help you to answer this.)

From the tree diagram, it's the sum of the probabilities for the branches ending in "F" = *.06+.28=.34.*

From the hypothetical hundred thousand table, it's the proportion in the column "F" $= \frac{34{,}000}{100{,}000} = .34.$

8. (**15 points**) Given that someone needs something fixed during the warranty period, what is the probability that he or she did *not* get regular maintenance?

From the tree diagram and the probability rules, it is $P(NM \mid F) = \frac{P(NM \text{ and } F)}{P(F)} = \frac{.28}{.34} = .8235$

From the table, it's the proportion of NM in the F column $= \frac{28{,}000}{34{,}000} = .8231$