Quiz 3   Key
Math 1040–1
June 15, 2012

Directions: Show all work for full credit. Clearly indicate all answers. Simplify all mathematical expressions completely. Unless otherwise directed, give each decimal approximation rounded to at least three decimal places.

1. Consider the experiment carried out by flipping a fair coin, then rolling a fair (six-sided) die.

   (a) Draw a tree diagram for this experiment. (9 points)
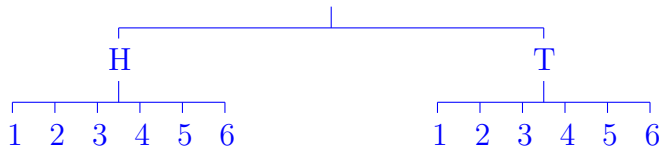
   (b) What is the probability that you get heads on the coin and roll an even number? (6 points)
   There are 3 out of 12 equally likely outcomes that match this description, so the probability is $3/12 = 1/4 = .25$. You could also calculate this by noticing that the outcomes for the coin and die are independent, so $P(\text{heads and even}) = P(\text{heads}) \cdot P(\text{even}) = \frac{1}{2} \cdot \frac{3}{6} = 1/4 = .25$.

2. The access code for a garage door consists of three digits. Each digit can be any number from 0 to 9, and each digit can be repeated. (#45 from 3.1)

   (a) What is the probability of randomly selecting the correct access code on the first try? (7 points)
   There are $10 \cdot 10 \cdot 10 = 1000$ total options for three-digit codes. Only one is correct, so the probability of getting the correct code on the first try is $1/1000 = 0.001$.

   (b) What is the complement of the event in part 2a? What is the probability of this event? (8 points)
   The complement is "selecting an incorrect code on the first try." Its probability is $1 - 0.001 = 0.999$.

3. The table shows the results of a survey in which 146 families were asked if they own a computer and if they will be taking a summer vacation during the current year. (A shorter version of #19 from 3.2)

| | | Summer Vacation This Year | | |
		Yes	No	Total
Own	Yes	87	28	115
a	No	14	17	31
Computer	Total	101	45	146

(a) Find the probability that a randomly selected family is taking a summer vacation this year. (8 points)

There are 101 out of 146 families taking a vacation this year, so the probability is $101/146 = 0.692$.

(b) Find the probability that a randomly selected family is taking a summer vacation this year, given that they own a computer. (8 points)

Out of the 115 families that own a computer, 87 of them are taking a vacation, so the probability is $87/115 = 0.757$.

(c) Are the events "owning a computer" and "taking a summer vacation this year" independent of dependent events? Explain. (6 points)

The events are dependent, since $P(\text{vacation}) \neq P(\text{vacation} \mid \text{computer})$ from parts a and b.

4. Two cards are selected from a standard deck without replacement. What is the probability that a spade is selected for the first card, then a heart? (8 points)

$$P(\spadesuit \text{ and } \heartsuit) = P(\spadesuit) \cdot P(\heartsuit \mid \spadesuit) = \frac{13}{52} \cdot \frac{13}{51} = \frac{13}{204} = 0.0637$$