Week in Review #7

Section 7.5: Conditional Probability and Independent Events.
Section 7.6: Bayes' Theorem.

- TO CONVERT CONDITIONAL PROBABILITY TO REGULAR PROBABILITY.
  - $P(B|A) = \dfrac{P(B \cap A)}{P(A)}$
  - probability of the event B occurring knowing that the event A has already occurred.
- A and B are independent events if and only if $P(A \cap B) = P(A)P(B)$

1. A clothing company selected 1000 persons at random and surveyed them to determine a relationship between age of purchaser and annual purchases of jeans. The results are given in the table. A person from the survey is selected at random.

   (a) What is the probability that the person is under 12 if they purchases 3 or more pairs of jeans annually.

   (b) What is the probability that the person purchases 2 pairs of jeans annually if we know they are older than 25.

Jeans Purchased Annually

Age	0	1	2	3 or More	Totals
Under 12	60	70	30	10	170
12-18	30	100	100	60	290
19-25	70	110	120	30	330
Over 25	100	50	40	20	210
Totals	260	330	290	120	1000

   (c) What is the probability that the person is younger than 19 given they purchase 0 or 1 pair of jeans annually.

2. S is the sample space with events: E, F, and G. Use this information to answer these questions.

   $S = \{s_1, s_2, s_3, s_4, s_5, s_6,\}$
   $E = \{s_1, s_2, s_5, s_6\}$
   $F = \{s_2, s_4, s_5\}$
   $G = \{s_3, s_5\}$

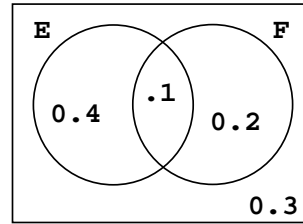| outcome	s_1	s_2	s_3	s_4	s_5	s_6
prob.	$\dfrac{2}{29}$	$\dfrac{7}{29}$	$\dfrac{1}{29}$	$\dfrac{11}{29}$	$\dfrac{6}{29}$	$\dfrac{2}{29}$

   (a) $P(F|E) =$

   (b) $P(G|F) =$

3. Use the Venn Diagram to answer the following.

   (a) $P(E|F) =$

   (b) $P(F^C|E) =$

4. Fill in the missing values of the tree and then answer the following.

   (a) $P(B \cap E) =$

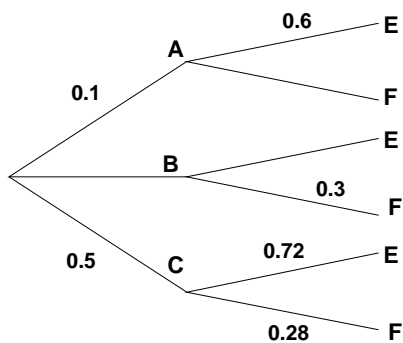   (b) $P(E|C) =$

   (c) $P(E) =$

   (d) $P(A \cup F) =$

   (e) $P(C|E) =$

   (f) Are the events B and E independent?
       Justify your answer.

   (g) Are the events A and E independent?
       Justify your answer.

5. Two cards are drawn from a standard deck of cards without replacement. What is the probability that the first card is a club if the second card is a club?

6. Two cards are drawn from a standard deck of cards without replacement. What is the probability that the first card is an Ace if the second card is a diamond?

7. A building on campus has three vending machines: two coke machines and a snack machine. Based on the model of the machines, the first coke machine has a 12% chance of breaking down in a particular week and the second coke machine has a 4% chance of breaking down in a particular week. The snack machine has a 10% chance of breaking down in a particular week. Assuming independence, find the probability that exactly one machine breaks down.

8. The following information was compiled regarding married couples living in single-family dwellings. It was found that in 30% of these households, both the husband and the wife worked, and that 10% of these couples were renting. In 50% of the households, only the husband worked, and 20% of these couples were renting. In 15% of the households, only the wife worked, and 70% of these couples were renting. In the households where neither worked, 95% were renting. A couple from this group is selected at random.

   (a) Find the probability that
       this couple is renting.

   (b) What is the probability that only
       the husband works and the couple
       owns their house?

   (c) If the couple is renting, find the
       probability that only the wife
       is working.

9. An auto insurance company classifies its drivers as good risk, medium risk or bad risks. The table shows the percent of the drivers in these classifications and the probability that a driver in that classification will have an accident during the next year. A driver is selected bar random.

   (a) What is the probability that the driver will have
       an accident in the next year?

Classification	drivers(%)	Accident(%)
good	50	2
medium	35	5
bad	15	12

   (b) What is the probability that the driver is rated
       as a medium risk if they had an accident in the
       next year?

   (c) What is the probability that the driver is rated
       as a bad risk and they did not have an accident
       in the next year.

Section 8.1: Distribution of Random variables.

- A random variable is a rule that assigns a number to each outcome of an experiment.
    - finite discrete: takes on a finite number of values(skips values).
    - infinite discrete: takes on an infinite number of values(skips values).
    - continuous: takes on any value in an interval.
- probability distribution
- a histogram is a probability distribution represented by a graph(chart).

10. Classify the random variable as finite discrete, infinite discrete or continuous and give the values of the random variable.

    (a) You toss a coin and X = the number of tosses until the first head occurs.

    (b) A football team plays twelve games in a regular season and X = the number of games the team wins.

    (c) X = the temperature of a fish tank in your house.

    (d) X = the number of minutes that you slept in your math class on a particular class day.

11. A box has 2 green, 2 red and 5 yellow balls. A sample of 6 balls are drawn without replacing the balls drawn. Let the random variable X be the number of yellow balls drawn.

    (a) Give the range of values that the random variable X may assume.

    (b) Find the probability distribution of X.

    (c) Draw the histogram of X.

    (d) $P(X = 4) =$

    (e) $P(X < 4) =$

12. You pay \$2.00 to play a game. The game consists of flipping two coins. If both coins are heads, then you get to spin the spinner on the left for the dollar amount that you win. If both coins are tails, then you get to spin the spinner on the right for the dollar amount that you win. All other results for the coins means that you lose the game. Assume that the sections in each respective spinner are equal. Let the random variable X be your net winnings when you play the game one time. What is the probability distribution for this game.