

**Math 141 Week in Review**  
**Week 9 Problem Set**

Note: Not every topic is covered in this review. It is more heavily weighted towards Sections 8.4-8.6, since these are new. Please also look at the previous Week in Reviews for more practice from other sections.

1. Determine whether the following experiments are binomial.
  - A. Picking 3 cards in succession with replacement from a deck of cards and observing if the card is a king.
  - B. Tossing a coin until a head is tossed.
  - C. Rolling a pair of dice 5 times and recording each sum.
  - D. Picking 4 marbles in succession without replacement from a jar of 3 red and 5 blue marbles and observing the color of the marble.
  
2. A certain medicine is known to cause headaches in 35% of those who take it. In a group of 15 people who are taking this medicine, what is the probability that:
  - A. Exactly 7 of them will have headaches?
  - B. At most 5 of them will have headaches?
  - C. At least 9 will have headaches?
  
3. Suppose a biased coin is tossed 400 times. The coin is biased in such a way that the probability of tossing a head is .70. What is the probability that
  - A. Exactly 275 heads are tossed?
  - B. More than 300 heads are tossed?
  - C. 293 or fewer heads are tossed?
  - D. What is the expected number of heads that will be tossed?
  - E. What are the variance and standard deviation for the number of heads tossed?
  
4. Calculate the following probabilities.
  - A.  $P(-0.33 < Z < 0.47)$
  - B.  $P(Z < 0.93)$
  - C.  $P(Z > 0.29)$
  
5. Suppose that the number of Doritos in a bag is normally distributed with a mean of 65 and a standard deviation 8. What is the probability that a bag selected at random
  - A. contains between 55 and 80 chips, inclusive?
  - B. contains more than 90 chips?

6. The government of a country wants to create a system for tax purposes where families are classified as “elite,” “upper class,” “middle class,” or “lower class” based on the total family income. Suppose family incomes in this country are normally distributed with a mean of \$30,000 and a standard deviation of \$9,000. The government knows that they want 15% elite, 25% upper class, 40% middle class, and 20% lower class.
- A. What is the minimum household income for an “elite” family?
  - B. What would be the range of income classified as “middle class?”
7. Suppose that when David Beckham shoots at the goal, his probability of scoring is 0.1 and that he attempts 400 shots on the goal during a season. Use an appropriate normal distribution to approximate the binomial probabilities. What is the probability that Beckham scores
- A. between 35 and 45 goals, inclusive?
  - B. at least 50 goals?
  - C. fewer than 38 goals?
8. Victoria Beckham’s closet is littered with shoes. There are 5 single sandals, 9 single heels, and 4 single boots. Suppose that 6 shoes are selected at random from Posh’s closet. What is the probability that
- A. exactly 4 sandals and exactly 2 boots are selected?
  - B. exactly 3 heels or exactly 2 sandals are selected?
  - C. at least 1 boot is selected?
9. Suppose that 59% of students at Texas A&M listen to country music. It is known that 37% of those who listen to country music attended the State Fair of Texas while 26% of those who do not listen to country music attended the State Fair.
- A. What is the probability that a student who listens to country music did not attend the State Fair of Texas?
  - B. What is the probability that a student does not listen to country music and did not attend the State Fair?
  - C. Are the events “listens to country music” and “attends the State Fair” independent events?

10. A bag of jellybeans contains 7 reds and 10 yellows. An experiment consists of picking a jellybean at random. If the jellybean is red, it is immediately eaten and a second jellybean is picked from the bag. If the jellybean is yellow it is put back into the bag and a second jellybean is picked from the bag. What is the probability that the first jellybean is red given that the second jellybean is yellow?
11. A lie detector correctly indicates that a person is lying 94% of the time. However, 11% of the time, the test incorrectly indicates that a person is lying when they really aren't. A group of students are asked "Do you like math?" while hooked up to a lie detector. It is known that 45% of these students are actually lying. If the test says a person is not lying, what is the probability that the person really is?
12. A game costs \$3 to play. The game involves drawing two cards at random from a deck of cards. If a pair of aces is drawn, you win \$38. If any other pair is drawn, then you win \$13. If two cards of the same suit are drawn, you win \$8. Otherwise, you win nothing.

- A. What are the expected net winnings of a person who plays this game?  
 B. Is this game fair?  
 C. What are the standard deviation and variance for the net winnings?

13. The following table describes the hourly wages of 150 TAMU student workers who have the title of Student Worker I. (The data is fictional.)

<b>Hourly Wage (in \$)</b>	6.00	6.50	7.00	7.50	8.00
<b>Number of Students</b>	47	34	28	22	19

- A. Find the mean, median, mode, standard deviation, and variance for the hourly wage.  
 B. Find the probability distribution of  $X$  where  $X$  is the hourly wage.  
 C. What is  $P(X > 7)$ ?

14. Determine whether the following statements are True or False:
- A. An experiment consists of rolling a die 4 times. Let  $X$  be the sum of the numbers rolled.  $X$  is a finite discrete random variable.
  - B. An experiment consists of drawing cards without replacement from a standard deck until all four Aces have been drawn. Let  $X$  be the number of draws needed.  $X$  can be any value in the set  $\{1, 2, 3, \dots, 52\}$ .
  - C. A bag of marbles contains 5 reds and 6 blues. An experiment consists of pulling marbles out in succession with replacement until a red marble is pulled. Let  $X$  be the number of pulls needed.  $X$  is an infinite discrete random variable.
  - D. Let  $X$  be the amount of time (in hours) it takes a person to drive to work or school every day.  $X$  is an infinite discrete random variable.
  - E. If the odds that a person finishes the crossword are 2 to 17, the probability that the person will not finish the crossword (rounded to 4 decimal places) is 0.8947.
  - F. If the probability that a person likes math is 0.88, the odds that a person does not like math are 22 to 3.
  - G. The total area under a probability histogram is equal to 1.
  - H. The median of a distribution is the point where the probability histogram is in balance.