

Math 141 Exam 3 Review Problem Set

Note: Not every topic is covered in this review. It is more heavily weighted on 8.4-8.6. Please also take a look at the previous Week in Reviews for more practice problems on other sections.

- Determine whether the following experiments are binomial.
 - Picking 3 cards in succession with replacement from a deck of cards and observing if the card is a king.
 - Tossing a coin until a head is tossed.
 - Rolling a pair of dice 5 times and recording the sum.
 - Picking 4 marbles in succession without replacement from a jar of 3 red and 5 blue marbles and observing the color of the marble.
- A certain medicine is known to cause nausea in 35% of those who take it. In a group of 15 people who are taking this medicine, what is the probability that:
 - Exactly 7 of them will have nausea?
 - At most 5 of them will have nausea?
 - At least 9 will have nausea?
- Suppose a biased coin is tossed 400 times. The coin is biased such that the probability of tossing a head is .70. What is the probability that
 - Exactly 275 heads are tossed?
 - More than 300 heads are tossed?
 - 293 or fewer heads are tossed?
 - What is the expected number of heads that will be tossed?
 - What are the variance and standard deviation for the number of heads tossed?
- Calculate the following probabilities. (Z is the standard normal random variable.)
 - $P(-0.33 < Z < 0.47)$
 - $P(Z < 0.93)$
 - $P(Z > 0.29)$
- Find the value of z that satisfies the following probabilities.
 - $P(Z < z) = 0.3682$
 - $P(Z > z) = 0.9778$
 - $P(-z < Z < z) = 0.5254$
- Suppose that the weights of students at a university are normally distributed with a mean of 165 and a standard deviation 24. What is the probability that a student selected at random
 - weighs between 150 and 200 pounds?
 - weighs more than 215 pounds?

7. The government of a certain 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. If this government knows that they want 15% elite, 25% upper class, 40% middle class, and 20% lower class, what would be the range of income classified as “middle class?”
8. Suppose the probability that Acie Law makes a 3-pointer is 0.64 and that he attempts 400 3-pointers during his career. Use an appropriate normal distribution to approximate the following binomial probabilities.
 - (a) What is the probability that Acie makes between 250 and 300 3-pointers (inclusive)?
 - (b) What is the probability that Acie makes at least 230 3-pointers?
 - (c) What is the probability that Acie makes fewer than 260 3-pointers?
9. A toy chest contains 9 Micro Machines, 7 Lego blocks, and 4 GI Joes. Suppose that 6 toys are selected at random from the box. What is the probability that
 - (a) exactly 4 Lego blocks and exactly 2 GI Joes are selected?
 - (b) exactly 3 Micro Machines or exactly 2 Lego blocks are selected?
 - (c) at least 1 GI Joe is selected?
10. 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 Chilifest while 26% of those who do not listen to country music attended Chilifest.
 - (a) What is the probability that a student does not listen to country music and did not attend Chilifest?
 - (b) What is the probability that a student who listens to country music did not attend Chilifest?
 - (c) Are the events “listens to country music” and “attends Chilifest” independent events?
11. A bag of jelly beans contains 7 whites and 10 oranges. An experiment consists of picking a jelly bean at random. If the jelly bean is white, it is immediately eaten and a second jelly bean is picked from the bag. If the jelly bean is orange it is put back into the bag and a second jelly bean is picked from the bag. What is the probability that the first jelly bean is white given that the second jelly bean is orange?
12. 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?
13. 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. What are the expected net winnings of a person who plays this game. Is this game fair? What are the standard deviation and variance for the net winnings?

14. There are 130 boxes of Cheerios in a grocery store. The following table tells you how many boxes had a certain number of Cheerios in them.

Number of Cheerios	510	480	467	434	521	535
Number of boxes	23	40	17	30	9	11

- (a) Find the mean, median, mode, standard deviation, and variance for the number of Cheerios in a box.
- (b) Find the probability distribution of X where X is the number of Cheerios in a box.
- (c) What is $P(X > 500)$?
15. Determine whether the following statements are True or False:
- (a) TRUE FALSE 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) TRUE FALSE 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) TRUE FALSE 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) TRUE FALSE 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) TRUE FALSE 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) TRUE FALSE 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) TRUE FALSE The total area under a probability histogram is equal to 1.
- (h) TRUE FALSE The median of a distribution is the point where the probability histogram is in balance.

Note: The next problem is not covered by all instructors.

16. A probability distribution has a mean of 27 and a VARIANCE of 9. Use Chebychev's Inequality to estimate the probability that an outcome of the experiment lies between 9 and 45.