

MA 207 In-class Exam 2

Spring 2021

Directions: You have two hours to complete this exam. Always label units where appropriate. You may use a standard or graphing calculator, but no cell phones or other electronic devices are allowed. You may not use your book or notes. Please turn off your cell phone and store it during the exam. Also, you must work alone. Good luck!

I, _____, am fully aware of and have abided by the BSC Honor Code in completing this exam.

1. Suppose you roll a fair, 8-sided die. Find the probability that your roll is a:
 - a. (3 pts) 4
 - b. (3 pts) Number greater than 5
 - c. (2 pts) Number other than 6
2. (8 pts) Suppose you roll two fair dice: one has 4 sides and the other has 6. Specify the probability model for this situation.

3. For the dice in the previous problem, find the probability that the sum of your roll is a:
- a. (2 pts) 6
 - b. (2 pts) Number that is divisible by 3
 - c. (2 pts) Number that is 6 and divisible by 3
 - d. (2 pts) Number that is 6 or divisible by 3
4. Suppose you have a coin that is not fair because heads comes up 55% of the time when the coin is flipped.
- a. (2 pts) Specify the probability model for the situation.
 - b. (2 pts) Find the probability of flipping three tails in a row.
 - c. (2 pts) Find the probability of getting at least one heads in three consecutive flips.
 - d. (2 pts) Find the probability that you will get at least exactly one heads in 3 consecutive flips.

5. (8 pts) Consider the proposed probability model for a 4-sided die below.

$$P(1) = 0.25, P(2) = 0.25, P(3) = 0.2, P(4) = 0.2.$$

Is this a legitimate probability model? Why or why not?

6. You have a bag of marbles that contains 6 red, 4 blue, and 3 green marbles. Besides their color, the marbles are indistinguishable.

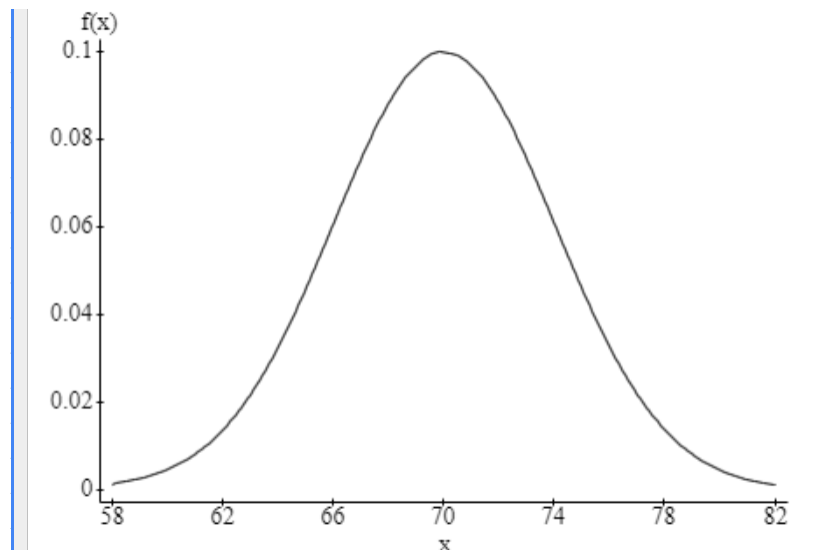
- a. (2 pts) Find the probability of selecting a red marble.
- b. (2 pts) Find the probability of selecting a red marble followed by two blue marbles (all without replacement).
- c. (4 pts) Find the probability of selecting 6 red marbles on 6 consecutive draws:
 - i. With replacement
 - ii. Without replacement

7. You roll two fair, 6-sided dice. If the sum of the next roll is a 2, you win \$100, otherwise you lose \$3.
- (4 pts) Find the expected value of the game.
 - (3 pts) Interpret the expected value in a complete sentence.
 - (1 pt) Should you play it? Why?
8. (8 pts) A weighted coin has $P(H) = 0.53$, and $P(T) = 0.47$. If you flip tails you win \$10. Determine how much you would have to lose on heads to make this a fair game.
9. (10 pts) You purchase a cell phone for \$300, and the store offers to sell you a full replacement warranty on the phone for \$50. If 4% of phones like yours will fail and need to be replaced during the warranty period, use expected value to determine if the warranty is worth it from a purely financial point of view. Be sure to explain your answer.

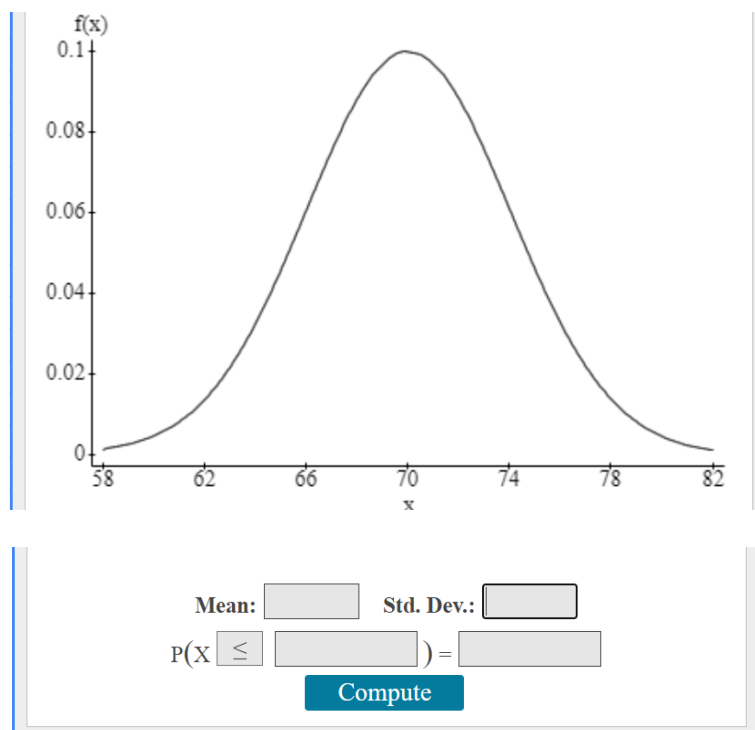
10. (8 pts) What would the warranty in the previous problem have to cost in order for it to be a financially neutral decision for you?

11. The heights of adult men are normally distributed with a mean of 70" and a standard deviation of 4". Sketch the corresponding area and use the Empirical Rule or fill out the given StatCrunch dialog boxes to answer the following questions.

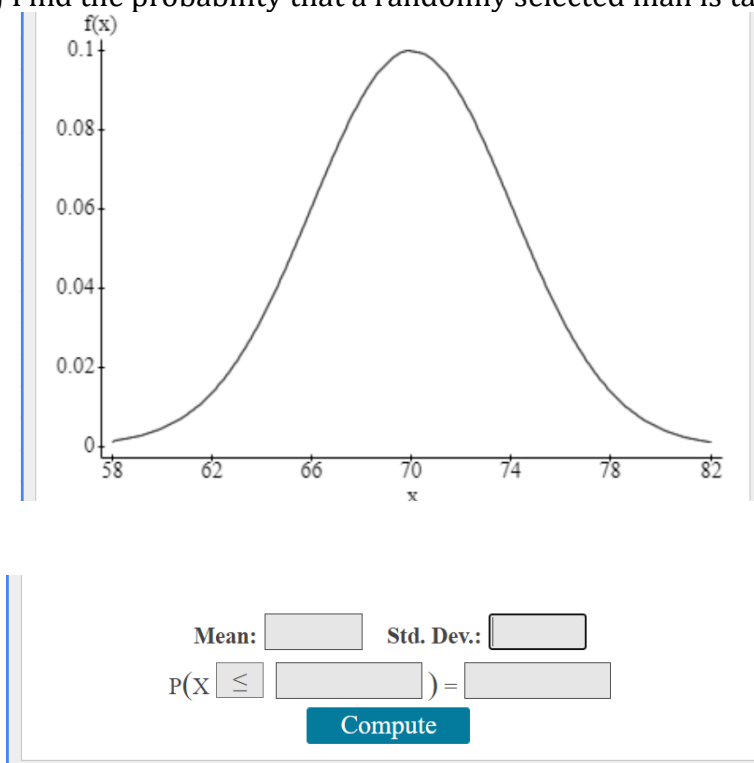
- a. (4 pts) Use the Empirical Rule to find the probability that a randomly selected man is between 5'2" and 6'6".



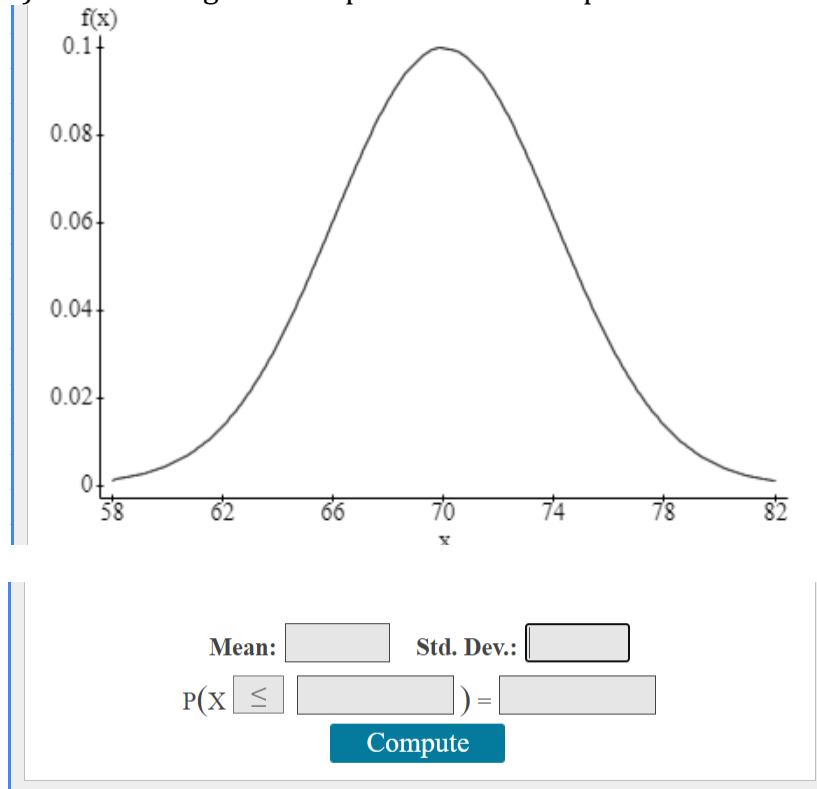
- b. (2 pts) Find the probability that a randomly selected man is shorter than 5'1" tall.



- c. (2 pts) Find the probability that a randomly selected man is taller than 6'3".



d. (2 pts) Find the height that represents the 70th percentile for men.



12. (8 pts) Assuming IQ's are normally distributed with mean 100 and standard deviation 15, answer the following question. Which is rarer, a person with an IQ higher than 150 or a man that is taller than 7'2"?