

ProbabilityExerciseSetThree is due on Friday, September 13, 2019 at 11:59pm.

The number of attempts available for each question is noted beside the question. If you are having trouble figuring out your error, you should consult the textbook, or ask a fellow student, one of the TA's or your professor for help.

There are also other resources at your disposal, such as the Mathematics Continuous Tutorials. Don't spend a lot of time guessing – it's not very efficient or effective.

Make sure to give lots of significant digits for (floating point) numerical answers. For most problems when entering numerical answers, you can if you wish enter elementary expressions such as $2 \wedge 3$ instead of 8, $\sin(3 * \pi / 2)$ instead of -1, $e \wedge (\ln(2))$ instead of 2, $(2 + \tan(3)) * (4 - \sin(5)) \wedge 6 - 7/8$ instead of 27620.3413, etc.

1. (1 point) A recent poll suggests that 63% of Canadians use their mobile device to comparison shop while they are in a store. You are to randomly pick 4 Canadians from a population made up of people who have a mobile device. You ask each the question: Do you use your mobile device to comparison shop while you are in a store? The number who respond "yes" is counted and represented by the random variable X . Its probability distribution is given below.

X	0	1	2	3	4
$P(X = x)$	0.0187	0.1276	0.326	0.3701	0.1575

(a) What can you say about the tendency of X ? Pick all that apply.

- A. The probability distribution of X is left-skewed.
- B. X is more likely to take on smaller rather than larger values.
- C. The probability distribution of X is right-skewed.
- D. The probability distribution of X is perfectly symmetric.
- E. X is more likely to take on larger rather than smaller values.

(b) Compute the expected value, or mean, of X .

$E(X) = \mu_X =$ ____ (use two decimals in your answer)

(c) Compute the standard deviation of X .

$SD(X) = \sigma_X =$ ____ (use two decimals in your answer)

Answer(s) submitted:

- (A, E)
- 2.52
- 0.97

(correct)

2. (1 point) You walk into the Rolling Thunder Casino, and are immediately faced with a table that offers the following game: A player pays \$2 to play. The player can win \$ 2, \$ 4, or \$ 5 with probabilities 0.28, 0.08, and 0.03, respectively. A random variable X is to represent the players profit on a single play of the game.

The partial probability distribution of X is provided.

X	-2	0	2	3
$P(X = x)$?	0.28	0.08	0.03

(a) $P(X = -2) =$ ____ (Use two decimals in your answer.)

(b) Sketch the distribution of probabilities from (a), with the values of X on the x-axis and $P(X = x)$ on the y-axis.

What can you say about the tendency of the random variable X ? The distribution of X is

- ?
- symmetrical
- right skewed
- left skewed

(c) Compute the expected value of X and the standard deviation of X .

$E(X) =$ ____ (use two decimals in your answer)

$SD(X) =$ ____ (use two decimals in your answer)

Answer(s) submitted:

- 0.61
- right skewed
- -0.97
- 1.45

(correct)

3. (1 point) A hockey player is to take 3 shots on a certain goalie. The probability he will score a goal on his first shot is 0.35. If he scores on his first shot, the chance he will score on his second shot increases by 0.1; if he misses, the chance that he scores on his second shot decreases by 0.1. This pattern continues to on his third shot: If the player scores on his second shot, the probability he will score on his third shot increases by another 0.1; should he not score on his second shot, the probability of scoring on the third shot **decreases** by another 0.1.

A random variable X counts the number of goals this hockey player scores.

(a) Complete the probability distribution of X below. Use four decimals in each of your entries.

X	0	1	2	3
$P(X = x)$	_____	_____	_____	_____

(b) How many goals would you expect this hockey player to score? Enter your answer to four decimals.

$E(X) =$ _____

(c) Compute the standard deviation the random variable X . Enter your answer to two decimals.

$SD(X) =$ _____

Answer(s) submitted:

- 0.4144
- 0.3039
- 0.1951
- 0.0866
- 0.954
- 0.9767

(correct)

4. (1 point) A person is to walk into a casino and play a certain game. The chance the person will win the game is 0.34. Once they play the first game, win or lose, they are to play the game 3 more times for a total of 4 games.

A random variable X is to count how many of the 4 games the gambler wins.

(a) Finish the probability distribution of X below. Use four

decimals in each of your entries.

X	0	1	2	3	4
$P(X = x)$	_____	_____	_____	_____	_____

(b) From the distribution you found in part (a), what can you say about the distribution of X ?

The distribution of X is

- ?
- symmetrical
- skewed to the right
- skewed to the left

, with an mean of _____ games won and a standard deviation of _____ games won.

(Enter your answers to two decimals.)

Answer(s) submitted:

- 0.1897
- 0.3910
- 0.3021
- 0.1038
- 0.0134
- skewed to the right
- 1.36
- 0.9474

(correct)

5. (1 point) A recent poll has suggested that 64 % of Canadians will be spending money - decorations, halloween treats, etc. - to celebrate Halloween this year.

24 Canadians are randomly chosen, and the number that will be spending money to celebrate Halloween is to be counted. This count is represented by the random variable X .

Part (a) Compute the probability that 14 of these Canadians indicate they will be spending money to celebrate Halloween.

$P(X = 14) =$ _____ (use four decimals in your answer)

Part (b) Compute the probability that between 7 and 14 of these Canadians, inclusive, indicate they will be spending money to celebrate Halloween.

$P(7 \leq X \leq 14) =$ _____ (use four decimals in your answer)

Part (c) How many of the 24-Canadians randomly chosen would you expect to indicate they will be spending money to

celebrate Halloween? Compute the standard deviation as well.

$E(X) = \mu_X = \underline{\hspace{2cm}}$ (use two decimals in your answer)

$SD(X) = \sigma_X = \underline{\hspace{2cm}}$ (use two decimals in your answer)

Part (d) Compute the probability that the 13-th Canadian random chosen is the 7-th to say they will be spending money to celebrate Halloween.

$\underline{\hspace{2cm}}$ (use four decimals in your answer)

Answer(s) submitted:

- 0.1387
- 0.3511
- 15.36
- 2.35
- 0.0885

(correct)

6. (1 point) A certain airline has 165 seats available for a flight from YYC (Calgary International Airport) to LAX (Los Angeles International Airport). Because people with reservations **do not show up** for their flight 11% of the time, the airline always overbooks this flight. That is, there are more passengers that have tickets on the flight than there are seats.

Suppose the airline has 177 passengers booked for 165 seats. Assume one person showing up for the flight does not effect others who may, or may not, show up for this flight.

(a) How many people (with tickets) does the airline expect to **show up** for this flight? Provide the standard deviation as well. Enter your answers to two decimals.

Expected number of the number of people showing up for the flight = $\underline{\hspace{2cm}}$

Standard deviation of the number of people who show up for the flight = $\underline{\hspace{2cm}}$

(b) When the flight takes off from YYC, what is the probability that there will be 6 seats empty? Enter your answer to four decimals.

$P(6 \text{ seats empty}) = \underline{\hspace{2cm}}$

(c) What is the chance that a passenger with a flight reservation will not make it to LAX due to overbooking? Use four decimals in your answer.

Answer(s) submitted:

- 157.53
- 4.16
- 0.0926
- 0.0216

(correct)

7. (1 point) Your statistics professor hands you a fair die, with each side having the same chance of being the uppermost face. You are asked to toss the die 7 times and count the number of times the die shows a topside of six.

This count is represented by the random variable X .

(a) Complete the probability distribution of X below. Use four decimals in each of your entries.

X	0	1	2	3	4	5	6	
$P(X = x)$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	$\underline{\hspace{1cm}}$	0.00

(b) From the distribution you found in part (a), what can you say about the distribution of X ?

The distribution of X is

- ?
 - symmetrical
 - skewed to the right
 - skewed to the left
- , with an mean of $\underline{\hspace{1cm}}$ sixes and a standard deviation of $\underline{\hspace{1cm}}$ sixes.

(Enter your answers to two decimals.)

(c) As requested, you have tossed the die 7-times and observed $X = 5$ sixes. If you were to repeat the 7-tosses of this die, what is the probability you will observe at least the same number of sixes as this? Enter your answer to four decimal places.

(d) Looking at your initial outcome of $X = 5$ and the chance of observing at least this outcome again, what does this say about the fairness of the die? Select the **most appropriate** answer.

- A. The die appears not to be fair. $X = 5$ is an unusual event.

- B. The die appears to favor an outcome of a six. $X = 5$ is an unusual event.
- C. The die appears to be fair. $X = 5$ is not an unusual event.
- D. The distribution of the random variable X appears to be roughly symmetrical.
- E. The distribution of the random variable X appears to be skewed to the right.

Answer(s) submitted:

- 0.2791
- 0.3907
- 0.2344
- 0.0781
- 0.0156
- 0.0019
- 0.0001
- skewed to the right
- 1.17
- 0.986
- 0.002
- B

(correct)

8. (1 point) A random variable X is to count the number of customers entering a 24-hour convenience store every 10-minutes. The mean of X is found to be $\lambda = 4.8$ customers per 10-minute interval.

Part (a) What is the probability that 2 customers will enter this convenience store within the next 10-minutes?

$P(X = 2) = \underline{\hspace{2cm}}$ (use four decimals in your answer)

Part (b) Compute the probability that between 1 and 7 customers will enter the convenience store within the next 10-minutes?

$P(1 \leq X \leq 7) = \underline{\hspace{2cm}}$ (use four decimals in your answer)

Part (c) Compute the probability that more than 4 customers will walk into the convenience store in the next 10-minutes.

$P(\text{more than 4 customers enter}) = \underline{\hspace{2cm}}$ (use four decimals in your answer)

Part (d) A random variable Y is to count the number of customers that walk into this convenience store in hour. How many customers do you expect in an hour? Compute the standard deviation of this count as well.

$E(Y) = \mu_Y = \underline{\hspace{2cm}}$ (use two decimals in your answer)

$SD(Y) = \sigma_Y = \underline{\hspace{2cm}}$ (use two decimals in your answer)

Answer(s) submitted:

- 0.0948
- 0.8784
- 0.5237
- 28.8
- 5.37

(correct)

9. (1 point) On a typical day at a local popular mall, the number of shoplifters caught by mall security fluctuates from day to day, with an average of 7.3 caught per day.

Suppose you are to count the number of shoplifters apprehended at this mall today. (Assume today is a typical day at the mall.)

Part (a) Compute the probability that mall security apprehended 8 shoplifters.

$\underline{\hspace{2cm}}$ (use four decimals in your answer)

Part (b) Compute the probability that mall security will apprehend at least 6 shoplifters. Enter your answer to four decimals.

$\underline{\hspace{2cm}}$

Part (c) Compute the probability that between 6 and 12 shoplifters will be apprehended. Enter your answer to four decimals.

$\underline{\hspace{2cm}}$

Part (d) Think about the distribution of the number of shoplifters mall security apprehends on a typical day. What can you say about this distribution? Select the most appropriate reason below.

- A. The distribution of values is roughly symmetrical, with a mean of 7.3 shoplifters and a standard deviation of 2.70185121722126 shoplifters.
- B. The distribution of values is skewed to the right, with a mean of 7.3 shoplifters and a standard deviation of 2.70185121722126 shoplifters.
- C. The distribution of values is skewed to the right, with a mean of 7.3 shoplifters and a variance of 2.70185121722126 shoplifters.

- D. The distribution of values is roughly symmetrical, with a mean of 7.3 shoplifters and a variance of 2.70185121722126 shoplifters².
- E. The number of shoplifters apprehended each day is 7.3.

Part (e) On a typical day, the mall is open from 10:00am to 9:00pm, a total of 11 hours. You are interested in the number of shoplifters apprehended in any given hour.

How many shoplifters would you expect mall security to catch in any given hour? Provide the variance of this count as well.

$\mu = \underline{\hspace{2cm}}$ (use three decimals in your answer)

$\sigma^2 = \underline{\hspace{2cm}}$ (use three decimals in your answer)

Answer(s) submitted:

- 0.1351
- 0.736
- 0.7002
- B
- 0.6636
- 0.6636

(correct)

10. (1 point) The number of people entering a security check-in lineup in a 15-minute interval at a medium sized airport can be modeled by the following probability model:

$$P(X = x) = \frac{e^{-15.3}(15.3)^x}{x!} \quad x = 0, 1, 2, \dots$$

Part (a) What does 15.3 represent in the probability model? Select the **most appropriate** explanation below.

- A. 15.3 represents the average number of people who enter the a security check-in lineup every 15-minutes.

- B. 15.3 is the rate at which people enter the security check-in lineup every 15 minutes.
- C. 15.3 represents how much skewed the distribution of values is.
- D. 15.3 represents a weighted-average of the number of people who enter the a security check-in lineup every 15-minutes.
- E. 15.3 is the standard deviation of the distribution of people entering the security check-in lineup every 15-minutes.

Part (b) Compute the probability that 18 people enter the security check-in lineup in a 15-minute interval. Use four decimals in your answer.

$P(X = 18) = \underline{\hspace{2cm}}$

Part (c) Compute the probability that at least 5 people will enter the security check-in lineup in a **5-minute** interval. Enter answer to four decimals.

$\underline{\hspace{2cm}}$

Part (d) In the past 15-minutes, you have been told that somewhere between 14 and 20 people, inclusive, have entered the security lineup. Compute the probability that this uncertain number is 17.

$\underline{\hspace{2cm}}$ (use four decimals in your answer)

Answer(s) submitted:

- D
- 0.0747
- 0.5769
- 0.1546

(correct)