# Test Prep 2

Additional questions

# Question 1

“A shipment of 12 smartphones arrives at a warehouse. A quality-control inspector randomly selects 5 of them to test for defects. Each tested phone is either defective or non-defective. Let X be the number of defective phones among the 5 selected. List all the values that the random variable X can assume.”

# Answer

x= 0,1,2,3,4,5

# Question 2

Determine whether each of the following random variables are discrete or continuous.

1. Number of library books
2. Height of a sunflower
3. Goals scored in a match
4. Time to run a mile
5. Stephenville temperature

# Answer

1) Discrete
2) Continuous
3) Discrete
4) Continuous
5) Continuous

# Question 3

Determine the value of the missing probability that will make the table below represent a valid probability distribution

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| p(X=x) | 0.14 | 0.05 | 0.26 | ? | 0.20 |

# Answer

0.35

# Question 4

Find which distribution probability table is correct

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| p(X=x) | 0.47 | 0.63 | 0.22 | 0.08 |

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| p(X=x) | 0.43 | -0.23 | 0.52 | 0.28 |

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| p(X=x) | 0.23 | 0.58 | 0.03 | 0.16 |

# Answer

The third one

# Question 5

Consider the probability distribution table for the random variable x shown below:

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| p(x) | 0.1 | 0.2 | 0.3 | 0.3 | 0.1 |

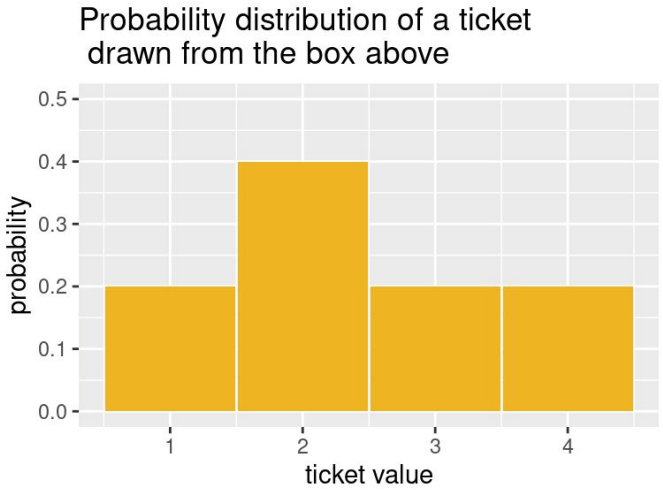
a) Find the expected value(aka mean) (by hand)
b) Find the variance
c) Find the standard deviation

# Answers

a) 2.1
b) 1.29
c) 1.136

# Question 6

Use the probability distribution for the random variable x shown below to answer the following question. Report your answers as decimals without rounding or as fractions.




a) What is the probability that x is two or more?
b) What is the probability that x is at most two?
c) Determine the mean (expected value) of the random variable x. (do it by hand and check it using the calculator)

# Answer

a)0.8

b) 0.6

c) 2.4

# Question 7

Suppose that the probability of a customer making a purchase at a store is 0.40. Five customers enter the store independently. Let x be the number of customers who make a purchase.

1. Find the probability that x is equal to 2.

2. Find the probability that x is at most 1

# Answer

$p(x=2) = 0.3456$

$p(x<2) = .33696$

# Question 9

Find the mean and standard deviation of the binomial distribution given that $n = 150$ and $p = 0.42$.

# Answer

Mean = 63

Standard Deviation = 6.05

# Question 11

A basketball player has a 20% chance of making a free throw. She keeps shooting until she makes her first successful shot. Let X be the number of shots taken until the first successful free throw.

Does this scenario represent a binomial distribution random variable?

# Answer

## NO, because

- ✅ The trials are independent.
- ✅ The probability of success (20%) stays constant.
- ❌ **The number of trials is *not fixed***

# Question 12

A witch is preparing for the Grand Conjuration Tournament. She practices by casting 10 spells, each with a 10% chance of success. Let X be the number of successful spells she casts during this practice session.

Does this scenario represent a binomial distribution random variable?

# Answer

- YES, because:
- There is a **fixed number of trials** (10 spells). Each trial is **independent**.
- Each trial has the **same probability of success** (10%).
- The random variable X counts the **number of successes**.

# Question 13

A battery manufacturer reports that the mean lifespan of its AA batteries is 1,200 hours with a standard deviation of 80 hours. Assume the distribution of battery lifespans is approximately mound-shaped and symmetric.

1. Use the Empirical Rule to determine an interval that contains approximately 95% of all battery lifespans.
2. Use the Empirical Rule to estimate the proportion of batteries that last shorter than 1,360 hours.

# Answer

1)1040, 1360

2) 97.5

# Question 15

In a game of chance, two fair **six-sided dice** are rolled and their **sum** is observed. The table below shows each possible outcome in this scenario.

1. What is the probability that the sum equals **7**?
2. What is the probability that the sum is **greater than 9**?
3. What is the probability that the sum

   is **an even number**?

| | | Dice 1 | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Dice 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

# Answer

1) 6
2) 6
3) 18

# Question 16

When applying for graduate school, students in the US may take the GRE exam.
Suppose the GRE has the following summary statistics:

- $\mu = 150$
- $\sigma = 8$

1. Compute the **z-score** for a student who made **162** on the GRE.
2. What score, xxx, did a student make on the GRE if they had a **z-score of 1.75**?

# Answer

a) 1.5
b) 164