

## 4.11 POP QUIZ!

It's time for a pop quiz!

- The quiz consists of 5 multiple-choice questions.
- Each question has five answer choices, labeled A through E.
- Bad News: You will not get to see the questions. You just have to guess the answer for each one.

**Bubble in your answers for each question.**

1	(A)	(B)	(C)	(D)	(E)
2	(A)	(B)	(C)	(D)	(E)
3	(A)	(B)	(C)	(D)	(E)
4	(A)	(B)	(C)	(D)	(E)
5	(A)	(B)	(C)	(D)	(E)

Let  $X$  = number of correct guesses

1. Is this a binomial setting? Explain by verifying the conditions for BINS. Do it the right way!

**B -**

**I -**

**n -**

**S -**

2. How many would you expect to get correct **just by guessing**? Show your formula and calculations.

- a. With what standard deviation? Show your formula and calculations.

3. Fill in the table below showing the probability of getting exactly  $X$  correct.

$x = \# \text{ of correct guesses}$	0	1	2	3	4	5
$P(X = x)$						

4. Create a histogram of the distribution below. Make sure to label your axes.

Grade Yourself: Number Correct = \_\_\_\_\_

#### 4.11.1 Calculating Parameters of a Binomial Distribution

5. How many ways are there to get exactly two questions correct? List them out.

**Write out the probabilities of the following questions with proper notation and supporting work.**

6. Calculate the probability of getting **exactly 2 correct**.

7. What is the probability of getting **exactly 3 correct**?

8. What is the probability of getting **at least 3 correct**?

9. What is the probability of getting **at most 3 correct**?

10. A student claimed that they **got four correct** and they were **guessing**. Is this likely?

## CHECK YOUR UNDERSTANDING

Are you more likely to win a random drawing if you crinkle the paper that contains your name before putting it into the drawing box? A curious student conducted a study to investigate.

The student took 100 equal sized slips of paper and crinkled 25 of them before putting them all into a box. After mixing well, they asked an uninformed person to select a winner at random. The student noted if the slip was crinkled. The slip was returned to the box, mixed well, and asked another uninformed person to select a winner at random. This process was repeated 10 times.

Let  $Y$  = the number of times that a crinkled paper was selected.

- a. Does this setting represent a binomial distribution? Explain.

---

$B$  -

---

$I$  -

---

$n$  -

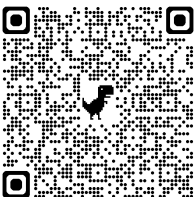
---

$S$  -

---

- b. Make a histogram of the probability distribution of  $Y$  and draw it below. Describe its shape.

- c. **Calculate** and **interpret** the mean and standard deviation of  $Y$ .



#### 4.11.1 Calculating Parameters of a Binomial Distribution

### **BIG IDEAS**

1. Determine whether the conditions for a binomial setting are met.
2. Calculate the mean and standard deviation of a binomial random variable. Interpret these values.

Answers CHECK YOUR UNDERSTANDING

## ANSWERS CHECK YOUR UNDERSTANDING

Are you more likely to win a random drawing if you crinkle the paper that contains your name before putting it into the drawing box? A curious student conducted a study to investigate.

The student took 100 equal sized slips of paper and crinkled 25 of them before putting them all into a box. After mixing well, they asked an uninformed person to select a winner at random. The student noted if the slip was crinkled. The slip was returned to the box, mixed well, and asked another uninformed person to select a winner at random. This process was repeated 10 times.

Let  $Y$  = the number of times that a crinkled paper was selected.

- a. Does this setting represent a binomial distribution? Explain.

---

**B - Two outcomes:** For each trial, the outcome is either selecting a crinkled paper (success) or not (failure).

---

**I - Independence:** The selection of one slip does not affect the probability of selecting another, since each slip is returned to the box and mixed well before the next trial. Therefore, the trials are independent.

---

**n - Fixed number of trials:** There are 10 trials, as the process is repeated 10 times, with one slip being selected each time.

---

**S - Same probability:** The probability of selecting a crinkled paper is 25/100 (0.25) for each trial, assuming the slips are mixed well and the draws are random. This probability remains constant across the trials.

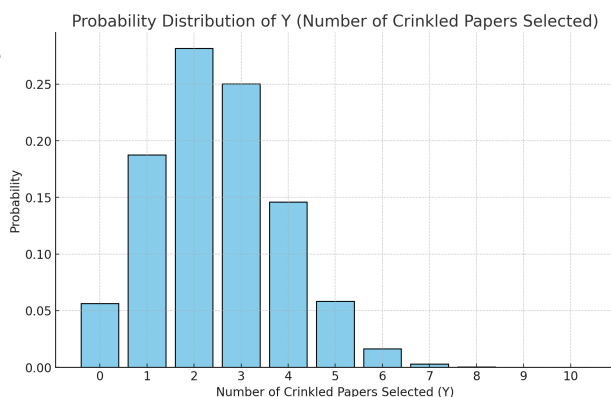
---

Since all the conditions of a binomial distribution are met—fixed number of trials, two possible outcomes, constant probability of success, and independence—the number of crinkled papers selected, denoted by  $Y$ , follows a binomial distribution.

- b. Make a histogram of the probability distribution of  $Y$  and draw it below. Describe its shape.

The histogram of the probability distribution of  $Y$  (the number of crinkled papers selected) shows that the distribution is skewed to the right, with a higher concentration of probabilities around the lower values (0 to 4) and a decrease as the number of selected crinkled papers increases.

- c. **Calculate** and **interpret** the mean and standard deviation of  $Y$ .



The mean of  $Y$  is 2.5, which indicates that on average, crinkled papers are selected per round. The standard deviation of  $Y$  is approximately 1.37, indicating a moderate amount of variability in the number of crinkled papers selected across the rounds.

2.5