

4.10: Practice

Introduction

Use the following information to answer the next five exercises: A company wants to evaluate its attrition rate, in other words, how long new hires stay with the company. Over the years, they have established the following probability distribution.

Let X = the number of years a new hire will stay with the company.

Let $P(x)$ = the probability that a new hire will stay with the company x years.

1. Complete Table 4.10.1 using the data provided.

Table 4.10.1

x	$P(x)$
0	0.12
1	0.18
2	0.30
3	0.15
4	
5	0.10
6	0.05

2. $P(x = 4) =$ _____

3. $P(x \geq 5) =$ _____

4. On average, how long would you expect a new hire to stay with the company?

5. What does the column " $P(x)$ " sum to?

Use the following information to answer the next six exercises: A baker is deciding how many batches of muffins to make to sell in his bakery. He wants to make enough to sell every one and no fewer. Through observation, the baker has established a probability distribution.

Table 4.10.2

x	$P(x)$
1	0.15
2	0.35
3	0.40
4	0.10

6. Define the random variable X .

7. What is the probability the baker will sell more than one batch? $P(x > 1) =$ _____

8. What is the probability the baker will sell exactly one batch? $P(x = 1) =$ _____

9. On average, how many batches should the baker make?

Use the following information to answer the next four exercises: Ellen has music practice three days a week. She practices for all of the three days 85% of the time, two days 8% of the time, one day 4% of the time, and no days 3% of the time. One week is selected at random.

10. Define the random variable X .

11. Construct a probability distribution table for the data.
12. We know that for a probability distribution function to be discrete, it must have two characteristics. One is that the sum of the probabilities is one. What is the other characteristic?

Use the following information to answer the next five exercises: Javier volunteers in community events each month. He does not do more than five events in a month. He attends exactly five events 35% of the time, four events 25% of the time, three events 20% of the time, two events 10% of the time, one event 5% of the time, and no events 5% of the time.

13. Define the random variable X .
14. What values does x take on?
15. Construct a PDF table.
16. Find the probability that Javier volunteers for less than three events each month. $P(x < 3) =$ _____
17. Find the probability that Javier volunteers for at least one event each month. $P(x > 0) =$ _____

4.2 Hypergeometric Distribution

Use the following information to answer the next five exercises: Suppose that a group of statistics students is divided into two groups: business majors and non-business majors. There are 16 business majors in the group and seven non-business majors in the group. A random sample of nine students is taken. We are interested in the number of business majors in the sample.

18. In words, define the random variable X .
19. What values does X take on?

4.2 Binomial Distribution

Use the following information to answer the next eight exercises: The Higher Education Research Institute at UCLA collected data from 203,967 incoming first-time, full-time freshmen from 270 four-year colleges and universities in the U.S. 71.3% of those students replied that, yes, they believe that same-sex couples should have the right to legal marital status. Suppose that you randomly pick eight first-time, full-time freshmen from the survey. You are interested in the number that believes that same sex-couples should have the right to legal marital status.

20. In words, define the random variable X .
21. $X \sim$ _____ (_____, _____)
22. What values does the random variable X take on?
23. Construct the probability distribution function (PDF).

Table 4.10.3

x	$P(x)$

24. On average (μ), how many would you expect to answer yes?

25. What is the standard deviation (σ)?
26. What is the probability that at most five of the freshmen reply "yes"?
27. What is the probability that at least two of the freshmen reply "yes"?

4.3 Geometric Distribution

Use the following information to answer the next six exercises: The Higher Education Research Institute at UCLA collected data from 203,967 incoming first-time, full-time freshmen from 270 four-year colleges and universities in the U.S. 71.3% of those students replied that, yes, they believe that same-sex couples should have the right to legal marital status. Suppose that you randomly select freshman from the study until you find one who replies "yes." You are interested in the number of freshmen you must ask.

28. In words, define the random variable X .
29. $X \sim \text{____}(\text{____}, \text{____})$
30. What values does the random variable X take on?
31. Construct the probability distribution function (PDF). Stop at $x = 6$.

Table 4.10.4

x	$P(x)$
1	
2	
3	
4	
5	
6	

32. On average (μ), how many freshmen would you expect to have to ask until you found one who replies "yes?"
33. What is the probability that you will need to ask fewer than three freshmen?

4.4 Poisson Distribution

Use the following information to answer the next six exercises: On average, a clothing store gets 120 customers per day.

34. Assume the event occurs independently in any given day. Define the random variable X .
35. What values does X take on?
36. What is the probability of getting 150 customers in one day?
37. What is the probability of getting 35 customers in the first four hours? Assume the store is open 12 hours each day.
38. What is the probability that the store will have more than 12 customers in the first hour?
39. What is the probability that the store will have fewer than 12 customers in the first two hours?
40. Which type of distribution can the Poisson model be used to approximate? When would you do this?

Use the following information to answer the next six exercises: On average, eight teens in the U.S. die from motor vehicle injuries per day. As a result, states across the country are debating raising the driving age.

41. Assume the event occurs independently in any given day. In words, define the random variable X .
42. $X \sim \text{____}(\text{____}, \text{____})$
43. What values does X take on?
44. For the given values of the random variable X , fill in the corresponding probabilities.

45. Is it likely that there will be no teens killed from motor vehicle injuries on any given day in the U.S? Justify your answer numerically.
46. Is it likely that there will be more than 20 teens killed from motor vehicle injuries on any given day in the U.S.? Justify your answer numerically
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