

Quiz 6 Solutions

Show your work for full credit. Provide the appropriate formula for all problems.

1. The following table gives the probability distribution of a discrete random variable x .

x	$P(x)$	$xP(x)$	$x^2P(x)$
0	.11	.0	0
1	.19	.19	.19
2	.28	.56	1.12
3	.15	.45	1.35
4	.12	.48	1.92
5	.15	.75	3.75
		2.43	8.33

Find the following probabilities.

a. $P(x = 3) = .15$ b. $P(x < 2) = P(x = 0) + P(x = 1)$
 From the table $= .11 + .19 = .3$

c. $P(x \geq 4) = P(x = 4) + P(x = 5) = .12 + .15 = .27$

d. Find the mean and standard deviation of this distribution.

$\mu = \sum xP(x) = 2.43$ $\sigma = \sqrt{\sum x^2P(x) - \mu^2} = \sqrt{8.33 - 2.43^2} = 2.45$

2. According to a Harris Interactive Poll, 60% of American college graduates have Facebook accounts. Suppose that this result is true for the current population of American college graduates.

a. Find the probability that exactly 9 American college students in a sample of 15 have Facebook accounts.

$P(x = 9) = C(15, 9) * .6^9 * .4^6$
 $= .1702$

b. Find the probability that six, seven, or eight college students in a random sample of 15 have a Facebook account.

$P(x = 6) + P(x = 7) + P(x = 8) = .1338 + .1864 + .2020 = .5222$

c. What is the mean and standard deviation of a sample size of 15 from this population?

$\mu = np = 9$
 $\sigma = \sqrt{npq} = 4.32$

3. An average of .8 accidents occur per day in a particular large city. Assume a Poisson distribution.

a. Find the probability that 2 accidents occur in this city on a given day.

$P(x = 2) = \frac{\lambda^x e^{-\lambda}}{x!} = \frac{.8^2 e^{-.8}}{2!} = .1438$

b. Find the probability that 2 or more accidents occur in this city on a given day.

$P(x \geq 2) = 1 - P(x \leq 1) = 1 - P(x = 0) - P(x = 1) = 1 - .4493 - .3595 = .1912$

c. What is the mean and standard deviation of this distribution?

$\mu = \lambda = .8$ $\sigma = \sqrt{\lambda} = .8944$

4. Jason and Lisa are planning an outdoor reception following their wedding. They estimate that the probability of bad weather is .25, that the probability of a disruptive incident is .15, and that the probability that both bad weather and a disruptive incident will occur is .08.

a. What is the probability that their reception will suffer bad weather or a disruptive incident.

Let BW be the event "bad weather" and DI be the event "disruptive incident"

Then $P(BW \text{ or } DI) = P(BW) + P(DI) - P(BW \cap DI) = .25 + .15 - .08 = .32$

b. Are the events “bad weather” and “disruptive behavior” independent? Justify your answer completely.

Because $P(BW \cap DI) \neq P(BW) * P(DI)$, the events are dependent, or show $P(BW | DI) \neq P(BW)$

5. Suppose that 20% of all adults in a small town live alone, and 8% of the adults live alone and have at least one pet. What is the probability that a randomly selected adult from this town has at least one pet given that this adult lives alone?

$$P(\text{has a pet} | \text{lives alone}) = \frac{P(\text{has a pet} \cap \text{lives alone})}{P(\text{lives alone})} = \frac{.08}{.2} = .4$$

6. A certain population has a mean of 23 and a standard deviation of two thirds. At least what percent of the population lives between 22 and 24?

$1 = k\sigma$ means that $k = 1.5$. So by Chebyshev, $1 - \frac{1}{1.5^2} = .555 = 55.5\%$ of population lives between 22 and 24.