

Test 2 Questions

Probability & Statistics

Question 1

Let Y be a random variable with distribution $p(y)$ given in the following table:

y	$p(y)$
1	0.15
2	0.25
3	0.55
4	0.05

Calculate $E[Y]$, $E[5Y]$, $E[2Y + 2]$, $E\left[\frac{1}{Y}\right]$, and $V[Y]$. Use any valid method to calculate $V[Y]$.

Question 2

You are given

$$\begin{aligned}E[Y] &= 11 \\E[Y^2] &= 153 \\E[Y^3] &= 1926\end{aligned}$$

Calculate the following:

1. $E[2Y - 3Y^2 + 5Y^3]$
2. $V[Y]$

Question 3

A potential customer for an \$85,000 fire insurance policy possesses a home in an area that, according to experience, may sustain a total (100%) loss in a given year with probability 0.001 and a 50% loss with probability 0.01. Assuming these are the only losses the policy can sustain, show that the premium that must be charged on all \$85,000 policies in this area is \$510.

Question 4

Show that the binomial distribution satisfies the second law of probability, i.e. show that the sum of all probabilities of the binomial distribution sums to 1.

Question 5

A fire-detection device utilizes four temperature-sensitive cells acting independently of each other in such a manner that any one or more may activate the alarm. Each cell has a probability of 0.9 of activating the alarm when the temperature reaches 100° Celsius or more. Let Y equal the number of cells activating the alarm when the temperature reaches 100° Celsius.

1. What type of experiment is this? Why?
2. What is the probability that the alarm will function when the temperature reaches 100° Celsius?
3. Calculate $E[Y]$ and $V[Y]$.

Question 6

A certified public accountant (CPA) has found that 7 of 10 company audits contain substantial errors. If the CPA audits a series of company accounts, let Y equal the audit number of the first company that has substantial errors.

1. What type of experiment is this? Why?
2. What is the probability of success?
3. What is the probability that the first company account containing substantial errors is the fourth one to be audited?
4. What is the probability that the first company account to contain substantial errors will occur on or after the fourth audited account?