Questions: Expected value, variance, standard deviation

Tom Coleman

Summary

A selection of questions to test your understanding of expected values, variance, and standard deviation.

*Before attempting these questions it is highly recommended that you read* [*Guide: Expected value, variance, standard deviation*](../studyguides/expectedvariance.qmd)*.*

## Q1

For each of the following valid random variables with associated probability mass function, work out the expected value and variance.

#### 1.1.

Let be the random variable representing the result of rolling a biased four sided-die. The PMF of is given by:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

#### 1.2.

A discrete random variable has five possible outcomes ( or ), and the PMF is given by:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

#### 1.3.

A coin is tossed, where the probability of tails is and heads is . Let represent the result of the coin toss. Complete the table below:

|  | Heads | Tails |
| --- | --- | --- |
|  |  |  |

#### 1.4.

The PMF for a random variable is given as:

|  | 1 | 2 | 3 | 4 |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

## Q2

For each of the following valid random variables with associated probability density function, work out the expected value and variance.

#### 2.1.

Let be a continuous random variable on the interval with the PDF:

#### 2.2.

Let be a continuous random variable with the PDF:

## Q3

Give the expected value and variance for rolling seven fair -sided dice. You may assume that each roll is independent of every other roll.

## Q4

This question refers to the exponential distribution for a continuous random variable. You can find more information about this and [Factsheet: Exponential distribution](../factsheets/f-expdist.qmd).

The PDF of the exponential distribution is . Using integration by parts (see [Guide: Integration by parts]) and the fact that

for any natural number and real , show that

1. the mean of the exponential distribution is ;
2. the variance of the exponential distribution is .

[After attempting the questions above, please click this link to find the answers.](../answers/as-expectedvariance.qmd)

## Version history and licensing

v1.0: initial version created 08/25 by tdhc.

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