Questions: PMFs, PDFs, and CDFs

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SUMMARY

A selection of questions to test your understanding of Probability Mass Functions (PMFs), Probability Density Functions (PDFs), and Cumulative Distribution Functions (CDFs).

*Before attempting these questions it is highly recommended that you read [Guide: PMFs, PDFs, and CDFs].*

## Q1

For each of the scenarios below, determine if the given distribution is a valid PMF and answer the following questions.

1.1

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

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

What is the probability of ?

1.2

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

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

What is the probability of or ?

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

A discrete random variable has the possible outcomes or , with the following PMF:

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

Is this a valid PMF? Why or why not?

1.5

A bag contains red, blue, and green sweets from a sweet shop. Let represent the color of a randomly picked sweet:

1. What is the probability of picking a blue sweet?
2. Construct the PMF for this scenario by completing the table:

|  | Red | Blue | Green |
| --- | --- | --- | --- |
|  |  |  |  |

1.6

The PMF for a random variable is given as:

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

1. For what value of is this a valid PMF?
2. For this value of , what is the probability of ?

## Q2

For each of the scenarios below, determine if the given distribution is a valid PDF and answer the following questions.

2.1

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

What is the probability that lies between 1 and 2?

2.2

Let be a continuous random variable with the PDF:

1. What is the probability that lies between 0.5 and 1?
2. What is ?

2.3

Let be a continuous random variable uniformly distributed between 3 and 7. The PDF is:

What is the probability that lies between 3 and 6?

2.4

The PDF of a random variable is given by:

Is this a valid PDF? Why or why not?

2.5

Consider the PDF:

1. For what value of is this a valid PDF?
2. For this value of , what is the ?

2.6

The PDF of is given by:

Is this a valid PDF? Why or why not?

## Q3

For each of the scenarios below, answer the following questions.

3.1

In a scenario involving a discrete random variable, the following CDF is given:

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

1. What is ?
2. What is ?

3.2

For the random variable uniformly distributed on as seen in question 2.2:

1. Calculate the CDF at values , , and .
2. What is ?

3.3

For the PDF given in question 2.3:

1. Calculate the CDF at points , , and .
2. What is ?

3.4

The CDF of for a scenario is given by:

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

Is this a valid CDF? Why or why not?

[After attempting the questions above, please click this link to find the answers.]

## Version history and licensing

v1.0: initial version created 12/24 by Sophie Chowgule

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