Question sheet

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# Questions: PMFs, PDFs, and CDFs

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-dice. The PMF of is given by:

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

1. What is the probability of ?

**1.2**

A random variable has five possible outcomes , and the PMF is:

|  | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |
|  | 0.25 | 0.35 | 0.05 | 0.2 | 0.1 |

1. What is the probability of or ?

**1.3**

A coin is tossed, where the probability of tails is 70% and heads is 30%. Let represent the result of the coin toss. Complete the table below:

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

**1.4**

A random variable have the possible outcomes with the following PMF:

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0.1 | 0.05 | 0.05 | 0.3 | 0.25 | 0.75 | 0.35 |

1. Is this a valid PMF? Why or why not?

**1.5**

A bag contains 5 red, 3 blue, and 2 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:

1. 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:

1. What is the probability that lies between 3 and 6?

**2.4**

The PDF of a random variable is given by:

1. 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:

1. Is this a valid PDF? Why or why not?

## Q3

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

**3.1**

A scenario respresented by a PMF has the following CDF:

|  | 1 | 2 | 3 | 4 |
| --- | --- | --- | --- | --- |
|  | 0.1 | 0.3 | 0.5 | 1 |

1. What is ?
2. What is ?

**3.2**

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

1. Write the CDF for the values 0.5, 1, and 2.
2. What is ?
3. What is ?

**3.3**

For the PDF given in question 2.3:

1. Write the CDF at points 4, 5, and 6?
2. What is ?

**3.4**

The PDF of for a scenario is given by:

|  | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0.1 | 0.2 | 0.5 | 0.4 | 0.8 | 1 |

## a. Is this a valid CDF? Why or why not?