Probability functions and cumulative probabilities

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. For probabilities 0.2, 0.5 and 0.3 at $x = 0$, 1, 2, give $F(0)$, $F(1)$ and $F(2)$. [3 marks]

Take running totals: 0.2; $0.2 + 0.5$; $0.2 + 0.5 + 0.3$.

Answer: 0.2, 0.7, 1.

2. For the same distribution, find $P(X < 2)$. [2 marks]

The event includes $x = 0$ and $x = 1$ only.

Add $0.2 + 0.5$.

Answer: 0.7.

3. An integer-valued X has $F(2) = 0.65$ and $F(3) = 0.90$. Find $P(X = 3)$. [2 marks]

Subtract the cumulative total before 3 from the total at 3.

$0.90 - 0.65 = 0.25$.

Answer: 0.25.

4. X takes only the values 2, 5 and 8, with probabilities 0.1, 0.6 and 0.3. Find $F(6)$. [2 marks]

The values no larger than 6 are 2 and 5.

Add $0.1 + 0.6$; there need not be mass at 6.

Answer: 0.7.

5. For integer-valued X, $F(1) = 0.3$ and $F(4) = 0.95$. Find $P(2 \leq X \leq 4)$. [2 marks]

$F(4)$ includes all values up to 4.

Subtract $F(1)$, which excludes everything below 2: $0.95 - 0.3$.

Answer: 0.65.

6. A proposed cumulative function has $F(1) = 0.7$ and $F(2) = 0.6$. Explain why it is impossible. [2 marks]

The event $X \leq 1$ is contained in $X \leq 2$.

Adding possible values cannot reduce total probability.

Answer: A cumulative probability cannot decrease.