

ECE 341 - Homework #5

Geometric & Pascal Distributions. Summer 2024

Geometric Distributions

Let A be the number of times you roll a 10-sided die until you get a 1 ($p = 1/10$)

- 1) Determine the pdf of A using z-transforms. From this, compute
 - The probability that $A = 10$
 - The probability that $A \geq 10$
- 2) Use a Monte-Carlo simulation with 100,000 A 's. From your Monte-Carlo simulation, determine
 - The probability that $A = 10$
 - The probability that $A \geq 10$

Pascal Distribution

Let

- A be the number of times you roll an 10-sided die until you get a 1 ($p = 1/10$), and
 - B be the number of times you roll an 10-sided die until you get a 1 or 2 ($p = 1/5$).
 - $X = A + B$
- 3) Determine the pdf of X using z-transforms. From this compute
 - The probability that $X = 20$
 - The probability that $X \geq 20$
 - 4) Determine the pdf of X using convolution. From this, compute
 - The probability that $X = 20$
 - The probability that $X \geq 20$
 - 5) Use a Monte-Carlo simulation with 100,000 X 's. From your Monte-Carlo simulation, determine
 - The probability that $X = 20$
 - The probability that $X \geq 20$

(problem 6-8: over)

Pascal Distribution (cont'd)

Let

- A be the number of times you roll a 10-sided die until you roll a 1 ($p = 1/10$)
- B be the number of times you roll a 8-sided die until you get a 1 ($p = 1/8$)
- C be the number of times you roll a 6-sided die until you get a 1 ($p = 1/6$)
- $Y = A + B + C$

6) Determine the pdf of Y using z-transforms. From this compute

- The probability that $Y = 20$
- The probability that $Y \geq 20$

7) Determine the pdf of Y using convolution. From this, compute

- The probability that $Y = 20$
- The probability that $Y \geq 20$

8) Use a Monte-Carlo simulation with 100,000 Y's. From your Monte-Carlo simulation, determine

- The probability that $Y = 20$
- The probability that $Y \geq 20$