Computation and Modeling Assignment 36

Anton Perez

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Problem 36-1

Suppose you are a mission control analyst who is looking down at an enemy headquarters through a satellite view, and you want to get an estimate of how many tanks they have. Most of the headquarters is hidden, but you notice that near the entrance, there are four tanks visible, and these tanks are labeled with the numbers 52, 30, 68, 7. So, you assume that they have N tanks that they have labeled with numbers from 1 to N.

Your commander asks you for an estimate: with 95% certainty, what's the max number of tanks they have?

Solution:

$$P(\{52, 30, 68, 7\}|k) = \begin{cases} \dfrac{1}{k^4} & k \geq 68 \\ 0 & \text{otherwise} \end{cases}$$

$$\sum_{k=1}^{\infty} c \cdot P(\{52, 30, 68, 7\}|k) = 1$$

$$c \sum_{k=68}^{\infty} \frac{1}{k^4} = 1$$

$$1.083726 \times 10^{-6} c = 1$$

$$c = 922742.5$$

$$P(k|\{52, 30, 68, 7\}) = c \cdot P(\{52, 30, 68, 7\}|k) = \frac{922713.5}{k^4}$$

You can be 95% sure that the maximum number of tanks is 183 or under.