



MITx: 6.041x Introduction to Probability - The Science of Uncertainty



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Exercise: Describing events

(4/4 points)

Events related to the Poisson process can be often described in two equivalent ways: in terms of numbers of arrivals during certain intervals or in terms of arrival times. The first description involves discrete random variables, the second continuous random variables.

Let $N(t)$ be the number of arrivals during the time interval $[0, t]$ in a Poisson process. Let Y_k be the time of the k th arrival.


a) The event $\{N(5) > 1\}$ is equivalent to the event $\{Y_k \leq b\}$, for suitable b and k . Find b and k .

 $b =$ Answer: 5 $k =$ Answer: 2


- ▶ Unit 6: Further topics on random variables
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- ▼ **Unit 9: Bernoulli and Poisson processes**

Unit overview

Lec. 21: The Bernoulli process

Exercises 21 due May 11, 2016 at 23:59 UTC 

Lec. 22: The Poisson process

Exercises 22 due May 11, 2016 at 23:59 UTC 

Lec. 23: More on the Poisson process

b) The event $\{2 < Y_3 \leq Y_4 \leq 5\}$ is equivalent to the event $\{N(2) \leq a \text{ and } N(5) \geq b\}$. Find a and b .



$a =$ Answer: 2




$b =$ Answer: 4

Answer:

a) We have $N(5) > 1$ if and only if we have had two or more arrivals by time 5, i.e., $T_2 \leq 5$. Thus, $b = 5$ and $k = 2$.

b) We have $2 < Y_3 \leq Y_4 \leq 5$ if and only if by time 2 we have not yet had 3 arrivals (i.e., $N(2) \leq 2$) and by time 5 we have had at least 4 arrivals (i.e., $N(5) \geq 4$). Thus, $a = 2$ and $b = 4$.


You have used 2 of 2 submissions

Exercises 23 due May 11, 2016
at 23:59 UTC 

Solved problems

**Additional theoretical
material**

Problem Set 9

Problem Set 9 due May 11,
2016 at 23:59 UTC 

Unit summary

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