



## 12. Exercise: Describing events

Exercises due May 13, 2020 05:29 IST Completed

### Exercise: Describing events

4/4 points (graded)

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

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

**Solution:**

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  $b = 4$ .

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You have used 3 of 3 attempts

**i** Answers are displayed within the problem

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3 hours before having all correct

1

I take 3 hours before having all correct. However, reading the explanation, I assume it's confusing.



Hint

1

Be careful with the comparison operators and with the domains of Y and N.



STAFF: I see a couple of problems with this question

4

Wow, this turned out to be far more confusing than I expected. It might just be me that did not realize th...



Hint

5

Review video 10 or check out video 16.



Question about the solution of (a).

3

Shouldn't the solution involve  $Y_k$  and not  $T_k$ ?

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