

# Assignment 12

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# Outline

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## Question

Suppose that the time between arrivals of patients in a dentist's office constitutes samples of a random variable  $X$  with density  $\theta e^{-\theta x} U(x)$ . The 40th patient arrived 4 hours after the first. Find the 0.95 confidence interval of the mean arrival time  $\eta = \frac{1}{\theta}$

# Solution

The time of arrival of the 40th patient is the sum  $x_1 + x_2 + \dots + x_n$  of  $n = 39$  RVs with exponential distribution.

We can estimate the mean  $\eta = \frac{1}{\theta}$  of  $x$  in terms of its sample mean

$X = \frac{240}{39} = 6.15$  minutes using Normal Approximation method.

Taking  $\lambda = \eta$  and  $z_{0.975}/\sqrt{39} = 0.315$

$$P\left\{\frac{\bar{x}}{1.315} < \eta < \frac{\bar{x}}{0.685}\right\} = 0.95 \quad (1)$$

$$\implies 4.68 \text{ minutes} < \eta < 8.98 \text{ minutes} \quad (2)$$