

Instructions: Show all work. Use exact answers or appropriate rounding conventions. If you use your calculator, you can show work by saying which calculator commands you used.

1. What is a point estimate?

a point estimate is a single value for a parameter that contains no information about accuracy.

2. Why do we typically report point estimates with the associated standard error?

because point estimates are almost certainly incorrect and so the standard error gives us a way to express how wrong (or right) it's likely to be.

3. Suppose that times between customers at a drive-thru window is exponentially distributed according to $f(x) = \lambda e^{-\lambda x}$, $x \geq 0$. Ten measurements of times between customers are taken and are $\{10, 13, 8, 20, 3, 15, 4, 7, 11, 12\}$. Use this information to estimate the value of the parameter λ using the Maximum Likelihood Estimator function.

$$L(\lambda) = \lambda e^{-10\lambda} \cdot \lambda e^{-13\lambda} \cdot \lambda e^{-8\lambda} \cdot \lambda e^{-20\lambda} \cdot \lambda e^{-3\lambda} \cdot \lambda e^{-15\lambda} \cdot \lambda e^{-4\lambda} \cdot \lambda e^{-7\lambda} \cdot \lambda e^{-11\lambda} \cdot \lambda e^{-12\lambda}$$

$$= \lambda^{10} e^{-103\lambda}$$

$$L'(\lambda) = 10\lambda^9 e^{-103\lambda} - \lambda^{10} (103) e^{-103\lambda} = 0 = \lambda^9 e^{-103\lambda} (10 - 103\lambda) = 0$$

$$\frac{10 = 103\lambda}{103} \Rightarrow \boxed{\lambda = \frac{1}{13}}$$