(Example 4.32)

Animals of the forest need to cross a remote highway. From experience they know that, from the moment someone arrives at the roadside, the time till the next car is an exponential random variable with expected value **30 minutes**. The turtle needs **10 minutes** to cross the road.

(a) What is the probability that the turtle can cross the road safely?

(b) Now suppose that when the turtle arrives at the roadside, the fox tells her that he has been there already **5 minutes** without seeing a car go by. What is the probability now that the turtle can cross safely?

Write X = time to next car

$E(X) \sim 30 = 1/\lambda \Rightarrow \lambda = 1/30$ "1 30th cars per minute"

$\Rightarrow X \sim \text{Exp}(1/30)$

(a) $P(X > 10) = 1 - P(X \le 10) = 1 - F_X(10)$

$= 1 - (1 - e^{-10/30}) = \boxed{e^{-1/3}} \approx .72$

(b) $P(X > \overset{5+10}{15} \mid X > 5) = P(X > 10)$ by the memoryless property

$= e^{-1/3}$