

Example 31.1.1

Problem Setup: The average number of shoppers arriving at a supermarket check-out counter waiting to be served by a cashier is 6 per minute. The arrivals follow a Poisson distribution.

↳ 1 minute = 60 seconds

Question: In any 10-second interval, what is the probability that 2 shoppers will arrive?

$$\lambda_{\text{new}} = \lambda_{\text{old}} \times \frac{t_{\text{new}}}{t_{\text{old}}} = 6 \times \frac{10 \text{ sec}}{60 \text{ sec}} = \frac{6 \times 10}{60} = 1 \text{ per 10 seconds.}$$

$$\lambda_{\text{new}} = 1 \quad x = 2 \quad P(x) = \frac{\lambda^x e^{-\lambda}}{x!} = \frac{1^2 e^{-1}}{2!}$$

$$1^2 = 1 \times 1 = 1$$

$$2! = 2 \times 1 = 2$$

$$e^{-1} = 0.3679$$

$$= \frac{1 \times 0.3679}{2} = 0.1839$$

↳ 18.39%