

# The Exponential Distribution

How much time will elapse before an earthquake occurs in a given region? How long do we need to wait before a customer enters our shop? How long will it take before a call centre receives the next phone call? How long will a piece of machinery work without breaking down?

Questions such as these are often answered in probabilistic terms using the exponential distribution. The exponential distribution describes the arrival time of a randomly recurring independent event sequence. If  $\mu$  is the mean waiting time for the next event recurrence, its probability density function is:

$$f(x) = \begin{cases} \frac{1}{\mu}e^{-x/\mu} & \text{when } x \geq 0 \\ 0 & \text{when } x < 0 \end{cases}$$

Below is a graph of the exponential distribution with  $\mu=1$ :

