The Exponential Distribution

The exponential distribution is the distribution of the intervals between successive Poisson events

The parameters for the exponential distribution are:

$$X \sim Exp(\lambda)$$

Exponential mean = $1 / \lambda$ ... *and therefore* $\lambda = 1/mean$

Exponential variance = $1 / \lambda^2$ ... *and therefore s.d.* $= 1 / \lambda$

This information can be found on page 5 in the formula booklet

NOTE: due to the relationship between the Poisson and Exponential distributions the parameter λ is used but the mean is $1 / \lambda$.

The exponential cumulative probability formula is:

$$P(X \leq x) = 1 - e^{-\lambda x}$$

- where e is the mathematical constant which is approximately equal to 2.71828
- where λ is the Poisson parameter for the related discrete distribution

We know that $P(X \leq x) = 1 - e^{-\lambda x}$

This information can also be found on page 5 in the formula booklet

Due to the laws of inequalities, we know that:

$\mathbf{P(X < x)} = P(X \leq x) = \mathbf{1 - e^{-\lambda x}}$

$\mathbf{P(X > x)} = P(X \geq x) = 1 - (1 - e^{-\lambda x}) = \mathbf{e^{-\lambda x}}$

$\mathbf{P(a < X < b)} = P(X \leq b) - P(X \leq a) = 1 - e^{-\lambda b} - 1 - e^{-\lambda a} = \mathbf{e^{-\lambda a} - e^{-\lambda b}}$