

# Factsheet: Poisson distribution

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## Summary

A factsheet for the Poisson distribution.

$$\text{Poisson}(\lambda = 8.0)$$

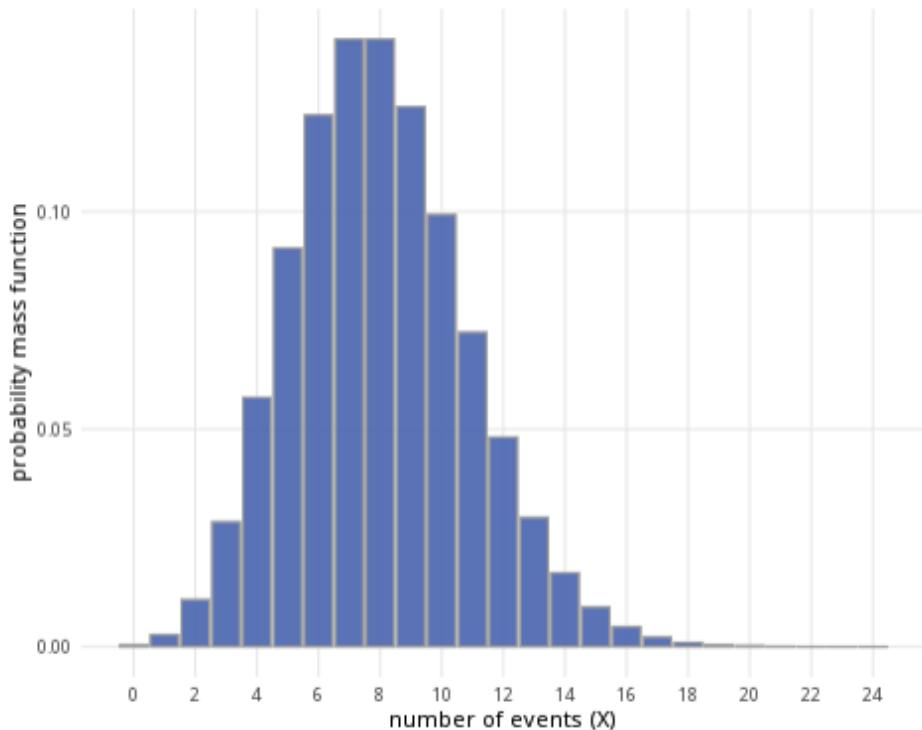


Figure 1: An example of the Poisson distribution with  $\lambda = 8$ .

**Where to use:** The Poisson distribution is used when a specific event occurs at some rate  $\lambda$ , and you are counting  $X$ , the number of times this event occurs in some interval.

**Notation:**  $X \sim \text{Poisson}(\lambda)$  or  $X \sim \text{Pois}(\lambda)$ .

**Parameter:**  $\lambda$  is the integer number of times an event occurs within a specific period of time.

Quantity	Value	Notes
Mean	$\mathbb{E}(X) = \lambda$	

Quantity	Value	Notes
<b>Variance</b>	$\mathbb{V}(X) = \lambda$	
<b>PMF</b>	$\mathbb{P}(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$	
<b>CDF</b>	$\mathbb{P}(X \leq x) = \sum_{i=1}^{\lfloor x \rfloor} \frac{\lambda^i e^{-\lambda}}{i!}$	$\lfloor x \rfloor$ the floor function

**Example:** Customers enter Cantor's Confectionery at an average rate of 20 people per hour, and you want to see the likelihood that  $X$  number of customers walks in. This can be expressed as  $X \sim \text{Pois}(20)$ .

## Further reading

This interactive element appears in Overview: Probability distributions. Please click this link to go to the guide.

## Version history

v1.0: initial version created 04/25 by tdhc and Michelle Arnetta as part of a University of St Andrews VIP project.

- v1.1: moved to factsheet form and populated with material from Overview: Probability distributions by tdhc.

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