Part 8.5: Working Backwards

Again, just like with the binomial, sometimes we are given the 'answer' and need to work backwards to find certain other numbers using the formula, $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$. Let's look at the most common type of question:

Example
A bank knows the likelihood of them having one or more customers arrive in a minute is 0.95. What is the mean number of customers arriving at the bank per minute?

Answer
The first thing we need to do is find the probability that x = 0 which in this case is 0.05. If we put this into the formula $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!} = \frac{\lambda^0 e^{-\lambda}}{0!} = e^{-\lambda} = 0.05\ldots$ if we put this last part ($e^{-\lambda} = 0.05$) into solver we can find out that x = 2.9957 which means the average number of customers is likely to be 3 per minute.

Sometimes we will need to work out questions with different parameters (i.e. when x is not zero). If this comes about you need to work out what you are trying to find out, put the numbers into the formula (or the calculator) and find the solution.

Note: sometimes the easiest way to solve this is just by trial and error in the calculator.

Exercise 8.5

1. The average likelihood of having 1 or more defective products on a production line in an hour is 0.993. What is the mean number of defective products produced per hour?
2. A real-estate agent knows that on 4.98% of weeks he will sell no houses. What is the average number of houses that he will sell in **one year**?
3. A company claims that the likelihood of seeing at least one dolphin on its 1 day dolphin sightseeing cruise is 99.9%. What is the average number of dolphins seen on the 1 day cruise?
4. The probability a m^2 of carpet has a certain number of faults is 0.0437. If there are 0.85 faults per m^2 on average, what is the certain number?