Part 8.3: Probability it is More Than

Again, just like with the binomial, we often need to work out the probability that it is more than a certain amount. Let's look at an example.

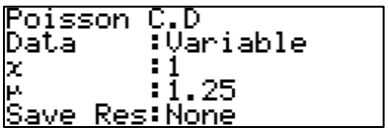
Example
My car has broken down 10 times in the last 8 years. What is the probability it breaks down more than once in the next year?

Answer
Again, the first thing we should do is draw a number line and highlight the part that we want…

0 1 2 3 4 5 …

And from the last time we did this question we can remember that the mean is 1.25.

(Graphics Calculator)
We go to STAT (2) → DIST (F5) → Across (F6) → Poisn (F1). We want Pcd as we are after up to. In this case x = 1 and μ = 1.25 which looks like this:



When we press calculate we get 0.6446 (4sf) which is the probability of the part we do not want.
We then do 1 – 0.6446 to find the probability of the car breaking down more than once is 0.355 (3sf).

(Formula)
We can see that x is not 0 or 1 and λ = 1.25. This means we need to substitute into the formula 2 times, once for each vaule of x… we get

$$\mathrm{P}(X=1)=\frac{1.25^1e^{-1.25}}{1!}=0.35813$$

$$\mathrm{P}(X=0)=\frac{1.25^0e^{-1.25}}{0!}=0.28650$$

We then add these up giving 0.6446 (4sf).
We subtract from 1 giving 0.355 (3sf).
As you can see these two answers match up.

Exercise 8.3

1. The number of kiwi birds in a km^2 in a particular area is on average 20. Calculate the probability there are:
   a. More than 25 kiwi birds in a 1 km^2 area.
   b. 50 or more kiwi birds in a 3 km^2 area.
   c. Exactly 58 kiwi birds in a 3 km^2 area.
   d. Between 18 and 22 kiwi birds (inclusive) in a 1 km^2 area.
2. The number of books on a shelf in the library is on average 50. What is the probability there are:
   a. 60 or more books on a shelf
   b. More than 90 books on two shelves?
   c. Exactly 95 books on two shelves?
   d. Between 45 and 55 books (inclusive) on a shelf?
3. The number of cups of coffee sold at a café is on average 15 per hour. Calculate the probability the café sells:
   a. More than 20 cups of coffee in a hour.
   b. 10 or more cups of coffee in half an hour.
   c. Less than 5 cups of coffee in 15 minutes.
   d. Between 3 and 5 cups of coffee (inclusive) in 10 minutes.
4. The number of calls to a call centre is on average 10 per minute. What is the probability there are:
   a. More than 12 calls in a minute?
   b. 100 or more calls in 10 minutes?
   c. Less than 10 calls in a minute?
   d. Between 8 and 12 calls (inclusive) in a minute?