Imagine that on average, there are 5 feral cats in a 1 square mile region. Here, the number of cats is denoted by the variable Y that has a Poisson distribution with *E(Y)* = *V(Y)* = = 5 cats/square mile. Also recall that the PMF of a Poisson random variable *Y* is .

What is the probability of observing exactly 3 cats in a square mile?

In Excel, we write: =

In R, we write: *dpois(3,5)*

With all that in mind, imagine that the question is as follows: What is the probability of observing *at most* 3 cats in a square mile?

The answer to that question should be intuitively clear. The probability of observing at most 3 cats is the probability of observing 0 cats, plus the probability of observing 1 cat, plus the probability of observing 2 cats, plus the probability of observing 3 cats. Mathematically,

When we substitute λ = 5 and e = 2.72, we can easily calculate the quantity above in any calculator (the answer is 0.265).

We can also calculate the probability of observing at most 3 cats in Excel, using the simple following formula: *=POISSON(3,5,TRUE)*.

In R, we can do this as follows: *ppois(3,5)*

And what’s the probability of observing *at least* 3 cats? Well, that’s simply

In Excel, we can calculate it as =*1-POISSON(2,5,TRUE)* = .875.

In R, we calculate it as *1-ppois(2,5).*