The lifetime of a lightbulb is an exponentially distributed random variable $T$, where $T$ is measured in hours and the expected lifetime is 800 hours. You consider a "dud" to be a bulb that lasts less than 400 hours.

You have a box of six bulbs, what is the probability that we have to wait until the 6th bulb to get a dud.

In Chapter 2 we dealt a lot with Bernoulli trials. We can easily identify Bernoulli trials by scanning the problem and looking for something that can be modeled by a "loaded coin toss." Even though we are in Chapter 3, we should be able to notice that the "Dud/No Dud" classification can be modeled as a loaded coin toss. We are being asked to find the waiting time for a successful outcome of a Bernoulli trial.

So we are looking for $P(X=6)$ for a geometric random variable. The new twist in this problem is that now we have the information we need to compute $p$ (in the past, $p$ was usually given to us).

The random variable $T$ follows an exponential distribution with parameter $\lambda = \frac{1}{800}$.

The probability of the lightbulb being a dud is $p = P(0 \leq T \leq 400) = 1 - e^{-400/800} = 0.3935$.

The probability of the lightbulb being a dud is $p = (0.6065)^5(0.3935)$.

Therefore, $P(X=6) = 0.0323$. 