Math 30530 — Introduction to Probability

Quiz 3 – Wednesday October 3, 2012

Solutions

3 in every 10 copies of today's *Observer* had an insert with a discount voucher for Sorin's restaurant (so when you pick up a copy of the *Observer*, there is a 3/10 probability of finding such an insert; you may assume that different copies are independent of each other).

1. How likely is it that you have to look in *more than* six copies of the *Observer* in order to find your first insert?

   Solution: Let X be the number of copies you have to look in until you find your first insert; $X \sim$ Geometric(3/10). The event $\{X > 6\}$ that you have to look in *more than* six copies of the *Observer* in order to find your first insert is the same as the event that on the first attempts, you failed to find an insert; so (by independence) $\Pr(X > 6) = (7/10)^6 \approx .1176$.

2. You have searched in 4 copies of the *Observer*, and still haven't found the insert. How likely is it that you will have to look in *more than* 10 copies in total to find your first insert?

   Solution: X is memoryless, so after failing to find an insert in the first 4 copies you looked in, you are starting a fresh geometric random variable; $\Pr(X > 10 | X > 4) = \Pr(X > 6) = (7/10)^6$.

3. On average how many copies of the *Observer* do you have to look in until you have found 9 inserts in total?

   Solution: Let Y be the number of copies you have to look in until you find 9 inserts; $Y \sim$ NegBinomial(3, 3/10), and so $E(Y) = 9 \times (1/(3/10)) = 30$.