

Math 30530 — Introduction to Probability

Quiz 5 – Wednesday October 12, 2011

NAME: _____ *Solutions* _____

Instructions: This is a closed-book quiz. Please do not use any notes.

On cold winter mornings, the chance that my car will start when I turn the ignition is 60%. Experience suggests that the results of different attempts to start are independent of each other.

1. On a particular morning, what is the probability that it will take at least 3 attempts to start my car?

Solution: If X is the number of attempts needed to start, then X is a geometric random variable with $p = .6$. We have

$$P(X \geq 3) = 1 - P(X = 1) - P(X = 2) = 1 - p - p(1 - p) = (1 - p)^2 = .4^2 = .16.$$

2. On a particular work-week (Monday through Friday), what is the expected value of the number of days on which it will take at least 3 attempts to start my car?

Solution: If Y is the number of days (out of 5) on which it will take at least 3 attempts to start, then Y is a binomial random variable with $n = 5$ and $p = .16$, so $E(Y) = 5 * .16 = .8$.

3. On a particular work-week (Monday through Friday), what is the probability that there will be at most two days on which it will take at least 3 attempts to start my car?

Solution:

$$P(Y \leq 2) = P(Y = 0) + P(Y = 1) + P(Y = 2) = .84^5 + 5 * .84^4 * .16 + 10 * .84^3 * .16^2 = .9682$$