Name: ______________________

Directions: MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

When a problem says “Find,” do NOT use simulation.

1. Consider the coin and die game, Sec. 4.15.3.
   (a) (15) Find $P(M = 2)$.
   (b) (15) Find $Var(M)$.
   (c) (15) Find $p_{M,W}(1,1)$.

2. (15) Suppose some random variable $X$ has a Poisson distribution with $\lambda = 3.2$. Do NOT use loops in this problem.
   (a) (15) Find $P(X \leq 8)$.
   (b) (15) Find $E(X^2)$. (You’ll need a mailing tube, but need not cite it.)

3. Consider the parking space example, Sec. 4.2.2.
   (a) (15) Change line 7 in the code so that instead of returning the approximate value of $ED$, it returns the approximate value of $P(D \leq 12)$.
   (b) (10) (Not a continuation of part (a).) We have a caravan of four cars, and thus need four parking spaces. Let $D$ denote the distance of the furthest car from the destination. Find $P(D = 12)$. Do NOT answer with a single R function call; instead, you must write an R expression that includes a call to `choose()`.
Solutions:

1.a \( (5/6)(1/6) \)

1.b \( M \) is geometric, so its variance is \((1 - p)/p^2\), where \( p = 1/6 \).

1.c

\[ p_{M,W}(1,1) = P(M = 1, W = 1) = P(M = 1)P(W = 1|M = 1) = (1/6)(1/2) \]

2.a

\( \text{ppois}(8, 3.2) \)

2.b

\[ E(X^2) = Var(X) + (EX)^2 = 3.2 + 3.2^2 \]

3.a

\( \text{mean}(dvals <= 12) \)

3.b Number the spaces 1,2,...,10 in the first block, 11,12,...,20 in the second block and so on. \( D = 12 \) means that the furthest car is in space 23. That in turn means that the fourth empty space was space 23. The probability of this is that of a negative binomial distribution with \( r = 4 \) and \( p = 0.15 \).