1. (20) Consider the ALOHA example, Sec. 3.14.3. Write a call to the built-in R function `dbinom()` to evaluate (3.123) for general m and p.

2. Consider the bus ridership example, Sec. 2.10. Suppose upon arrival to a certain stop, there are 2 passengers. Let A denote the number of them who choose to alight at that stop.

   (a) (10) State the parametric family that the distribution of A belongs to.

   (b) (20) Find \( p_A(1) \) and \( F_A(1) \), writing each answer in decimal expression form e.g. \( 12.3\cdot0.32 + 0.3333 \).

3. (20) Consider the following simple inventory model. A store has 1 or 2 customers for a certain item each day, with probabilities \( p \) and \( q \) (\( p+1 = 1 \)). Each customer is allowed to buy only 1 item.

When the stock on hand reaches 0 on a day, it is replenished to \( r \) items immediately after the store closes that day.

If at the start of a day the stock is only 1 item and 2 customers wish to buy the item, only one customer will complete the purchase, and the other customer will leave emptyhanded.

Let \( X_n \) be the stock on hand at the end of day \( n \) (after replenishment, if any). Then \( X_1, X_2, ... \) form a Markov chain, with state space \( 1, 2, ..., r \).

Write a function `inventory(p,q,r)` that returns the \( \pi \) vector for this Markov chain. It will call `findpi1()`, similarly to the two code snippets in p.65.
Solutions:

1. \[ \text{dbinom}(1, m, p) \]

2.a binomial

2.b

\[
p_A(1) = 2(0.2)(0.8) \quad (1)
\]

\[
F_A(1) = P(A = 0 \text{ or } A = 1) = (0.8)^2 + 2(0.2)(0.8) \quad (2)
\]

3.

```r
inventory <- function(p, q, r) {
  tm <- matrix(rep(0, r^2), nrow=r)
  for (i in 3:r) {
    tm[i, i-1] <- p
    tm[i, i-2] <- q
  }
  tm[2, 1] <- p
  tm[2, r] <- q
  tm[1, r] <- 1
  return(findpi1(tm))
}
```