Name: ____________________________

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

This entire quiz concerns the committee example in Sec. 3.9.2, pp.61ff. Except for Problem 3(c), all answers are numeric. As usual, numeric answers must be given as R expressions that evaluate to numbers. Note that there are 5 problems, 1-5.

1. (10) Find P(first pick is women, second is man).

2. (15) Find $P(D = 0)$. For full credit, use an appropriate R function.

3. Consider the following simulation code:

```
sim <- function(nreps) {
  reprecords <- matrix(nrow=nreps,ncol=5)
  for (rep in 1:nreps) {
     comm <- pickcommittee()
     reprecords[rep,1:4] <- comm
     tmp <- sum(comm)
     # find tmp-(4-tmp)
     reprecords[rep,5] <- 2*tmp-4
  }
  reprecords
}

pickcommittee <- function() {
   # choose the 4-person committee, recording
   # each time whether a man is picked
   npeopleleft <- 9
   nmenleft <- 6
   pickedsofar <- NULL
   for (i in 1:4) {
      propmen <- nmenleft / npeopleleft
      manpicked <-
         sample(0:1,1,prob=c(1-propmen,propmen))
      nmenleft <- nmenleft - manpicked
      npeopleleft <- npeopleleft - 1
      pickedsofar <- c(pickedsofar,manpicked)
   }
   pickedsofar
}
```

We then run

```
> simout <- sim(100000)
```

We then print out some quantities, as seen below.

(a) (15) What will be printed out from this?

```
> mean(simout[,5])
```

(b) (15) What will be printed out from this?

```
> mean(simout[,3])
```

(c) (20) What will be printed out from this?

```
> rownums <- which(simout[,1] == 1)
> sum(simout[rownums,2]) / length(rownums)
```

Your answer here in Part (c) must be in "P()" form, using only symbols in the book, e.g. P(D = 9).

4. (15) Find $Var(G_4)$.

5. (10) Find $Cov(G_1, G_4)$.

Solutions:

1. (3/9)(6/8)

2. We need $P(M = W = 2)$. It is

```
choose(6,2) * choose(3,2) / choose(9,4)
```

3.a $ED = 4/3$

3.b $P(G_3 = 1) = 6/9$

3.c $P(G_2 = 1|G_1 = 1)$

4. G_4 is an indicator random variable, and thus its variance is $p(1-p)$, where $p = P(G_4 = 1) = 2/3$.

5. We need to find

$$E(G_1 G_4) - EG_1 \cdot EG_4 \tag{1}$$

The latter term is $(6/9)^2$. To find $E(G_1 G_4)$, use reasoning similar to that on the top of p.63 to find that

$$E(G_1 G_4) = E(G_1 G_2) = \binom{6}{2}\binom{3}{0} / \binom{9}{2} \tag{2}$$