

Name: _____

Directions: **Work only on this sheet** (on both sides, if needed). MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

Important note: Remember that in problems calling for R code, you are allowed to use any built-in R function, e.g. `choose()`, `sum()`, `integrate()` etc.

1. This problem concerns the dice game example, Section 7.3.5 of our book. In writing R code, assume that the matrix (7.60) is already stored in a matrix named `v`.

And there is good news! Players now win \$8 each time they roll a four, five or six. Let W_5 , W_2 and W_8 represent how much a player wins in all her rolls that come up 1 dot, 2 or 3 dots, or 4, 5 or 6 dots, respectively; for example, $W_2 = 2Y$. Denote the (column) vector consisting of W_5 , W_2 and W_8 by U .

Find the following quantities. Unless specifically allowed, **do not use loops, + or sum()**. Do not make corrections for continuity.

- (a) (10) EW_2
- (b) (10) $Var(W_5)$
- (c) (10) $P(Y = 12)$ (exact)
- (d) (10) $P(Y \leq 12)$ (exact)
- (e) (15) $P(Y \leq 12)$ (approximate)
- (f) (15) $Cov(L)$ where $L = (X - Y, Y + Z)'$
- (g) (10) $Cov(U)$

2. (20) Here you will write code to help Justin conduct his opinion poll on Amanda's chances of winning the election. It will be an e-mail poll. Assume (as will actually be the case when my grading script runs) that we have the following global variables: `voters`, a data frame containing information on all the registered voters in Davis, one voter per row; `emailcol`, the column number in which the voters' e-mail addresses are stored; and `n`, the number of people to sample. The code will display a simple random sample of e-mail addresses. Single line of code (semicolons OK), no loops.

Solutions:

1.a $2 \cdot 50 \cdot 2/6$

1.b $5^2 \cdot 50 \cdot 5/36$

1.c

```
dbinom(12,50,2/6)
```

1.d

```
pbinom(12,50,2/6)
```

1.e

```
pnorm(12,50*2/6,sqrt(50*(2/6)*(4/6)))
```

1.f

```
a <- rbind(c(1,-1,0),c(0,1,1)); a %*% v %*% t(a)
```

1.g

```
a <- matrix(0,nrow=3,ncol=3); diag(a) <- c(5,2,8); a %*% v %*% t(a)
```

2.

```
polled <- sample(1:nrow(voters),n,replace=F); voters[polled,emailcol]
```