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 \( \text{sum()} \). Do not make corrections for continuity.

(a) (10) \( E W_2 \)
(b) (10) \( \text{Var}(W_5) \)
(c) (10) \( P(Y = 12) \) (exact)
(d) (10) \( P(Y \leq 12) \) (exact)
(e) (15) \( P(Y \leq 12) \) (approximate)
(f) (15) \( \text{Cov}(L) \) where \( L = (X - Y, Y + Z)' \)
(g) (10) \( \text{Cov}(U) \)

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: \textbf{voters}, a data frame containing information on all the registered voters in Davis, one voter per row; \textbf{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 (semicolon OK), no loops.
Solutions:
1.a $2 \cdot 50 \cdot \frac{2}{6}$
1.b $5^2 \cdot 50 \cdot \frac{5}{36}$
1.c
   \[ \text{dbinom}(12, 50, \frac{2}{6}) \]
1.d
   \[ \text{pbinom}(12, 50, \frac{2}{6}) \]
1.e
   \[ \text{pnorm}(12, 50 \cdot \frac{2}{6}, \sqrt{50 \cdot \frac{2}{6} \cdot \frac{4}{6}}) \]
1.f
   \[ a \leftarrow \text{rbind}(c(1, -1, 0), c(0, 1, 1)); a \%\% \times \%\% \text{t}(a) \]
1.g
   \[ a \leftarrow \text{matrix}(0, \text{nrow}=3, \text{ncol}=3); \text{diag}(a) \leftarrow c(5, 2, 8); a \%\% \times \%\% \text{t}(a) \]
2.
   \[ \text{polled} \leftarrow \text{sample}(1: \text{nrow(voters)}, n, \text{replace}=\text{F}); \text{voters}[\text{polled, emailcol}] \]