1. \[ P(X = 4) = \binom{4}{2} \frac{2}{14} = \frac{6}{91} \quad P(X = 0) = \binom{2}{2} \frac{1}{14} = \frac{1}{91} \]

\[ P(X = 2) = \binom{4}{2} \frac{2}{14} = \frac{8}{91} \quad P(X = -1) = \binom{8}{1} \frac{2}{14} = \frac{16}{91} \]

\[ P(X = 1) = \binom{4}{1} \frac{8}{14} = \frac{32}{91} \quad P(X = -2) = \binom{8}{2} \frac{2}{14} = \frac{28}{91} \]

   p(8)=21/216 p(9)=25/216 p(10)=27/216 p(11)=27/216 p(12)=25/216
   p(18)=1/216

5. \[ n - 2i, i = 0, 1, \ldots, n \]

13. \[ p(0) = P\{\text{no sale on first and no sale on second}\} \]
    \[ = (.7)(.4) = .28 \]

\[ p(500) = P\{1 \text{ sale and it is for standard}\} \]
    \[ = P\{1 \text{ sale}\}/2 \]
    \[ = [P\{\text{sale, no sale}\} + P\{\text{no sale, sale}\}]/2 \]
    \[ = [(3)(.4) + (.7)(.6)]/2 = .27 \]

\[ p(1000) = P\{2 \text{ standard sales}\} + P\{1 \text{ sale for deluxe}\} \]
    \[ = (.3)(.6)(1/4) + P\{1 \text{ sale}\}/2 \]
    \[ = .045 + .27 = .315 \]

\[ p(1500) = P\{2 \text{ sales, one deluxe and one standard}\} \]
    \[ = (.3)(.6)(1/2) = .09 \]

\[ p(2000) = P\{2 \text{ sales, both deluxe}\} = (.3)(.6)(1/4) = .045 \]
20. (a) \( P\{x > 0\} = P\{\text{win first bet}\} + P\{\text{lose, win, win}\} \)
\[
= \frac{18}{38} + (\frac{20}{38})(\frac{18}{38})^2 \approx 0.5918
\]
(b) No, because if the gambler wins then he or she wins $1. However, a loss would either be $1 or $3.
(c) \( E[X] = 1[\frac{18}{38} + (\frac{20}{38})(\frac{18}{38})^2] - [(\frac{20}{38})2(\frac{20}{38})(\frac{18}{38})] - 3(\frac{20}{38})^3 \)
\[
\approx -0.108
\]
21. (a) \( E[X] \) since whereas the bus driver selected is equally likely to be from any of the 4 buses, the student selected is more likely to have come from a bus carrying a large number of students.
(b) \( P\{X = i\} = \frac{i}{148}, i = 40, 33, 25, 50 \)
\( E[X] = \left[(\frac{40}{2}) + (\frac{33}{2})^2 + (\frac{25}{2})^2 + (\frac{50}{2})^2\right]/148 \approx 39.28 \)
\( E[Y] = (40 + 33 + 25 + 50)/4 = 37 \)

T9. \( E[Y] = E\left[\frac{X}{\sigma} - \frac{\mu}{\sigma}\right] = \frac{1}{\sigma}E[X] - \frac{\mu}{\sigma} = \frac{\mu}{\sigma} - \frac{\mu}{\sigma} = 0 \)
\( Var(Y) = \left(\frac{1}{\sigma}\right)^2 Var(X) = \frac{\sigma^2}{\sigma^2} = 1 \)

T12. Condition on the number of functioning components and then use the results of Example 4c of Chapter 1:
\[
\text{Prob} = \sum_{i=0}^{n}\binom{n}{i}p^i(1-p)^{n-1}\binom{i+1}{n-i},
\]
Where \( \binom{i+1}{n-i} = 0 \) if \( n-i > i+1 \). We are using the results of Exercise 11.