17. a) \( P(X = 1) = \frac{1}{2} - \frac{1}{4} = \frac{1}{4} \)
\( P(X = 2) = \frac{1}{12} - \frac{3}{4} = -\frac{5}{12} \)
\( P(X = 3) = 1 - \frac{11}{12} = \frac{1}{12} \)

b) \[
P\left(\frac{1}{2} < X \leq \frac{3}{2}\right) = P\left(\frac{1}{2} < X < \frac{3}{2}\right) \cup \left(X = \frac{3}{2}\right)
= P\left(\frac{1}{2} < X < \frac{3}{2}\right) + P\left(X = \frac{3}{2}\right)
\]

It follows that
\[
P\left(\frac{1}{2} < X < \frac{3}{2}\right) = F\left(\frac{3}{2}\right) - F\left(\frac{1}{2}\right)
= \frac{5}{8} - \frac{1}{8} = \frac{1}{2}
\]

19. \( P(X = 0) = \frac{1}{2} \)
\( P(X = 1) = \frac{1}{10} \)
\( P(X = 2) = \frac{3}{10} \)
\( P(X = 3) = \frac{1}{10} \)
\( P(X = 3.5) = \frac{1}{10} \)

22. Let \( N \) denote the number of games played.

(a) \( E(N) = 2[p^3 + (1-p)^2] + 3[2p(1-p)] = 2 + 2p(1-p) \)

The final equality could also have been obtained by using that \( N = 2 + I \) where \( I \) is 0 if two games are played and 1 if three are played. Differentiation yields that
\[
\frac{d}{dp}E[N] = 2 - 4p
\]

and so the minimum occurs when \( 2 - 4p = 0 \) or \( p = 1/2 \).

(b) \[
E[N] = 3[p^3 + (1-p)^3] + 4[3p^2(1-p)p + 3p(1-p)^2(1-p)]
+ 5[6p^2(1-p)^2] = 6p^3 - 12p^3 + 3p^3 + 3p + 3
\]

Differentiation yields
\[
\frac{d}{dp}E[N] = 24p^3 - 36p^2 + 6p + 3
\]

Its value at \( p = 1/2 \) is easily seen to be 0.

28. \[ 3 \cdot \frac{4}{20} = 3/5 \]

35. If \( X \) is the amount that you win, then
\[
P(X = 1.10) = 4/9 = 1 - P(X = -1)
E[X] = (1.1)4/9 - 5/9 = -.6/9 = -.067
Var(X) = (1.1)^2(4/9) + 5/9 - (.6/9)^2 = 1.089 \]
43. \[ \binom{5}{3}(.2)^3(.8)^2 + \binom{5}{4}(.2)^4(.8) + (.2)^5 \]

57. (a) \[ 1 - e^{-3} - 3e^{-3} - e^{-3} \frac{3^2}{2} = 1 - \frac{17}{2}e^{-3} \]

(b) \[ P(X \geq 3 \mid X \geq 1) = \frac{P(X \geq 3)}{P(X \geq 1)} = \frac{1 - \frac{17}{2}e^{-3}}{1 - e^{-3}} \]

58. Use Matlab or Octave (see www.octave.org for free download)

\[
\begin{align*}
\text{octave:3> binapprox} \\
a) \text{ Binomial Exact} \\
\text{ans} &= 0.14880 \\
\text{Poisson Approx} \\
\text{ans} &= 0.14379 \\
b) \text{ Binomial Exact} \\
\text{ans} &= 0.31512 \\
\text{Poisson Approx} \\
\text{ans} &= 1.8616e-08
\end{align*}
\]

Note that in part (b), that the assumptions were not met, therefore the approximation is bad.