

4.46 Jury convicts if 9 out of 12 say guilty. It reaches correct decision if convicts a guilty person ($Y = \# \text{ convict} \geq 9$) and if it does not convict an innocent person ($Y < 9$).

$$\begin{aligned} P(\text{correct}) &= P(Y \geq 9 | \text{Guilty}) P(G) + P(Y < 9 | \text{Inno}) P(\text{Inno}) \\ &= P(\text{Bi}(n=12, p=.8) \geq 9) (.65) + \\ &\quad P(\text{Bi}(n=12, p=.1) < 9) (.35) \\ &= \end{aligned}$$

4.51 (a) Under usual Poisson assumptions, $Y = \# \text{ errors}$ is Poisson with $\lambda = .2 / \text{errors/page}$.

$$P(Y=0) = e^{-\lambda}$$

$$(b) P(Y \geq 2) = 1 - P(Y \leq 1) = 1 - e^{-\lambda} - \lambda e^{-\lambda}$$

4.60 $P(\text{Beneficial}) = .75$ $C = \# \text{ colds}$ Use Bayes

$$\begin{aligned} P(B|C=2) &= \frac{P(C=2|B) P(B)}{P(C=2|B) P(B) + P(C=2|B^c) P(B^c)} \\ &= \frac{(3^2 e^{-3}/2) (.75)}{(3^2 e^{-3}/2) (.75) + (5^2 e^{-5}/2) (.25)} \end{aligned}$$

4.61 $H = \# \text{ hands with full house in } 1000 \text{ attempts}$

$H \sim \text{Bi}(n=1000, p=.0014)$. Use Poisson approximation,

$$P(H \geq 2) = 1 - P(H \leq 1) = 1 - (e^{-\lambda} + e^{-\lambda} \lambda)$$

with $\lambda = np = 1.4$.

4.67 Better team must win the last game

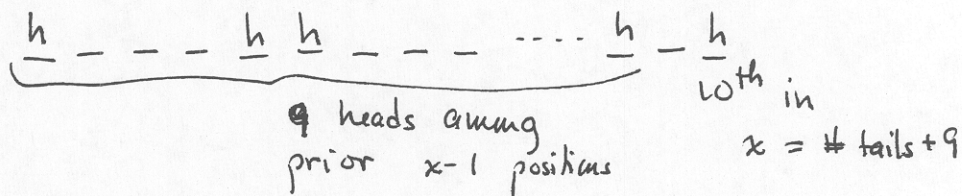
$$\begin{aligned} P(\text{wins in 4}) &= .6^4 \\ P(\text{wins in 5}) &= .4 \cdot .6^4 \cdot \binom{4}{1} \\ P(\text{wins in 6}) &= (.4)^2 (.6)^4 \cdot \binom{5}{2} \end{aligned}$$

4.68 Check your work to see that adds to one!

$$P(X=j) = 2 \binom{j-1}{j-4} \left(\frac{1}{2}\right)^j = \begin{cases} 1/8 & j=4 \\ 1/4 & j=5 \\ 5/16 & j=6 \\ 5/16 & j=7 \end{cases}$$

\nearrow either team wins series \nearrow winner wins last game

4.70 The first 9 heads can be in any of the previous locations,



$$P(T=t) = \binom{t+9}{t} (p_{\text{head}})^{10} (1-p_{\text{head}})^t \quad t=0,1,2,\dots$$

4.77 $P(4 \text{ ok}) = (.9)^4$, so prob of a problem fund is $1 - .9^4$

8.2 (a) Use Markov since one sided and positive r.v.

$$P(S \geq 86) \leq \frac{75}{86} = .87$$

(b) Use Chebyshev since want an interval

$$P(65 \leq S \leq 85) = P\left(\frac{65-75}{5} \leq \frac{S-\mu}{\sigma} \leq \frac{85-75}{5}\right)$$

(c) Skip!

$$= P\left(-2 \leq \frac{S-\mu}{\sigma} \leq 2\right)$$

$$\geq \frac{3}{4}$$

8.4 (a) $E[X_1 + \dots + X_{20}] = 20$ so by Markov

$$P\left(\sum_{i=1}^{20} X_i > 15\right) = P\left(\sum X_i \geq 16\right) \leq \frac{16}{20} = \frac{4}{5}$$