Homework #4 solutions: MA 204

3.34 $\lambda = \text{mean} = \frac{0(18)+1(30)+...7(2)}{104} = 1.98$
$P(X=k) = \frac{e^{-\lambda}\lambda^k}{k!}$
The number of expected seasons with 0 no-hit games is 14, while we observed 18. To get this number, we take P(X=0) = 0.138 and multiply that probability times the total number of seasons (e.g., 104*0.138 = 14).
We expect 14, 28, 28, 19, 9, 3, 1, and 0 seasons with 0, 1, 2, 3, 4, 5, 6, and 7 no hitters, respectively

3.36 $P(Redpill, 3colds) = \frac{e^{-1}(1)^3}{6} = 0.063$ and $P(Bluepill, 3colds) = \frac{e^{-4}(4)^3}{6} = 0.195$
Thus, $P(Bluepill|3colds) = \frac{0.195}{0.195+0.0613} = 0.7611$

3.37 This answer is in the back of the book. The answers are nearly identical using a Binomial distribution (n = 10,000, p = 1/6000) and a Poisson distribution ($\lambda = 5/3$). The answer to both is 0.72

4.8 $P(0aces) = \frac{\binom{48}{5}}{\binom{52}{5}} = 0.659$

$P(1aces) = \frac{\binom{4}{1}\binom{48}{4}}{\binom{52}{5}} = 0.300$

$P(2aces) = \frac{\binom{4}{2}\binom{48}{3}}{\binom{52}{5}} = 0.039$

$P(3aces) = \frac{\binom{4}{3}\binom{48}{2}}{\binom{52}{5}} = 0.002$

$P(4aces) = \frac{\binom{4}{4}\binom{48}{1}}{\binom{52}{5}} = 0.0000185$

$P(5aces) = 0$

Thus, $E[X] = 0(0.659) + 1(0.300) + 2(0.039) + 3(0.002) + 4(0.0000185) = 0.3844$