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Homework 5

Problem 3.1

P(X <= 1) = P(X=0) + P(X=1) = 0.25 + 0.33 = 0.58.

E(X) = 0 + 0.33 + 2(0.18) + 3(0.16) + 4(0.08) = 1.49

E(X+Y) = 1.49 + 1.49 = 2.98
if they are following the same expected value. See proof below.

$$\begin{aligned}\mathbf{E}[X+Y] &= \sum_x x\Pr(X=x) + \sum_y y\Pr(Y=y) \\ &= \mathbf{E}[X] + \mathbf{E}[Y]\end{aligned}$$

Problem 3.2

P(AwayScore >= 30 | HomeScore >= 30) = 0.105 / 0.312 = 0.3365.

P(Homescore >= 30 | AwayScore >= 30) = 0.105 / 0.219 = 0.4795.

Since P(B|A) is not equal to P(B) and P(A|B) is not equal to P(A), they are dependent.

Problem 3.3

It depends, because if the sample size is small, then the accuracy of the averages is biased. If the sample size is larger, then the accuracy of the averages is more accurate and by default, less biased. It could be safer to assume this would happen if the sample size is large, e.g. Number of games is large. I think theres other confounding variables than just innings here. It would be interesting to see a regression between different variables of these games.

Problem 3.4

P(B|A) is already given to us. Its 0.392.

P(B|A) = P(A and B) / P(A) == 0.333 * 0.392 = P(A and B) → P(A and B) = 0.130536

P(A|B) → (P(A and B) = 0.130536)/(P(B) = 0.785) = 0.1663.

Problem 3.5

P(X) + (0.216(0.383)) = 0.504 → P(X) + 0.082728 = 0.504 → P(X) = 0.421272 or 42.13% was the team's shooting percentage for two-point attempts.