75. (b) \[ P_{n,k} = \binom{n}{k} \frac{80-n}{80} \frac{20-k}{20} \] is the probability that exactly \( k \) of the \( n \) numbers chosen by the player are among the 20 selected by the house.

(a) So \[ P_{2,2} = \frac{\binom{2}{2} \left( \frac{80-2}{20} \right)}{\frac{20}{80} \frac{18}{20}} = \frac{20 \times 19}{80 \times 79} = \frac{380}{6320} = 0.0601 \]

The “fair” payoff is the one which will result in expected winnings of zero. So,

\[ 0 = E[\text{winnings}\mid \text{match}] \times P[\text{match}] + E[\text{winnings}\mid \text{no match}] \times P[\text{no match}] \]

\[ = a \times 0.0601 + (-1) \times 0.9399 \]

\[ \Rightarrow a = 15.64 = \text{fair payoff.} \]

(c) Expected payoff =

\[ \sum_{k=0}^{10} P_{10,k} \times \text{amount} = (P_{10,0} + P_{10,1} + P_{10,2} + P_{10,3} + P_{10,4}) \times (-1) + (P_{10,5}) \times 1 + (P_{10,6}) \times (17) + (P_{10,7}) \times (179) + (P_{10,8}) \times (1299) + (P_{10,9}) \times (2599) + (P_{10,10}) \times (24999) \]

\[ = -0.2058 \text{ (You can use Excel to make the calculation simpler.)} \]

77. \[ P\{\text{rejected}\} = 1 - (.9)^4 = 0.3439 \]