Statistics Assignment 5 - John Sinclair - 16325734

Q1.

(a) -0.0667

(5 / 10) x (4 / 9) = (2 / 9) x 2 = 4 / 9
(4 / 9) x 1.1 = 22 / 45
(5 / 9) x -1 = -5 / 9
(22 / 45) - (5 / 9) = -0.0667
For each color there are 5 balls to choose from, with the second pick there is only 4 balls to choose from and one less total balls, hence 4 / 9. We multiply this probability by the resulting winnings and do the same for the losing case (1 - 4 / 9 = 5 / 9), this gets us our expected winnings by taking the losses from the winnings.

(b) 1.0889

$Var(X) = E[X^2] - (E[X])^2$
$E[X^2] = (1.1)^2(4 / 9) + (-1)^2(5 / 9) = 82 / 75$
$(E[X])^2 = ((1.1)(4 / 9) + (-1)(5 / 9))^2 = 1 / 225$
82 / 75 - 1 / 225 = 1.0889

Q2.

(a) E[Xi] = 0.6
Var(Xi) = 0.24

$E[X] = 1(0.6) + 0(0.4) = 0.6$
$E[X^2] = 1^2(0.6) + 0^2(0.6) = 0.6$
$E[X]^2 = 0.6 \times 0.6 = 0.36$
$Var(X) = E[X^2] - E[X]^2 = 0.24$

(b) E[Y] = 0.6 x n

E[Y] is different to E[X] because we are summing up our expected value n times rather than a single time

(c) E[Y] = 0.6

E[Y] = E[X], as the alternative we are ruling out (i = 0) did not affect E[X]'s value

(d) ?

(e) ?

Q3.

(a) ?

(b) No they are not independent as without replacement the result of the first pick impacts any subsequent picks.

(c) 5 / 13

E[X2] = ww + rw (ignore results where X2 = 0)
(5 /13)(4 / 12) + (8 / 13)(5 / 12) = 5 / 13

(d) ?