Max Grove
MG6392
HW 8

Question 7

a) 6.1.5 b - d

b) (13 choose 1) * (4 choose 3) * (12 choose 2) * (4 choose 1) *
(4 choose 1 / (52 choose 5) = 88/4165 = 0.021128

c) (4 choose 1) * (13 choose 5) / (52 choose 5) = 33/16660 = 0.001981

d) (13 choose 1) * (4 choose 2) * (12 choose 3) * 4 * 4 * 4 / (52 choose 5) = 352 / 833
= 0.422569

b) 6.2.4 a - d

a) 1 - (39 choose 5) / (52 choose 5) = 1 - 2109/9520 = 7411 / 9520

b) 1 - (13 choose 5) * 4^5 / (52 choose 5) = 2053 / 4165

C) [2* (13 choose 1) * (39 choose 4) / (52 choose 5)
- (13 choose 1) * (13 choose 1) * (26 choose 3)]
/ (52 choose 5)
65351 / 99960

d) 1 - [(26 choose 5) / (52 choose 5)] = 9743 / 9996

Question 8

a) 6.3.2a - e
   a) p(A) = 6! / 7! = 1/7
      p(B) = (7! / 2) / 7! = 1/2
      p(C)= 5! / 7! = 1 / 42
   b) p(A|C) = 3! * 2 / 5! = 1/10
   c) p(B|C) = (5!/2) / 5! = 1/2
   d) P(A|B) = (3* 5!) / (7! / 2) = 1/7
   e) A and C are not independent. P(A|C) does not equal P(A). B and C are independent as P(B|C) = P(B).

b) 6.3.6 b, c
   b) $(1/3)^5 * (2/3)^5$
   c) $(1/3) * (2/3)^9$

c) 6.4.2 a
   a) $[(1/6)^6 * (1/2)] / [(1/6)^5 * (1/2) + (3/20)^4 * (1/4)^2 * (1/2)] = 40000 / 99049$

Question 9

6.5.2 a, b

a) {0, 1, 2, 3, 4}

b)
{(0, (48 choose 5) / (52 choose 5),
(1, (48 choose 4) * (4 choose 1) / (52 choose 5),
(2, (48 choose 3) * (4 choose 2) / (52 choose 5)),
(3, (48 choose 2) * (4 choose 3) / (52 choose 5)),
(4, (48 choose 1) * (4 choose 4) / (52 choose 5))
}

6.6.1 a

a) E[G] = 2 * 7 / 10 = 7 / 5

6.6.4 a, b

a) (12 + 22 + 32 + 42 + 52 + 62) / 6 = 91 / 6
b) (0 + 3 * 1 + 3 * 4 + 9) / 8 = 3

6.7.4 a

a) (1/10) * 10 = 1

Question 10

6.8.1 a-d

a) (100 choose 2) * 0.01^2 * 0.99^{98}

b) 1 – [(100 choose 0) * 0.01^0 * 0.99^{100} + (100 choose 1) * 0.01^1 * 0.99^{99}]

c) 100 * 0.01 = 1

d) Probability of 100 circuit boards, at least having a defect =

= 1 – [(50 choose 0) * 0.01^0 * 0.99^{50}]

What is the expected number of circuit boards with defects out of the 100 made?

= 2 * 50 * 0.01 = 0.5 * 2 = 1

There are different answers in the case with batches vs independent circuit boards as circuit boards are not independent in the batches example.

6.8.3 b

b) We reach the incorrect solution when there are at least 4 heads.

P(H>=4 | Biased) =

$$1 - \left[\binom{10}{0} \cdot 0.3^0 \cdot 0.7^{10} + \binom{10}{1} \cdot 0.3^1 \cdot 0.7^9 + \binom{10}{2} \cdot 0.3^2 \cdot 0.7^8 + \binom{10}{3} \cdot 0.3^3 \cdot 0.7^7 \right]$$