ECS 132

Homework 1

Problem 1

a. $P(3\ items\ in\ the\ box)$

$= P(111\ or\ 121\ or\ 211\ or\ 112)$

$= P(111) + P(121) + P(211) + P(112)$ mailing tube (2.2)

$= P(111\ and\ W_1\ in\ Box_2\ =\ 2\ or\ 3) + P(121) + P(211) + P(112)$

$= \frac{2}{3^4} + \frac{3}{3^3}$

$= \frac{11}{81}$

Ultimately there are three items in Box 1, we listed the ways in which the event 3 items in the box could occur. We decided $W1\ in\ box_2$ has either 2 or 3.

b. $P(weight < 4)$

$= 1 - P(weight = 4)$

$= 1 - P(1111\ or\ 121\ or\ 211\ or\ 112\ or\ 13\ or\ 31\ or\ 22)$

$= 1 - (\frac{1}{3^4} + \frac{3}{3^3} + \frac{3}{3^2})$

$= \frac{44}{81}$

Since the total weight in Box 1 is under 4, we listed the ways in which event equal amount of 4. Our goal for that is to find the probability that that the total weight in a box is under 4.

c. $P(W_1\ of\ Box_2\ = 1)$

$= P(weight\ of\ Box_1\ is\ 4) \times P(W_1 = 1)$ mailing tube (2.6)

$= (\frac{1}{3^4} + \frac{3}{3^3} + \frac{3}{3^2}) \times \frac{1}{3}$ given $P(weight = 4)$ from part b above.

$= \frac{37}{81} \times \frac{1}{3}$ by algebra

$= \frac{37}{243}$

Mailing tube (2.6) is said to be stochastically independent.

d. $P(W_1\ in\ Box_1 = 1 \mid W_1\ in\ Box_2 = 1)$ by definition of A given B

$= \frac{P(W_1\ in\ Box1\ and\ W_1\ in\ Box_2\ =\ 1)}{P(W_1\ in\ Box_2\ =\ 1)}$ Mailing tube (2.8)

$= \frac{P(1111\ or\ 121\ or\ 112\ or\ 13) \times P(W_1\ =\ 1)}{P(W_1\ in\ Box_2 = 1)}$ from part c above in the numerator

$= \frac{(\frac{1}{3^4} + \frac{2}{3^3} + \frac{1}{3^2}) \times \frac{1}{3}}{\frac{37}{243}}$ We have given the answer from part c.

$= \frac{\frac{16}{243}}{\frac{37}{243}}$

$= \frac{16}{37}$

Problem 2

Section 2.11

a. $P(Jack\ at\ square\ 0)$

$= P(sum\ =\ 6)$

$= P(dice\ = 6\ or\ (dice\ = 1\ and\ bonus\ = 5))$

$= \frac{1}{6} + \frac{1}{6} \times \frac{1}{6}$

$= \frac{7}{36}$

b. $P(Jill\ -\ Jack\ >=\ 0)$

$= P(non_{bonus}\ or\ one_{bonus}\ or\ both_{bonus})$

$= P(44\ or\ 54\ or\ 55\ or\ 64\ or\ 65\ or\ 66) + P(jill_{bonus}) \times P(jill >= jack) + P(jack_{bonus}) \times P(jill >= jack) + P(both_{bonus}) \times P(Jill >= Jack)$

$For\ jill_{bonus}, jill >= jack, we\ have$ 44 54 55 64 65 66 7(4 5 6 7) 8(4 5 6 7 8) and 9(4 5 6 7 8) $a\ total\ of$ $1 + 2 + 3 + 4 + 5 + 5$ $combinations.$

$Similarly,\ for\ jack_{bonus},\ we\ have$ 44 54 55 64 65 66 $only\ six\ combinations.$

$For\ both_{bonus}, there\ are\ totally$ $1 + 2 + 3 + 4 + 5 + 6$ $combinations.$

$= \frac{6}{6^2} + \frac{1}{6} \times \frac{1+2+3+4+5+5}{6^2} + \frac{1}{6} \times \frac{3+3}{6^2} + \frac{1}{6^2} \times \frac{1+2+3+4+5+6}{6^2}$

$= \frac{131}{432}$

c. $P(Neither\ bonus\ |\ Jill\ =\ Jack)$

$= \frac{P(Jill\ = Jack\ and\ neither\ bonus)}{P(Jill = Jack)}$

P(Jill=Jack) is from partb

$= \frac{\frac{3}{6^2}}{\frac{6}{6^4} + \frac{3}{6^3} + \frac{5}{6^3} + \frac{3}{6^2}}$

$= \frac{2}{3}$