HOME WORK 3

1. $f(x) = \begin{cases} 0.1 & x=1 \\ 0.1 & x=2 \\ 0.3 & x=3 \\ 0.3 & x=4 \\ 0.1 & x=5 \\ 0.1 & x=6 \\ 0 & \text{otherwise} \end{cases}$ (PMF)

(a) $F(x) = \begin{cases} 0 & \text{for } -\infty < x < 1 \\ 0.1 & \text{for } 1 \le x < 2 \\ 0.2 & \text{for } 2 \le x < 3 \\ 0.5 & \text{for } 3 \le x < 4 \\ 0.8 & \text{for } 4 \le x < 5 \\ 0.9 & \text{for } 5 \le x < 6 \\ 1 & \text{for } 6 \le x < \infty \end{cases}$ (CDF)

(b) $E(X) = 1 \times 0.1 + 2 \times 0.1 + 3 \times 0.3 + 4 \times 0.3 + 5 \times 0.1 + 6 \times 0.1$

$= 0.1 + 0.2 + 0.9 + 1.2 + 0.5 + 0.6$

$= 3.5$

$Var(X) = E(X^2) - [E(X)]^2$

$= (1^2 \times 0.1) + (2^2 \times 0.1) + (3^2 \times 0.3) + (4^2 \times 0.3) + (5^2 \times 0.1) + (6^2 \times 0.1) - (3.5)^2$

$= 1.85$

(c) $3.5 \times 10 = 35$

$1.85 \times 10 = 18.5$ (As they are independent)

2 (a) $Y \sim$ Hypergeometric ($m = 12$ blue chips, $n = 38$ other chips, $k = 5$ chips selected)

(b) $Y \sim$ Binomial ($n = 5$ number of chips, $p = \frac{2}{50} = \frac{1}{25}$)

(c) $Y \sim$ Geometric ($p = \frac{2}{50} = \frac{1}{25}$)

3. (4.5.4)

(a) $X \sim$ Hypergeometric $(2, 23, 12)$

$P(X=2)$

$= \frac{C(2,2)\, C(23,10)}{C(25,12)}$

$= 0.22$

(b) Since the retired person has to be twice as many as employed person, it can only take values of 4, 6, 8.

$\frac{{}^{12}C_4 \times {}^6C_2 \times {}^7C_6 + {}^{12}C_6 \times {}^6C_3 \times {}^7C_3 + {}^{12}C_8 \times {}^6C_4 \times {}^7C_0}{{}^{25}C_{12}}$

$= 0.1357$

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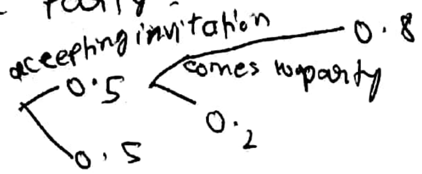
4. (4.5.10)

The probability of attending the party -



0.5×0.8

$= 0.4$

Atleast 8 people attend -

$P(X \geq 8)$

$= 1 - P(X \leq 7)$

$= 1 -$ Pbinom(7,12,0.4)

$= 0.05730992$

5. (4.5.13)

(a) Challenged calls = 38

Overruled calls = 12

Probability of overruled call success = 0.2 (assumed).

Probability of atleast 12 of 38 challenged calls being overruled -

$P(X \geq 12)$

$= 1 - P(X \leq 11)$

$= 1 -$ Pbinom(11,38,0.2)

$= 0.06230903$

(b) Since all the matches are independent of each other we can assume the probability of ~~a seo~~ overruled calls in a single match as calculated above and calculate it for all the 25 matches.

$P(X \geq 1)$

$= 1 - P(X \leq 0)$

$= 1 -$ Pbinom(0,25,0.0623090

$= 0.7997865$

6. (4.5.14)

5 symbols are there.

Probability of each symbol $\frac{1}{5}$.

Since all the 25 trials are independent of each other

We can expect the receiver to identify correct signal as -

$\frac{1}{5} \times 25 = 5$

(b) $P(X \geq 8)$

$= 1 - P(X \leq 7)$

$= 1 -$ Pbinom(7,25,0.2)

$= 0.1091228$

(c) $P(X \geq 1)$

$= 1 - P(X \leq 0)$

$= 1 -$ pbinom(0,20,0.1091228)

$= 0.9008353$