HomeWork - 2

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1) a. Probability of success = 0.3

$n = 10$

Probability of failure = $1 - 0.3 = 0.7$

$$\boxed{{}^nC_r\, P(x)^r q(x)^{n-r} = \frac{n!}{x!(n-x)!} p^x \cdot q^{n-x}}$$

$P(z = 5)$

$= {}^{10}C_5 (0.3)^5 (0.7)^5$

$= \boxed{0.10292}$

b) $P(z < 3) = P(z=0) + P(z=1) + P(z=2)$

$= {}^{10}C_0 (0.3)^0 (0.7)^{10} + {}^{10}C_1 (0.3)^1 (0.7)^9 + {}^{10}C_2 (0.3)^2 (0.7)^8$

$= 0.02825 + 0.12106 + 0.23347$

$= \underline{\underline{0.38278}}$

c) $P(z >= 7) = P(z=7) + P(z=8) + P(z=9) + P(z=10)$

$= {}^{10}C_7 (0.3)^7 (0.7)^3 + {}^{10}C_8 (0.3)^8 (0.7)^2 + {}^{10}C_9 (0.3)^9 (0.7)^1 + {}^{10}C_{10} (0.3)^{10} (0.7)^0$

$= 0.00900 + 0.00145 + 0.00014 + 0.000005$

$= 0.01059$

2) Probability of Success $= \frac{7}{10} = 0.7$

probability of failure $= 1 - 0.7 = 0.3$

$n = 20$

a) $P(z=10) = \frac{20!}{10!10!}(0.7)^{10}(0.3)^{10}$

$= 20C_{10}(0.7)^{10}(0.3)^{10}$

$= 0.03081$

b) $P(z > 15) = P(z=16) + P(z=17) + P(z=18) + P(z=19) + P(z=20)$

$= 20C_{16}(0.7)^{16}(0.3)^{4} + 20C_{17}(0.7)^{17}(0.3)^{3} + 20C_{18}(0.7)^{18}(0.3)^{2} + 20C_{19}(0.7)^{19}(0.3)^{1} + 20C_{20}(0.7)^{20}(0.3)^{0}$

$= 0.13042 + 0.07160 + 0.02784 + 0.00684 + 0.00079$

$= 0.23749$

c) Variance $= np(1-p)$

$= 20 \times (0.7)(0.3)$

$= 4.2$

d) Binomial distribution.

c) ~~Variance = λ = 0.7~~

d) ~~Poisson Distribution~~

3. $P(X=k) = \dfrac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$ $\boxed{\binom{N}{n} = \dfrac{N!}{n!(N-n)!}}$

	Draw	Total
Red card	4	26
Face Card	3	12
Total	5	52

a) $\dfrac{\binom{26}{4}\binom{52-26}{5-4}}{\binom{52}{5}} = \dfrac{14950 \times 26}{2598960}$

$= 0.14956$

b) $\dfrac{\binom{12}{3}\binom{52-12}{5-3}}{\binom{52}{5}} = \dfrac{220 \times 780}{2598960} = 0.06603$

C Hyper - geometric Distribution

4). $\lambda = 2$ per month

so $2 \times 3 = 6$

$e = 2.71828$

a) $K = 5$ $e^{-\lambda} \frac{\lambda^K}{K!}$

$(2.71828)^{-6} \frac{6^5}{5!}$

$= \underline{\underline{0.160622}}$

b) $K = 0, 1, 2, 3, 4$

$K=0$ $e^{-6} \frac{6^0}{0!} = 2.47876 \times 10^{-3} = 0.00248$

$K=1$ $e^{-6} \frac{6^1}{1!} = 0.01487$

$K=2$ $e^{-6} \frac{6^2}{2!} = 0.044617$

$K=3$ $e^{-6} \cdot \frac{6^3}{3!} = 0.08923$

$K=4$ $e^{-6} \frac{6^4}{4!} = 0.13385$

$= 0.00248 + 0.01487 + 0.044617$
$+ 0.08923 + 0.13385$

$= 0.28505$

c) Mean $= \lambda = 6$

d) Poisson Distribution

5) $p = 15\% = 0.15$

$(1-p)^{x-1}\, p$

a) first defective "is" 4th one

$x = 4$
$(1-p)^3 \cdot 0.15 = 0.09212$

b) first defective "in" 6 inspection

$x = 1$
$(1-0.15)^0 \cdot 0.15 = 0.15$
$x = 2 \quad = 0.1275$
$x = 3 \quad = 0.10837$
$x = 4 \quad = 0.09212$

$X = 5$ = 0.07830

$X = 6$ = 0.06655

Probability : $0.15 + 0.1275 + 0.10837 + 0.9212 + 0.07830 + 0.06655 = \underline{0.62284}$

b)

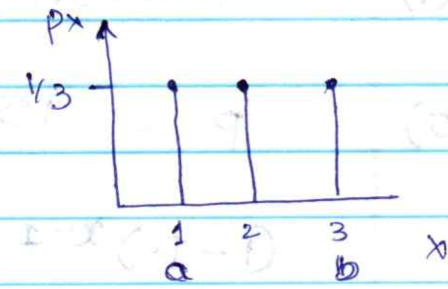
c) Geometric Distribution

6) a) PMF of X =

$(X = 1) = 1/3$

$(X = 2) = 1/3$

$(X = 3) = 1/3$



b) Mean = $\frac{a+b}{3} = \frac{3+1}{2} = 2$

c) Discrete Uniform Distribution.