Assignment 5.1

Q.1 → This is a binomial Distribution because there are only 2 outcomes possible i.e. either the Patient dies or it will survive

Given Data:-

P(failure = die) = 0.75

P(survive) = 1 - 0.75 = 0.25
= Success

The Probablity that 4 will recover should be found out as follows:-

$$P(X) = {}^{n}C_{x} p^{x} q^{n-x}$$

$$= {}^{6}C_{4} (0.25)^{4} (0.75)^{2}$$

$$= 0.03295$$

Sp. binom. pmf(x , n, Success Probablity)

Sp. binom. pmf (4, 6 0.25)
= 0.032958984375

Q. 2) → Let X = number of rejected pistons
(In this case, "success" means rejection!)

a) → Here $n = 10$, $p = 0.12$ $q = 0.88$

P_0 = Sp. binom. pmf(0, 10, 0.12)

P_1 = Sp. binom. pmf(1, 10, 0.12)

P_2 = Sp. binom. pmf(2, 10, 0.12)

P_no more_than 2 = $P_0 + P_1 + P_2$
= 0.8913

b) → Probablity of at least 2 rejects
$= 1 - P(X \leq 1)$
$= 1 - P(P_0 + P_1)$

Sp. P_at_least_2_rejects
$= 1 - (P_0 + P_1)$

= 0.34172

Q. 3) → $x = 5$
$\lambda = 3$

[We are using Poisson Distribution Here]

Sp. poisson. pmf(5, 3) = 0.10081
x, λ

Or

Sp. poisson. cdf(5, 3)
− Sp. Poisson. cdf(4, 3)

= 0.10081 (Approximately)

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Q.4 → ~~Solut~~ Mean (μ) = 65

Standard deviation, $\sigma = 4$

Expected Value $X = 4$

$$Z\text{-score}, Z = \frac{X - \mu}{\sigma}$$

$$= \frac{60 - 65}{4} = -1.25$$

Looking up the Z-score in the Z-table, we get 0.1056

Hence, the Probablity is 0.1056

Q.5 → The Probablity of Score falling between 75 and 95 can be found after finding the respective Z-scores

$$\text{For } X = 75, \ Z = \frac{75 - 85}{10} = -1.00$$

$$\text{For } X = 95, \ Z = \frac{95 - 85}{10} = 2.00$$

Probablity is $P(-1.00 < Z < 2.00)$

$$= P(Z < 2.00) - P(Z < -1.00)$$

$$= 0.9772 - 0.1587$$

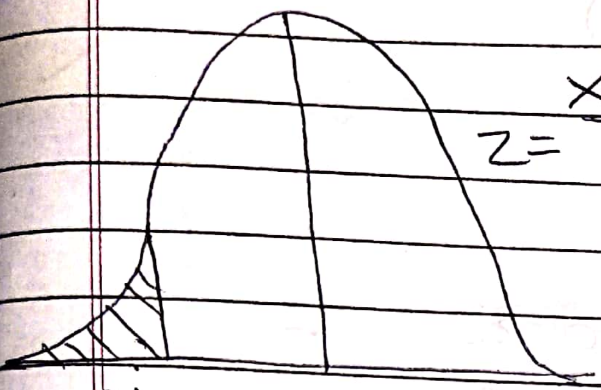
$$= 0.8185$$

Q.6 → That is $X \sim N(3500, 500^2)$ and we wan to calculate $P(X < 3100)$

$X \sim N(3500, 500^2)$ $\quad$ $Z \sim N(0,1)$

$P(X<3100)$ $\quad$ $P(Z<-0.8)$

$$Z = \frac{X-3500}{500}$$



3100 $\quad$ 3500

$$\frac{3100-3500}{500} \rightarrow 0$$

$$= -0.8$$

$$P(X<3100)$$

$$= P\left(\frac{X-3500}{500} < \frac{3100-3500}{500}\right)$$

$$= P(Z < -0.8)$$

$$= 1 - P(Z < 0.8)$$

$$= 1 - 0.7881$$

$$= 0.2119$$

Q.7] → ~~import numpy as np~~

~~np.random.poisson(3)~~ = 1

~~$\lambda = np$~~

i) → poisson.pmf$(0, \underset{\lambda}{3})$ = 0.049

~~Pois~~ $\lambda = np = 100 \times 0.03$

$= \cancel{100} \times 3 = 3$

PMF < Binomial, Poisson Distribution.

PDF → Normal Distribution (Continuous)

CDF → use in all Cases

ii) Sp. Poisson.pmf(1, 30)
$= 2.807 \times 10^{-12}$

Q.8] → Given Data:-

$p = \frac{1}{500} = 0.002$

~~np~~ $20 \times 0.002 = 40$

$\lambda = 0.02$

~~Sp. poisson. pmf (1.~~

$$P(n) = \frac{\lambda^n}{n!} e^{-\lambda}$$

$$P(1) = \frac{(0.02)^1}{1!} e^{-0.02}$$

$= 0.0196 * 20000$

=

approximate number of Packets Containing lens with one defective lens is
P(1) * 20000 = 392 Packets

Q.9] → Given Data:-

```
X = Sp. binom.pmf(1, 30, 0.25)
Y = 1 - Sp. binom.cdf(1, 30, 0.25)
Print(X)
Print(Y)
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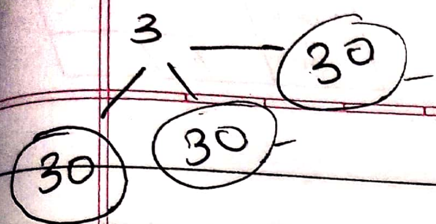

$200 \rightarrow 50$

$X = 0.0017858$
$Y = 0.99803$