Part - I

Stat Assignment

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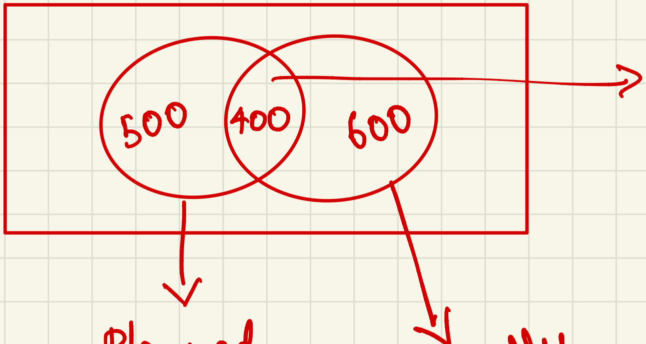
Q1)

1.



Joint Probability $\Rightarrow$ $P(A \cap B) = \dfrac{400}{1100} = 0.3636 = \underline{36.36\ \%}$

2. $P(\text{Planned \& Placed order} \mid \text{Planned})$

$$= P\left(\text{Planned} \cap \text{Placed order} \mid \text{Planned}\right)$$

$$= P\left(\text{Planned} \cap \text{Placed order}\right) \Big/ P(\text{Planned})$$

$$= 0.3636 \Big/ \left(\frac{400}{600}\right) = \frac{0.3636}{0.66} = 0.5454$$

$$= \underline{54.54\ \%}$$

Q2) Given,

$n = 10$

$p = 0.05$

$q = 0.95$

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

(A) $P(X=0) = {}^{10}C_{0} \cdot (0.05)^{0} \cdot (0.95)^{10} = 1 \times 1 \times 0.5987$

$= 0.5987 = 59.87\%$

(B) $P(X=1) = {}^{10}C_{1} \cdot (0.05)^{1} \cdot (0.95)^{9} = 10 \times 0.05 \times 0.6302$

$= 0.3151 = 31.51\%$

(c) $P(X \le 2) = P(X=0) + P(X=1) + P(X=2)$

$$P(X=2) = {}^{10}C_2 \cdot (0.05)^2 \cdot (0.95)^8 = \frac{10 \times 9}{1 \times 2} \times 0.0025 \times 0.6634$$

$$= 45 \times 0.0025 \times 0.6634$$

$$= 0.0746$$

$$\Rightarrow 0.5987 + 0.3151 + 0.0746 = 0.9884 = \underline{98.84\%}$$

(D) $P(X \ge 3) = 1 - P(X \le 2) = 1 - 0.9884$

$$= 0.0116 = \underline{1.16\%}$$

Q3) Given,

$\lambda = 3$

$$P(X=x) = \frac{e^{-\lambda} \cdot \lambda^{x}}{x!}$$

(A) $1 - P(X>0) \Rightarrow P(X=0) = \frac{e^{-3} \cdot 3^{0}}{0!} = \frac{0.0497 \times 1}{1} = 0.0497$

$1 - 0.0497 = 0.9503 = \underline{95.03\%}$

(B) $P(2 \le X < 5) = P(X=2) + P(X=3) + P(X=4)$

$$= e^{-3}\left[\frac{3^2}{2!} + \frac{3^3}{3!} + \frac{3^4}{4!}\right]$$

$$= 0.0497\left[\frac{9}{2} + \frac{27}{6} + \frac{81}{24}\right] = 0.0497 \times \frac{108+108+81}{24}$$

$$= 0.0497 \times \frac{297}{24} = 0.6150 = \underline{61.50\%}$$

(c)

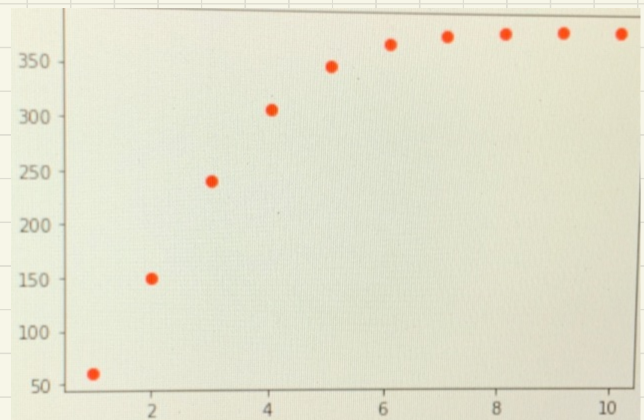
```python
import numpy as np
import matplotlib.pyplot as plt
from scipy.special import factorial

t = np.arange(1, 11, 1)
l = 3 #l be lambda


d = np.exp(l)*np.power(l, t)/factorial(t)

for i in range(1, 10):
    d[i] = d[i-1] + d[i]

print(d)
plt.plot(t, d, 'ro')
plt.show()
```



Q4) Given,

$$P(X=x) = {}^nC_x \, p^x q^{n-x}$$

$n=3$

$p = 0.8680$

$q = 0.1320$

(A) $P(X=3) = {}^3C_3 \cdot (0.8680)^3 (0.1320)^0$

$= 1 \times 0.6539 \times 1 = 0.6539 = \underline{65.39\%}$

(B) $P(X=0) = {}^3C_0 \cdot (0.8680)^0 (0.1320)^3$

$= 1 \times 1 \times 0.0023 = 0.0023 = \underline{0.23\%}$

(c) $P(X \geq 2) = P(X=2) + P(X=3)$

$P(X=2) = {}^3C_2 \cdot (0.8680)^2 (0.1320)^1 = 3 \times 0.7534 \times 0.1320$

$= 0.2983$

$\Rightarrow 0.6539 + 0.2983 = 0.9522 = \underline{95.22\ \%}$

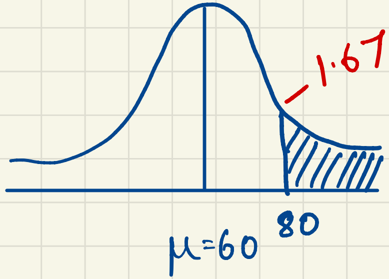
Q5) Given,

$n = 300$

$\mu = 60$

$\sigma = 12$

(A)



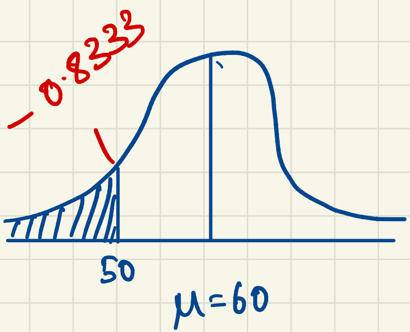
$$Z_{stat} = \frac{x-\mu}{\sigma} = \frac{80-60}{12} = \frac{20}{12} = 1.67$$

Area to the left of 1.67 $= 0.9525$

$\therefore$ Prob. of Students score > 80 $= 1 - 0.9525$

$= 0.0475 = 4.75\%$

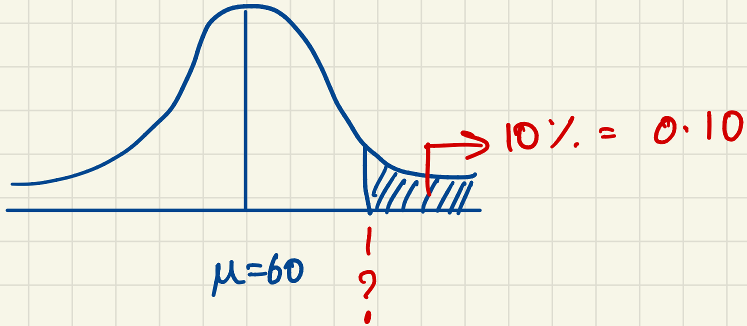
(B)



$$Z_{stat} = \frac{x-\mu}{\sigma} = \frac{50-60}{12} = \frac{-10}{12} = -0.8333$$

Area to the left of -0.8333 $= 0.2033 = 20.33\%$

(c)



$Z_{stat} = 1.28$

$$\frac{x-60}{12} = 1.28$$

$$x = (1.28 \times 12) + 60 = 15.36 + 60$$

Distinction mark $\rightarrow$ $\boxed{x = 65.36\%}$

Q6) In the current situation, we can use poisson distribution in case of COVID-19 vaccination to predict by when the vaccination would be over for 50% of the population.

50% is an example. In reality we can predict for any value.