Distribution Assignment

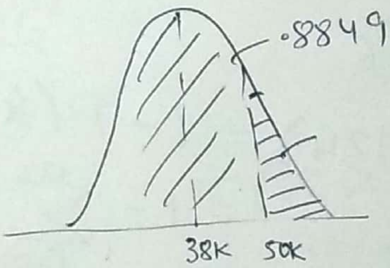
(1)

```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np.
df_csv = pd.read_csv('Dataset// titanic.csv")
a= df-csv["Age"]
plt.plot(a)
plt.ylabel("Ages")
plt.axis([0, 1000, 0, 100])
plt.show()
```

(2) $n_{pop} = 2000$

$\mu = 38000$

$\sigma = 10000$



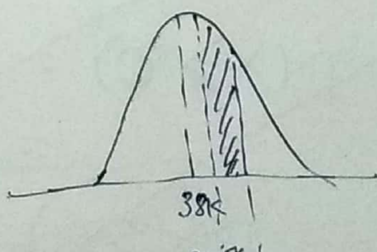
(a) $P(X > 50000) =$

$$Z_{score} = \frac{50K - 38K}{10K} = \frac{12}{10} = 1.2$$

$= .8849$

$P(X > 50000) = 1 - Z_{score} = 1 - .8849 = 0.1151$

No. of firms $= 5000 \times .1151 = 575.5 \simeq \boxed{576}$



(b) $P(38500 \leq X < 41000)$

$$Z_{score}(41K) = \frac{41K - 38K}{10K} = \frac{3}{10} = .3$$

$$Z_{score}(38.5K) = \frac{38.5K - 38K}{10K} = \frac{.5}{10} = .05$$

$P(X < 41k) = .6179$

$P(X < 38.5) = .5199$

$.6179 - .5199 = .098$ $\boxed{9.8\%}$

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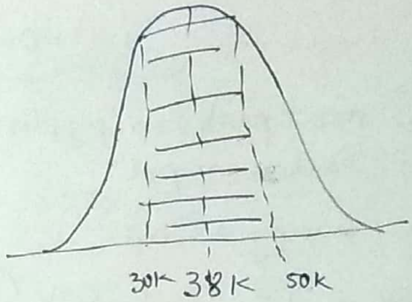
(c) $P(30000 \leq X < 50000) =$



$P(X < 50000) = \dfrac{50-38}{10} = 1.2$

$= .8849$

$P(X < 30000) = \dfrac{30-38}{10} = -.8$

$= .2119$

$.8849 - .2119 = .673$

No of firms $= 5000 \times .673 = \boxed{3365}$

(3) $n = 700$

$P = 1/6$

(a) $P(X > 124) = 1 - P(X \leq 124)$

$= 1 - \sum_{i=0}^{124} {}^{700}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{700-i}$

$= 1 - .7877$

$= .2123$

$\simeq 21.2\%$

(b) $P(81 \leq X \leq 100) =$

$P(X > 80) = 1 - P(X \leq 80)$

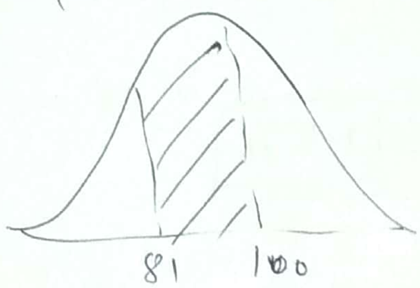
$= 1 - \sum_{i=0}^{80} {}^{700}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{700-i}$

$P(X \geq 81) = .9999$

$P(X < 100) = 1 - P(X \leq 100)$

$= .03909$

(3) (b) $P(81 \leq X < 100) = P(X \leq 99) = \sum_{i=0}^{99} {}^{700}C_i \, (1/6)^i \, (5/6)^{99-i}$



$P(X \leq 80) = \sum_{i=0}^{80} {}^{700}C_i \, (1/6)^i \, (5/6)^{80-i}$

$.03909 - .00010$

$\simeq .039$

$\boxed{\simeq 3.9\%}$

(c) $P(X=145) = {}^{700}C_{145} \left(\frac{1}{6}\right)^{145} (5/6)^{700-145}$

$= .00074$

$\boxed{\simeq .01\%}$

(4) $P(X \geq 30) = .182$

$\boxed{\simeq 18.2\%}$

$P(X > 30)$

$= 1 - P(X \leq 30)$

$= 1 - e^{-25} \sum_{i=0}^{30} \frac{25^i}{i!}$

$\boxed{= P(X>30) + P(X=30)}$

$\lambda = 25$

$r = 30$

(5) $n = 25$

$p = \frac{1}{4} \quad q = 3/4$

5 wrong + 20 write

$P(X=20) = \boxed{{}^{25}C_{20} \left(\frac{1}{4}\right)^{20} (3/4)^5}$

$= .000001$

6

$\lambda = 4$ photons/sec

$r = 0$

$$P(x=0) = \frac{e^{-4} \cdot 4^0}{0!} = .018 \simeq \boxed{1.8\%}$$

7

$\lambda = 3/\text{min}$

(a) $r=0$ $\quad P(x=0) = \dfrac{e^{-3} \cdot 3^0}{0!} = 0.049 \simeq \boxed{4.9\%}$

(b) $\cancel{P(x \leq 2)}$

2 calls $\longrightarrow$ 2 min

r calls/min $= \dfrac{2}{2} = 1$

$$P(x \geq 2) = P(\cancel{x}=2) + (1 - P(\cancel{x} \leq 2))$$

$$= P(x=2) + P(x>2)$$

$$= \left(\frac{e^{-3} \times 3^1}{1!}\right) + \left(1 - e^{-3} \sum_{i=0}^{1} \frac{3^i}{i!}\right)$$

$$= .9502 \simeq \boxed{95.02\%}$$

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8

$q = .2$

$p = .8$

$P(X=4) = P(\text{1st 3 non-defective})\,P(\text{1 defective})$

$$\boxed{= (.8)^3 \times .2}$$

No. of inspection $= E(X) = \dfrac{1}{\text{prob. of event considered}}$

$$= \frac{1}{.2} = \boxed{5}$$

9

$P = .3 \qquad n = 5$

$q = .7 \qquad r = 2$

$P(X=0) + P(X=1) + P(X=2) = P(X \leq 2)$

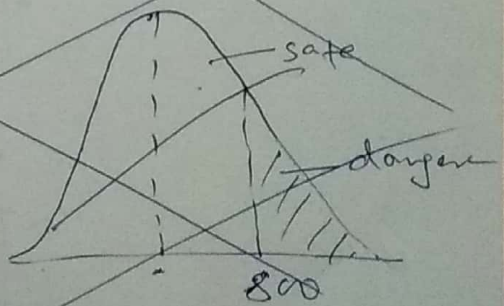
$$\sum_{i=0}^{2} {}^{5}C_i\,(.3)^i\,(.7)^{5-i} = .836 \simeq \boxed{83.6\%}$$

10

1 person → 70kg $\quad$ 200

11 person → 770 $\quad$ 2200

max No. of person $= \dfrac{800}{70} = 11.4 \simeq 11$



$$Z_{score} = \frac{800-770}{\sqrt{2200}} = \frac{30}{46.90}$$

$z = .6396 \simeq .35$

$\simeq \boxed{35\%}$

Last Index

~~12 adults~~ $\cancel{\rightarrow}$ $\cancel{12 \times 70}$ $\cancel{200 \times 12}$

$\cancel{840}$ $\cancel{2400}$

Last Index

~~Zscore~~ $\cancel{= \frac{840 - 770}{\sqrt{2400}} = \frac{70}{48.98} = 1.429}$

$\cancel{\simeq \boxed{92.2\%}}$

11

$p = \frac{1}{2}, \; q = \frac{1}{2}$

$n = 50$

$$P(x \geq 20) = P(x = 20) + (1 - P(x \leq 20))$$

$$= {}^{50}C_{20} \left(\tfrac{1}{2}\right)^{20} \left(\tfrac{1}{2}\right)^{30} + \left(1 - \sum_{i=0}^{20} {}^{50}C_i \left(\tfrac{1}{2}\right)^{i} \left(\tfrac{1}{2}\right)^{50-i}\right)$$

$$= .9405$$

$$\boxed{\simeq 94.05\%}$$

$p = \frac{1}{4} \; q = \frac{3}{4}$

$n = 50$

$$P(x \geq 20) = P(x = 20) + (1 - P(x \leq 20))$$

$$= {}^{50}C_{20} \left(\tfrac{1}{4}\right)^{20} \left(\tfrac{3}{4}\right)^{30} + \left(1 - \sum_{i=0}^{20} {}^{50}C_i \left(\tfrac{1}{4}\right)^{i} \left(\tfrac{3}{4}\right)^{50-i}\right)$$

$$= .0139$$

$$\simeq \boxed{1.39\%}$$

12

$p = .30$ faulty

$q = .70$ good

$n = 6$

$r = 2$ faulty

$$P(x=2) = {}^6C_2 (.3)^2 (.70)^4$$

$$= \frac{6!}{4!\,2!} \times (.09)(.2401)$$

$$= .3241 \simeq \boxed{32.4\%}$$

13

efficienty 6 errors/hr — 77 words/min

P (2errors) ———— 322 word

$2e \longrightarrow \frac{322}{77} \cancel{\times 60} \text{ min } \cancel{w/hr} = 4.18\text{min}$

in 1 hr ⟶ 29 error

$$P = \frac{e^{-29} \times 29^{2}}{2!}$$

$\lambda = 29$

$r = 2$

77w ⟶ 1m

322w ⟶ $\frac{322}{77}$ m

1m ⟶ $\frac{322}{77}$

60 m ⟶ $\frac{322}{77} \times 60$

4.18m ⟶ 2er

60m ⟶ $\frac{60 \times 2}{4.18}$

= 28.71

= 29 er

P.T.O

13

6 error $\rightarrow$ 1 hr

77 words $\rightarrow$ 1 min

6 error $\rightarrow$ 77 × 60 words

$$P = \frac{6}{77 \times 60}$$

$n = 322$

$r = 2$

$$\boxed{P(x=2) = {}^{322}C_2 \left(\frac{6}{77\times 60}\right)^2 \left(1 - \frac{6}{77\times60}\right)^{320}}$$

10 Max weight = 800 Kg

One person $\Rightarrow \mu = 70$ kg

$Var = \sigma^2 = 200 \Rightarrow \sigma = 10\sqrt{2}$

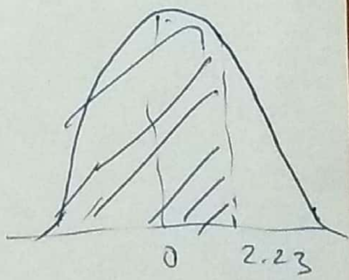
(a) $n = 10$

Mean as per 10 person $= \frac{800}{10} = 80$

$$\text{Zsore} = \frac{80-70}{10\sqrt{2}/\sqrt{10}} = \frac{\cancel{10} \times \sqrt{10}}{\cancel{10}\sqrt{2}} = \sqrt{5} = 2.23$$

$= .9871$

$\boxed{\simeq 98.7\%}$



(b) $n = 12$

Mean as per 12 person $= \frac{800}{12} = 66.66$

$$\text{Zsore} = \frac{66.66-70}{10\sqrt{2}/\sqrt{12}} = \frac{-3.333 \times \sqrt{12}}{10\sqrt{2}} = -0.816$$

$\simeq -0.82$

$\simeq .2016$

$\boxed{20.16\%}$