Stats Assignment — I

Problem-1

Data — 6, 7, 5, 7, 7, 8, 7, 6, 9, 7, 4, 10, 6, 8, 8, 9, 5, 6, 4, 8

Ascending → 4, 4, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 7, 8, 8, 8, 8, 9, 9, 10

$n = 20$

mean $= \dfrac{2+4 + 2\times5 + 4\times6 + 5\times7 + 4\times8 + 2\times9 + 10}{20}$

$= (8+10+24+35+32+18+10)/20$

$= 137/20 = 6.85$

Median $= \dfrac{20}{2} = 10 \Rightarrow$ median is Average of 10th and 11th number

10th number $= 7$
11th number $= 7$ $\Rightarrow$ $\boxed{\text{Median} = \dfrac{7+7}{2} = 7}$

Standard Deviation $= 1.63$

Mode $\rightarrow$ Highest frequency (7 has highest frequency)

So mode $= 7$

Problem-2

data ⇒ 28, 40, 68, 70, 75, 75, 75, 75, 80, 86, 89, 90, 90, 97, 97, 100, 100, 100, 104, 104, 109, 113, 120, 120, 120, 122, 123, 123, 130, 140, 145, 170, 174, 194, 217

n (Count) $= 35$

mean $= \dfrac{\text{Sum of all}}{35} = \dfrac{3763}{35} = 107.5143$

median $= \dfrac{35\text{th}}{2} = 18\text{th}$ Term $= 100$

Mode $= 75$ (highest frequency 4)

Standard Deviation $= \sqrt{\dfrac{\sum\limits_{i=1}^{\ } (x_i - \bar{x})^2}{(n-1)}} = \boxed{39.338}$

Problem – 3   the number of times I go to the Gym in weeks –

$x = 0, 1, 2, 3, 4, 5$

$f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01$

mean $= 0 \times 0.09 + 1 \times 0.15 + 2 \times 0.4 + 3 \times 0.25 + 4 \times 0.1 + 5 \times 0.01$

$\doteqdot 0 + 0.15 + 0.8 + 0.75 + 0.4 + 0.05$

$= 2.15$

Variance

$$S^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1} \qquad n = 6$$

$$S^2 = \frac{(0-2.15)^2 + (1-2.15)^2 + (2-2.15)^2 + (3-2.15)^2 + (4-2.15)^2 + (5-2.15)^2}{(6-1)}$$

$$\boxed{= 3.65}$$

Problem – 4

D – diameter of hole drilled

~~Target Diameter~~ $= 12.5 \, mm$

~~$PDF(d) = 20e - 20(d - 12.5)$~~

$d \geqslant 12.5$

Problem – # 4

Target Diameter $= 12.5 \, m$ $PDF(d) = 20e^{(-20)(d-12.5)}$

$, d \geqslant 12.5$

Proportion of Parts $> 12.6 = ?$

$$\cancel{P(x > 12.6) = 1 - P(x \leqslant 12.6)}$$

$$P(d > 12.6) = 1 - P(12.5 < d < 12.6)$$

$$P(12.5 < d < 12.6) = \int_{12.5}^{12.6} 20 \times e^{(-20)(d-12.5)}$$

$$\Rightarrow \left[-e^{-20(d-12.5)} \right]_{12.5}^{12.6}$$

$$\Rightarrow 0.865$$

$$\boxed{P(d > 12.6) = (1 - 0.865) = 0.135}$$

$$\boxed{CDF(d=11) = 0}$$

<u>Conclusion</u>

$\boxed{13.5\% \text{ of Parts will be scrapped}}$

Q.5

fault Rate $(P) = 30\% = 0.3$

LED chosen $(n) = 6$

$x = 2$

this is a Binomial Distributy

Probability of having 2 fualty LED $= {}^{6}C_2 (0.3)^2 (0.7)^4$

$\Rightarrow \dfrac{6!}{4! \; 2!} \times 0.09 \times 0.2401$

$\Rightarrow \dfrac{6 \times 5 \times 4!}{4! \times 2} \times 0.021609 = \boxed{0.3241 \text{ or } 32.41\%}$

$\boxed{mean = nap = 6 \times 0.3 = 1.8}$

$\boxed{Std \; Devial (\sigma) = \sqrt{nap \times (1-p)} = 6 \times 0.3 \times 0.7 = 1.26}$

Problem 6   Binomial Distribution

Chausave

Attempt $(n) = 8$

Success $(P) = 0.75$

~~Target~~

$P(x=5) = {}^{8}C_5 (0.75)^5 \cdot (0.25)^3$

$= 20.76\%$

$P(x=4) = {}^{8}C_4 (0.75)^4 (0.25)^4 = 8.65\%$

$P(x=6) = {}^{8}C_6 (0.75)^6 (0.25)^2 = 31.14\%$

Baakha

Attempt $(n) = 12$

Success $(P) = 0.45$

$P(x=5) = {}^{12}C_5 (0.45)^5 \times (0.55)^7$

$= \text{~~742~~} \times 22.25\%$

$P(x=4) = {}^{12}C_4 (0.45)^4 (0.55)^8 = 16.99\%$

$P(x=6) = {}^{12}C_6 (0.45)^6 (0.55)^6 = 21.24\%$

Chausave

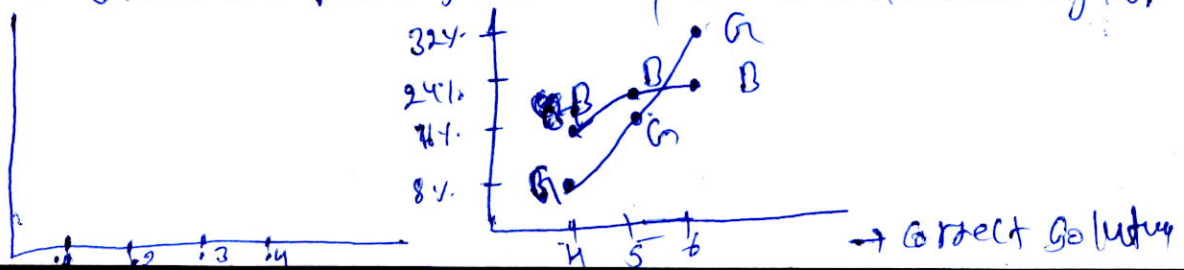$P(4) = 8.65\%$ $P(5) = 20.76\%$ $P(6) = 31.14\% \Rightarrow P(4 \leq x \leq 6) = 60.55$

Baakha

$P(4) = 16.99\%$ $P(5) = 22.25\%$ $P(6) = 21.24\% \Rightarrow P(4 \leq x \leq 6) = 60.48$

Inference → Both have same CDF $(4 \leq x \leq 6)$

Two factors → Chauseve has high Accuseay But Basakha has high speed.

Problem -7 Arrival per hour = 72

$$\text{Poisson} = \frac{e^{-\mu} \cdot \mu^k}{k!}$$

~~P(k=4)~~

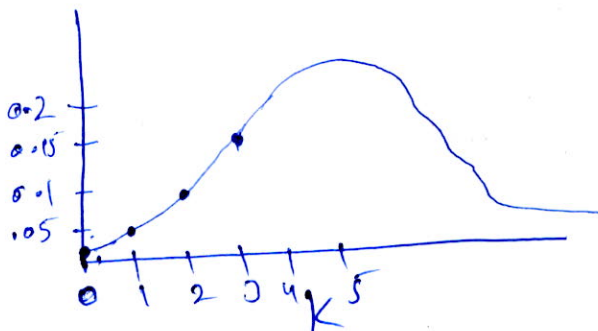~~μ=72~~

Arrival in 4 minutes →

$$\mu = \frac{72}{60} \times 4 = 4.8$$

(a) $P(K=5) = e^{-4.8}(4.8)^5/5! = \boxed{17.47\%}$

(b) $P(0) + P(1) + P(2) + P(3) = P(k \leq 3)$

$$P(k\leq 3) = \frac{e^{-4.8}(4.8)^0}{0!} + \frac{e^{-4.8}(4.8)^1}{1!} + \frac{e^{-4.8}(4.8)^2}{2!} + \frac{e^{-4.8}(4.8)^3}{3!}$$

$$\begin{aligned}&= 0.0082297\\&+0.0395027\\&+0.0948066 86\\&+0.15169064\\&\boxed{0.29492}\end{aligned}$$

(c) $P(k>3) = 1 - P(k\leq 3)$

$$= 1 - 0.29422 = 0.7057 = \boxed{70.57\%}$$

Problem - 8   entry per minute = 77

error per minute = $6/60 = 1/10$

Time taken to enter 455 word = 5.9 minute $\left(\frac{455}{77}\right)$

Commiting error $(k) = 2$

$$\mu = \frac{1}{10} \times 5.9 = 0.59$$ ~~minute~~

$$\lambda(K=2) = e^{-0.59}(0.59)^2/2! = 0.09648 = 9.6\%$$

Time for 250 words $= \frac{250}{77} = 3.25$ minute

Time for 1000 words $= \frac{1000}{77} = 12.99$ minute

Mean error in 3.25 minute = 0.325
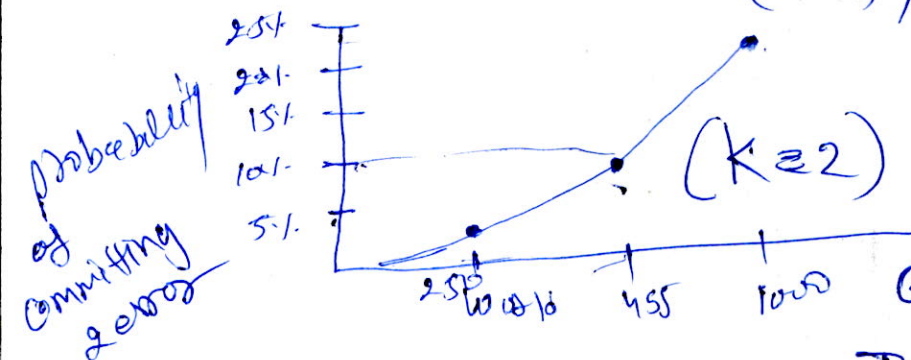
Mean error in 12.99 minute = 1.299

Probability of committing ~~error~~ 2 error

(a) 455 word document $\lambda (k=2) = \boxed{9.64}$

(b) 250 word document $\lambda (k=2) = e^{-0.325} (0.325)^2/2! = 0.038 = \boxed{3.8\%}$

(c) 1000 word document $\lambda (k=2) = e^{-1.299} (1.299)^2/2! = 0.023 = \boxed{23.01\%}$

(K=2)

① λ Increases as the number of words Increases.

② PMf function w/y Increase with number of words

Problem 9   Same as Question / problem No- 4

(Repeated)

Problem 10   (a) $P(z > 1.26) = 10.38\%$ $P(z \leq -4.6) = 0$
             $P(z < -0.86) = 19.49\%$
             $P(z > -1.37) = 91.47\%$ $P(1.25 < z < 0.37) = 53.87\%$

(b) $P(z > z) = 0.05$ $\boxed{z = 1.64}$

(c) $P(-z < Z < z) = 0.99$ $\boxed{-2.58 < z < 2.58}$

Problem Statement — 11

$\mu = 10\,mA$

$\sigma = \sqrt{4\,(mA)^2} = 2$

ⓐ $P(\cancel{x \leq 13.})$ Probability of ~~exceeding~~

$P(x > 13) = P\left(z > \left(\frac{13-10}{2}\right)\right)$

$= P(z > \cancel{\varnothing} 1.5)$

$= 1 - 0.9394$

$\boxed{= \cancel{92.66\%}}$ $\boxed{P(x > 13) = 6.06\%}$

ⓑ

$P(9 < x < 11)$

$= P\left(\frac{9-10}{2} < z < \frac{11-10}{2}\right)$

$= P\left(-\tfrac{1}{2} < x < \tfrac{1}{2}\right)$

$= P(-0.5 < z < 0.5)$

$= \cancel{0.5487 = 0.6073}$

$= \cancel{19.74\%}\ 69.15\% - 30.85\%$

$= \boxed{38.3\%}$

ⓒ $P(\cancel{X} < x) = 0.98$

$P\left(z < \frac{x-10}{2}\right) = 0.98$

$P(z < 2.5) = 0.98$

$\Rightarrow 2.5 \leq \frac{x-10}{2}$

$\Rightarrow 5 \leq x - 10$

$\Rightarrow x \geq 15$

$\boxed{\text{Current measurement is } 15}$

Problem Statement — 12

Part 1 $\mu = 0.2508$

$\sigma = 0.0005$

Lower Value $= 0.2500 - 0.0015 = 0.2485$

Upper Value $= 0.2500 + 0.0015 = 0.2515$

$P(0.2485 < x < 0.2515) = P\left(\cancel{\ } < z < z\right)$

$= P\left(\frac{0.2485 - 0.2508}{0.0005} < z < \frac{0.2515 - 0.2508}{0.0005}\right)$

$\cong P(-4.6 < z < 1.4)$

$= 91.92\%$

Part 2 $\mu = \cancel{0.2500}\ 0.2500$

$\sigma = 0.0005$

Lower $= 0.2485$

Upper $= 0.2515$

$P(0.2485 < x < 0.2515) =$

$P\left(\frac{0.2485 - 0.2515}{0.0005} < z < \frac{0.2515 - 0.2508}{0.0005}\right)$

$= P(-3 < z < 3)$

$= 99.74\%$