Assingment - 1

Q1) calculate mean median mode standard deviation interquartile range of the following data

i] 4, 7, 9, 9, 11, 15, 18, 18, 18, 25

→ a] Mean : $\frac{4+7+9+9+11+15+18+18+18+25}{10}$

Mean = $\frac{134}{10} = \boxed{13.4}$

b] median : $\frac{\frac{n}{2}^{th} \text{ observation} + \frac{(n+2)}{2}^{th} \text{ observation}}{2}$

median = $\frac{5+6}{2} = \frac{11}{2} = \boxed{5.5}$

c] mode = 18

d] Standard deviation :

Here n = 7 mean = 13.4

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
4	4 - 13.4 =	$(-9)^2$ = 81
7	7 - 13.4 =	$(-6)^2$ = 36
9	9 - 13.4 =	$(-4)^2$ = 16
9	9 - 13.4 =	$(-4)^2$ = 16
11	11 - 13.4 =	$(-2)^2$ = 4
15	15 - 13.4 =	$(2)^2$ = 4
18	18 - 13.4 =	$(5)^2$ = 25
18	18 - 13.4 =	$(5)^2$ = 25
18	18 - 13.4 =	$(5)^2$ = 25
25	25 - 13.4 =	$(12)^2$

x_i	$x_i - \overline{x}$	$(x_i - \overline{x})^2$
134		376

$= \frac{376}{10} = 37.6$

Standard Deviation $\sigma = \sqrt{Var(x)} = \boxed{\sqrt{37.6}}$

e] Interquartile Range

$Q1 : \left(\frac{n+1}{4}\right)^{th} : \left(\frac{10+1}{4}\right) : 2.75$ th observation

$Q2 : \left[2\left(\frac{n+1}{4}\right)\right]^{th} : \left[2\left(\frac{10+1}{4}\right)\right] : 5.5$ th observation

$Q3 : \left[3\left(\frac{n+1}{4}\right)\right]^{th} : \left[3\left(\frac{10+1}{4}\right)\right] : 8.25$th observation

ii

No. of households	0	1	2	3	4
No. of people	5	11	26	15	3

mean: No of households	class	No. of people	cummulative frequency
0	0-1	5	5
1	1-2	11-5 : 6	11
2	2-3	26-11 : 15	26
3	3-4	15-26 : 11	15
4		3-15 : 12	3

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median class : $\left(\frac{N}{2}\right)^{th}$ observation

: $\frac{3}{2}$ = 1.5 th observation

median class is 1 - 2

Here L : 1 h : 0 f : ~~11~~ 6 c.f = 11

median : $L + \frac{h}{f}\left(\frac{N}{2} - c.f\right)$

: $\cancel{1 + \frac{0}{6}}$ $1 + \frac{0}{6}\left(\frac{3}{2} - 11\right)$

median = 1.

mean : $\frac{5 + 11 + 26 + 15 + 13}{5}$

mean : $\frac{70}{5}$ = 14

standard deviation :

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
5	5 - 14 = -9	$(-9)^2$ = 81
11	11 - 14 = -3	$(-3)^2$ = 9
26	26 - 14 = 12	$(12)^2$ = 144
15	15 - 14 = 1	$(1)^2$ = 1
3	3 - 14 = -11	$(11)^2$ = 121
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= $\frac{356}{5}$ = ~~18~~ 71.2

standard Deviation σ = $\sqrt{Var(x)}$ = $\sqrt{71.}$

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Interquartile range

$Q_1 = \left(\frac{n+1}{4}\right)^{th} = \frac{5+1}{4} = 1.5$

$Q_2 = \left[2\left(\frac{n+1}{4}\right)\right]^{th} = \left[2\left(\frac{5+1}{4}\right)\right] = 3$

$Q_3 = \left[3\left(\frac{n+1}{4}\right)\right]^{th} = \left[3\left(\frac{5+1}{4}\right)\right] = 4.5$

Q2) ~~It is assumed that claims arising on an industrial policy can be modelled as Poison process at a rate of 0.5 per year.~~

i] Determine that probablity that no claims arise in a single year.

Q.3] An analyst intrested in using gamma distribution with parameters $\alpha = 2$ $\lambda = 1/2$ the range of x is defined as $0 < x < \infty$

i] State the mean and standard deviation of this distribution

mean $= \frac{\alpha}{\lambda} = \frac{2}{1/2} = 4$

standard deviation $= \sqrt{4} = 2$

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ii) comment breifely on its shape

→ The gama distribution is the member of the genral exponential family of distributions. The gama distribution with shape parameters $K \in (0, \infty)$ and scale parameter $b \in (0, \infty)$ is a two parameter exponential family with natural parameters $(K-1, -\frac{1}{b})$ and natural statistics $(\ln x\, x)$

iii) Calculate the cummulative distribution function

Q4) In an acturial office there are 10 males and 8 female staff 6 of the males and 7 of the females are fully qualified acturies calculate the probablity that the team of 2 workers randomly selected consist of 2 qualified females given that it contains at least one female

→ Total females : 8

qualified females : 7

∴ probablity that 2 qualified females are selected $= \frac{8}{7} = 1.14$

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Q6) If $X \sim U(1,2)$ and $Y = \frac{3}{6-X}$ determine the of Y

→

Q7) A Discrete Random variable X has the following probablity distribution

X	1	2	3	4	5
$P(X=x)$	0.05	0.15	0.35	0.4	0

Calculate

1] $F(3) = \cancel{1.05}$ 1.05

2] $E(X) = 15$

3] ~~Cof~~ coefficient of skewness : 0.203.

Q8) Insurance claim amounts are independe and exceed 1000 with probablity 0.2 in sample of 15 claims calculate the probablity that fewer than 3 of them exceed 1000

Q9) A man enters a raffle each week where the probablity of winning prize is 0.01 calculate the probablity that he takes 7 weeks up to and including the week where he wins his 3rd prize

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$\frac{\cancel{0.01}}{7}$ = probablity that he takes 7 weeks is 0.014

Q10) The number of claims submitted to an insurance office averages two per working weeks (of 5 days) calculate the probablity that more than 2 claims arrive in a day

→ Probablity that more than 2 claims arrive more than 2 claims per day = $\frac{2}{5}$ = 0.4

Q11) If the probablity of having male & female child is equal and a woma has 5 boys and 2 girls calculate the probablity that her next three children are boys.

→ The probablity that next three children are boys is 0.50 because everytim women has a kid there is equal chance of them having a girl or a boy

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Q12 Claims follows a poisson process with rate 10 per day calculate the probability that that the time between two claims is less than 0.1 days

Q13) If X is following uniform distribution with parameters $a = 75$ $b = 120$ calculate the probability that X lies between 80 and 100

$$\frac{1}{(B-A)} = \frac{1}{120 - 75} = 45$$

Q14) If $X \sim$ Gamma $(5, 0.43)$ calculate $P(X < 22.89$

Q15) A continuous random variable has the following probability density function

$$\frac{K}{(x+5)^4} \quad x > 0$$

$$= K(x+5)^{-4}$$

$F(10) = K \cdot (10+5)^{-4}$

$F(10) = K \cdot (15)^{-4}$

$F(10) = K \cdot = 0.19$