COMSATS University Islamabad
Abbottabad Campus

10/10
Good

ASSIGNMENT #

Title

Subject:

Statistics & probality

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Reg#

FA21-BSE-072

Date Of Submission

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Date:

Q.1 FREQUENCY DISTRIBUTION AND HISTOGRAM:-

Classes	class boundaries	x_i	frequency
65-89	64.5-89.5	77	9
90-114	89.5-114.5	102	20
115-139	114.5-139.5	127	16
140-164	139.5-164.5	152	6
165-189	164.5-189.5	177	7
190-214	189.5-214.5	202	2
215-240	214.5-240.5		

Range: $204 - 68 = 136$

no. of classes: $K = 1 + 3.3 \log(60) = 6.8 \cong 7$

interval: $h = R/K = 20 \cong 25$

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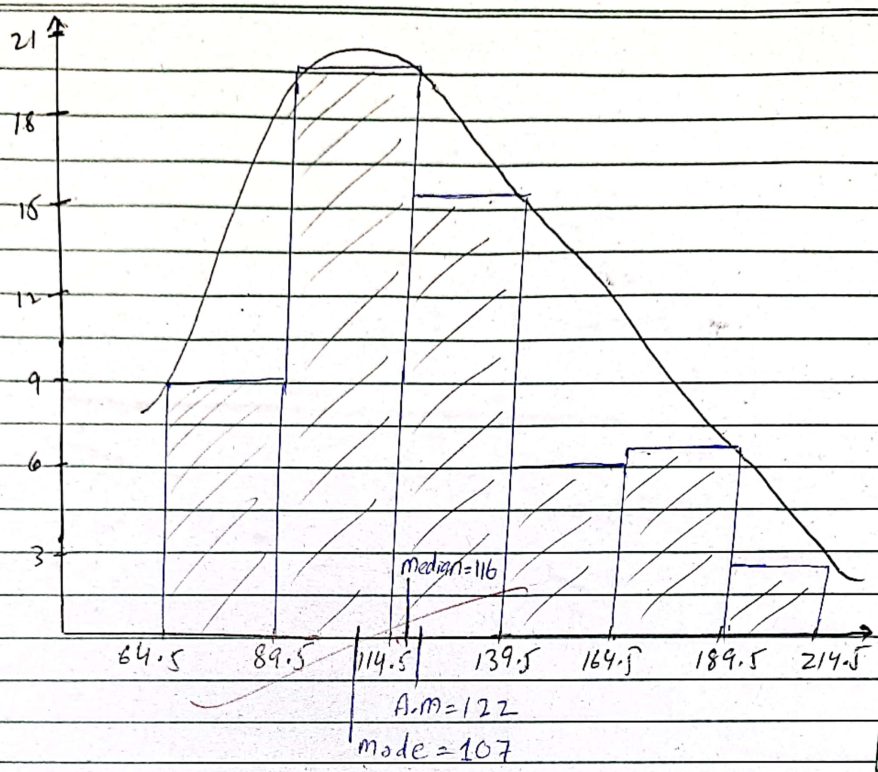

Q. (2) Take a sample of size $n=5$ and calculate A.M, G.M, H.M.

Sample $n = 2, 3, 1, 5, 4$

$$A.M = \frac{\sum_{i=1}^{n} x_i}{n}$$

$n=5$

$$\boxed{A.M = \frac{15}{5} = 3}$$

x_i
2
3
1
5
4
$\Sigma x_i = 15$

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$$G.M = \bar{x} = \text{antilog}\left[\frac{\sum_{i=1}^{n} \log x_i}{n}\right]$$

x_i	$\log x_i$	$1/x_i$
2	0.3	0.5
3	0.47	0.33
1	0	~~0.2~~ 1
5	0.69	0.2
4	0.6	0.25

$$\sum \log x_i = 2.06$$

$$G.M = \bar{x} = \text{antilog}\left[\frac{2.06}{5}\right]$$

$$\bar{x} = \text{antilog}\left[0.412\right]$$

$$G.M = \bar{x} = 2.58$$

$$H.M = \bar{x} = \frac{n}{\sum_{i=1}^{n}\left(1/x_i\right)}$$

$$\boxed{H.M = \bar{x} = \frac{5}{2.28} = 2.19}$$

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Q.3. Take frequency distribution from Q.1 and calculate A.m, G.m and H.m.

x_i	f_i	$f_i x_i$	$\log x_i$	$f_i \log x_i$	f_i / x_i
77	9	693	1.88	16.92	0.11
102	20	2040	2	40	0.19
127	16	2032	2.10	33.6	0.12
152	6	912	2.18	13.08	0.03
177	7	1239	2.24	15.68	0.03
202	2	404	2.30	4.6	0.009

$\Sigma f_i x_i = 7320$

$\Sigma f_i \log x_i = 123.8$

$\Sigma f_i = 60$

$\Sigma \left(\frac{f_i}{x_i}\right) = 0.489$

Arithmetic Mean:

$$A.m = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{7320}{60}$$

$$\boxed{A.m = \bar{x} = 122}$$

Geometric Mean:

$$G.m = \bar{x} = \text{antilog}\left[\frac{\Sigma f_i \log x_i}{\Sigma f_i}\right]$$

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$$G.M = \bar{x} = \text{anti}_{\log}\left[\frac{123.8}{60}\right]$$

$$G.M = \bar{x} = \text{antilog}\left[2.06\right]$$

$$G.M = \bar{x} = 114.81$$

Harmonic Mean:

$$H.M = \bar{x} = \frac{\Sigma f_i}{\Sigma(f_i/x_i)} = \frac{60}{0.489}$$

$$\boxed{H.M = \bar{x} = 122.6}$$

Q.4: ~~Ha~~ From Q.1, find median and mode i.e grouped data.

classes	class boundaries	f	Commulative f
65 – 89	64.5 – 89.5	9	9
90 – 114	89.5 – 114.5	20	29
115 – 139	114.5 – 139.5	16	45
140 – 164	139.5 – 164.5	6	51
165 – 189	164.5 – 189.5	7	58
190 – 214	189.5 – 214.5	2	60
215 – 240	214.5 – 240.5		

$$\Sigma f_i = 60$$

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Median:

To locate the median class search the value of $(n/2)$ in c.f column

$$\frac{n}{2} = \frac{\Sigma f_i}{2} = \frac{60}{2} = 30$$

$$m = L + \frac{h}{f}\left(\frac{n}{2} - c\right)$$

$$m = 114.5 + \frac{25}{16}\left(\frac{60}{2} - 29\right)$$

$$= 114.5 + \frac{25}{16}(1)$$

$$\boxed{m = 116.06}$$

Mode:

$$\text{Mode} = L + \left[\frac{(f_m - f_{-1})}{(f_m - f_{-1}) + (f_m - f_{+1})}\right] \times h$$

To locate mode class search maximum frequency

$$\text{Mode} = 89.5 + \left[\frac{(20-9)}{(20-9)+(20-16)}\right] \times 25$$

$$= 89.5 + \left[\frac{(11)}{11+4}\right] \times 25$$

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$$\boxed{\text{Mode} = 107.8}$$

Q.5:- Take sample data of n size & calculate median and ~~mode~~.

Let sample size $n = 6$

values: 1, 2, 4, 3, 6, 7

Median = The values of ~~$\left(\frac{n+1}{2}\right)^{th}$ position~~

Position	X_i
1st	1
2nd	2
3rd	3
4th	4
5th	6
6th	7

$m = \left(\frac{6+1}{2}\right)^{th}$ position

$m = (3.5)^{th}$ position

By splitting position

3rd position + 0.5 (4th position − 3rd position)

$= 3 + 0.5(4 - 3)$

$$\boxed{m = 3.5}$$

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Q.6: Calculate Q_2, D_5 and P_{50} for ungrouped and grouped data.

FOR UNGROUPED:

i) Q_2: Let $Q_i = 1, 2, 4, 2, 3, 6, 7, 9$

$n = 8$

Q_i = the value of $\frac{i(n+1)}{4}^{th}$ position.

$Q_2 = \frac{2(8+1)}{4}^{th}$

$= \frac{18}{4} = 4.5$

Position	x_i
1st	1
2nd	2
3rd	2
4th	3
5th	4
6th	6
7th	7
8th	9

Splitting:

Q_2 = 4th position + 0.5 (5th position − 4th position)

$= 3 + 0.5(4 - 3)$

$\boxed{Q_2 = 3.5}$

ii) D_5: D_i = the value of $\frac{i(n+1)}{10}^{th}$ position

$D_5 = \frac{5(8+1)}{10} = 4.5$

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Q. $D_5 = 4^{th}$ pos $+ 0.5(5^{th}$ pos $- 4^{th}$ posi$)$

$3 + 0.5(4-3)$

$\boxed{D_5 = 3.5}$

P_{50}: the value of $\frac{i(n+1)}{100}$ th position.

$P_{50} = \frac{50(8+1)}{100} = 4.5$

$P_{50} = 4^{th}$ pos $+ 0.5(5^{th}$ pos $- 4^{th}$ pos$)$

$P_{50} = 3 + 0.5(4-3)$

$\boxed{P_{50} = 3.5}$

Hence $Q_2 = D_5 = P_{50}$

GROUPED DATA:

Classes	C.B	f	C.F
65 – 89	64.5 – 89.5	9	9
90 – 114	89.5 – 114.5	20	29
115 – 139	114.5 – 139.5	16	45] Q_{i}th
140 – 164	139.5 – 164.5	6	51
165 – 189	164.5 – 189.5	7	58
190 – 214	189.5 – 214.5	2	60
215 – 240	214.5 – 240.5		

$\Sigma f_i = 60$

Q2: $Q_2 = L + \frac{h}{f}\left(\frac{in}{4} - c\right)$

for Q_ith class $= \frac{in}{4} = \frac{2 \times 60}{4} = \boxed{30}$

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$$Q_2 = 114.5 + \frac{25}{16}\left(\frac{2\times 60}{4} - 29\right)$$

$$\boxed{Q_2 = 116}$$

D5: $D_i = L + \frac{h}{f}\left(\frac{in}{10} - C\right)$

For D_ith class $= \frac{in}{10} = \frac{300}{10} = \boxed{30}$

$$D_5 = 114.5 + \frac{25}{16}\left(\frac{5\times 60}{100} - 29\right)$$

$$\boxed{D_5 = 116}$$

P50: $P_i = L + \frac{h}{f}\left(\frac{in}{100} - C\right)$

For P_ith class $= \frac{in}{100} = \frac{3000}{100} = \boxed{30}$

$$P_{50} = 114.5 + \frac{25}{16}\left(\frac{50\times 60}{100} - 29\right)$$

$$\boxed{P_{50} = 116}$$

Hence $Q_2 = D_5 = P_{50}$

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