

# **MT205**

# **ASSIGNMENT #2**

**Roll No: K19 - 1048**

**2021**

**Software Engineering  
SE (A)**

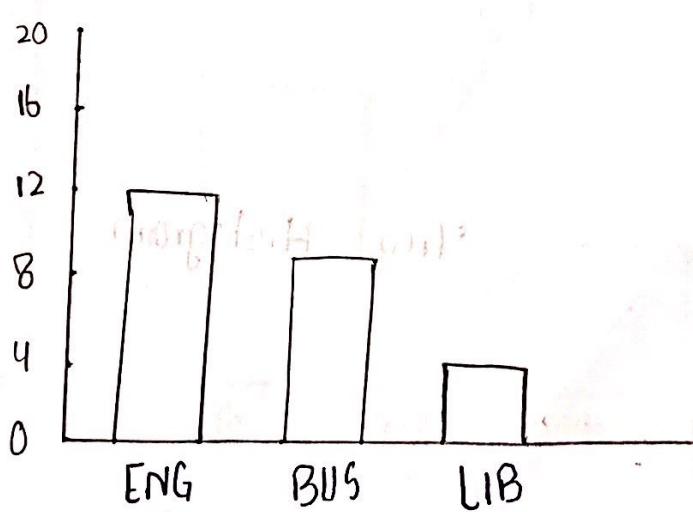
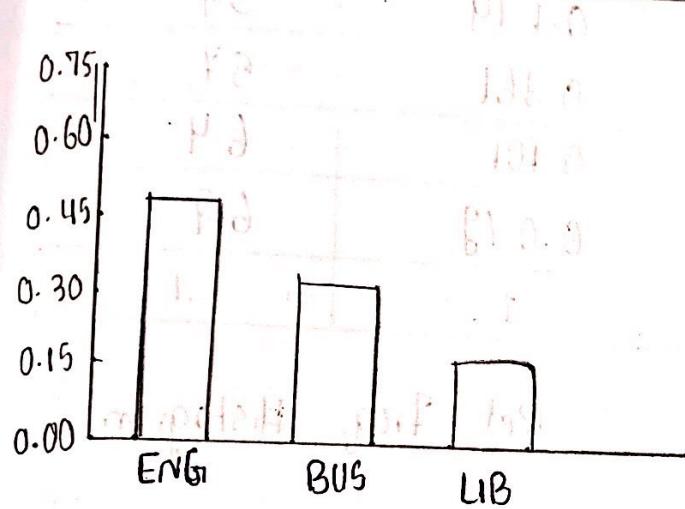
**Name:  
Amman Soomro**

**Instructor:  
Miss Javeria**

Questions from 2.18 - 2.29

$$Q = 2.20$$

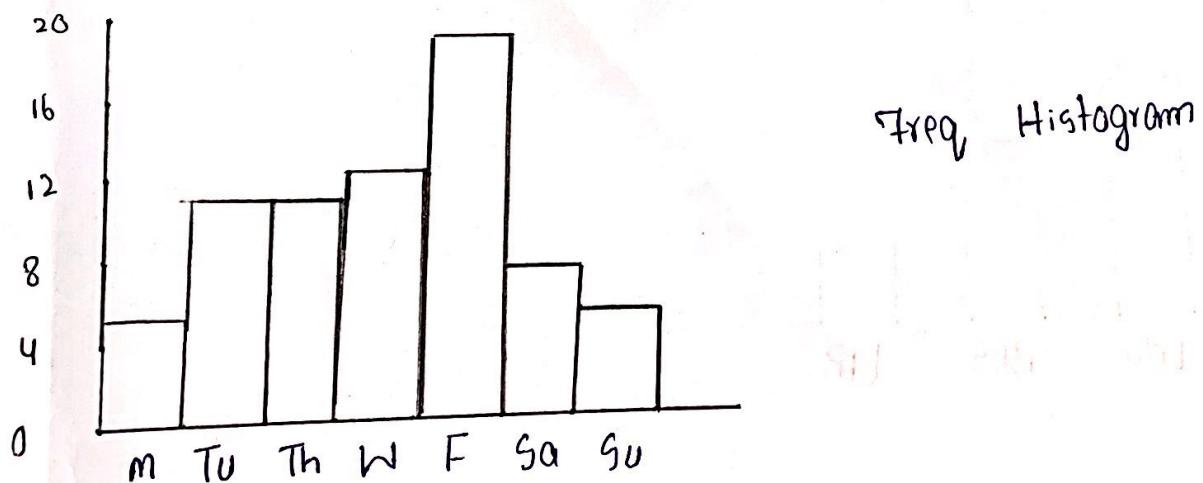
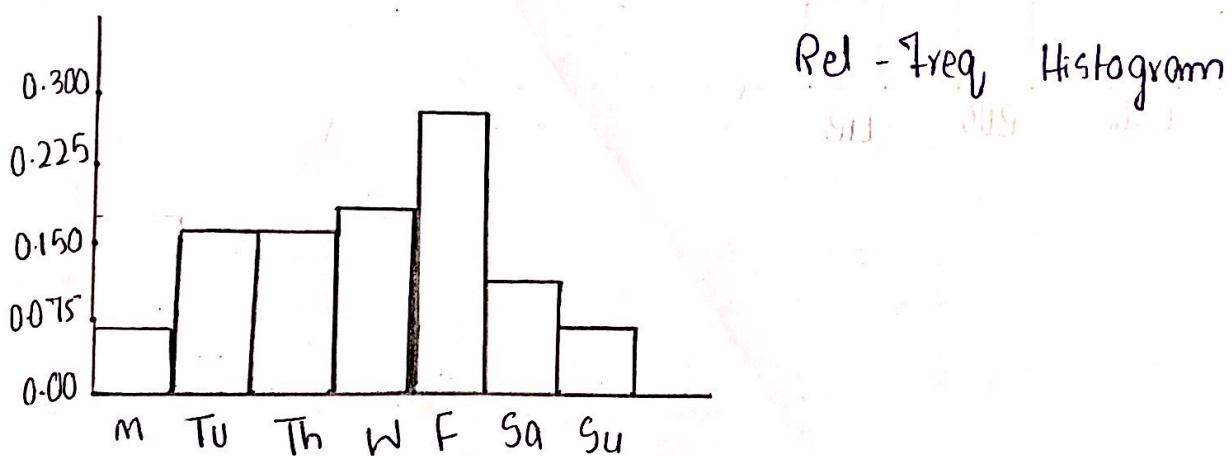
Value	Frequency	Rel-Frequency	C.F
ENG	12	0.48	12
BUS	9	0.36	21
LIB	4	0.16	25
	25	1.00	60



# Q.9.93 (Road Rage)

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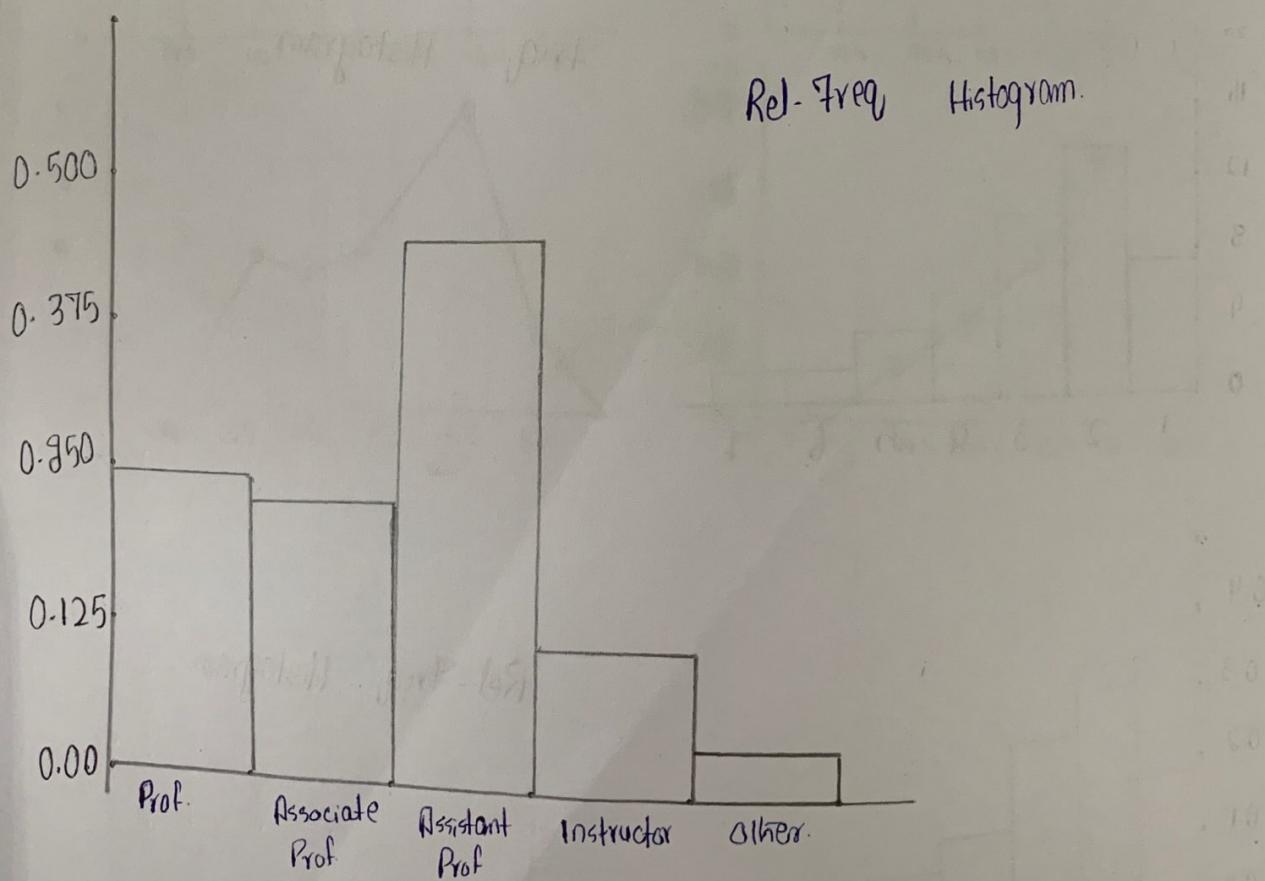
Value	Frequency	Rel.-Freq	C.F
M	5	0.072	5
TU	11	0.159	16
Th	11	0.159	27
W	12	0.174	39
F	18	0.261	57
Sa	7	0.101	64
Su	5	0.072	69
Total.	69	1	



$Q = 2.27$  Medical School Faculty

(3)

Value	Frequency	Rel - Freq	C.F
Professor	24418	0.447	24418
Associate Prof	21739	0.22	46150
Assistant Prof	40379	0.408	86529
Instructor	10960	0.111	97489
Other	1504	0.015	98993
total.	98993	1.00	

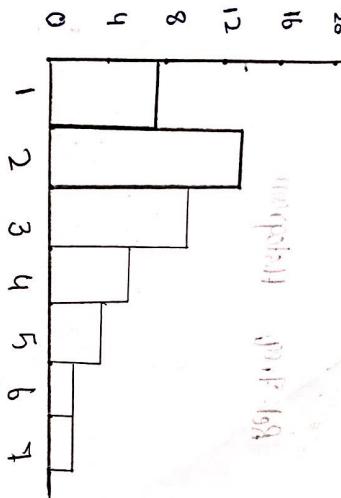


Questions from 9.53 - 9.59

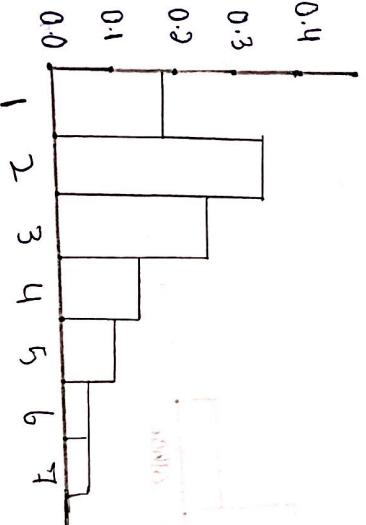
$$Q=3.53$$

Value	freq	Rel. freq	C.F
1	7	0.175	7
2	13	0.325	30
3	9	0.225	39
4	5	0.125	34
5	4	0.1	38
6	1	0.025	39
7	1	0.025	40
Total	40		

Rel. freq Histogram



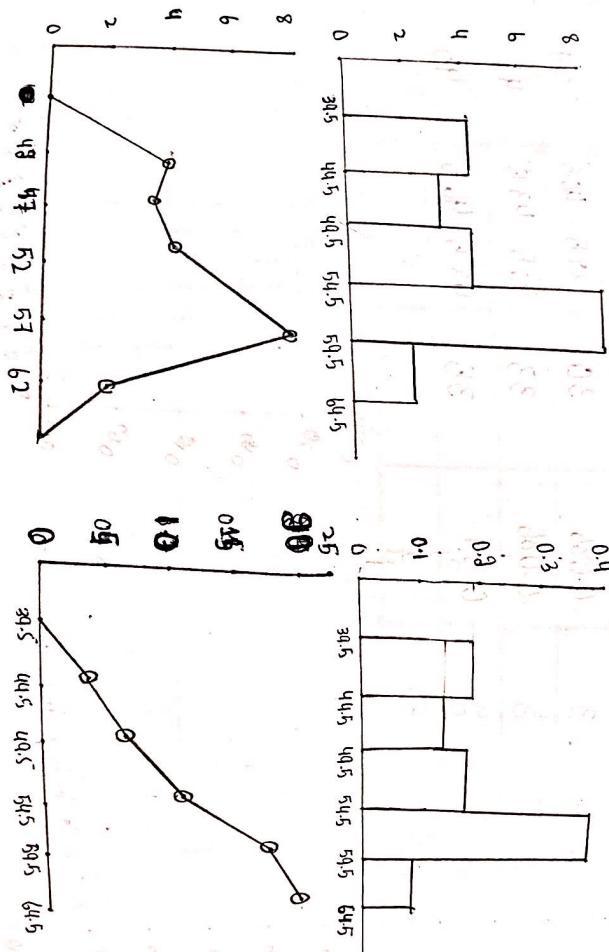
Rel. freq Histogram



$$Q = 9.57$$

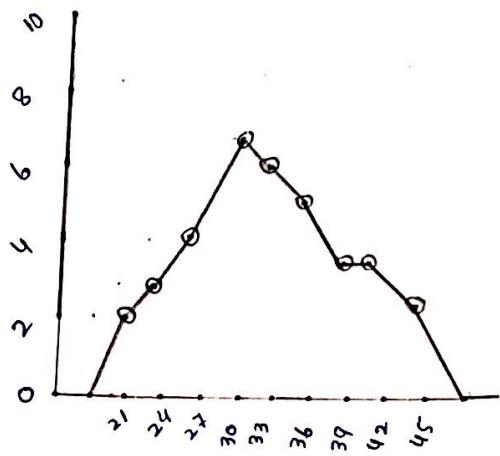
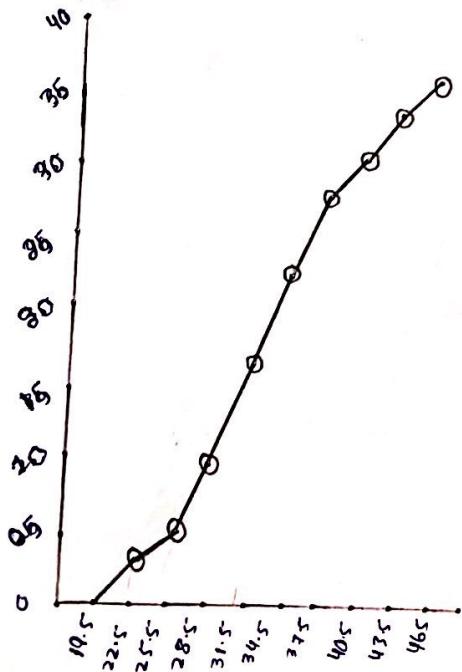
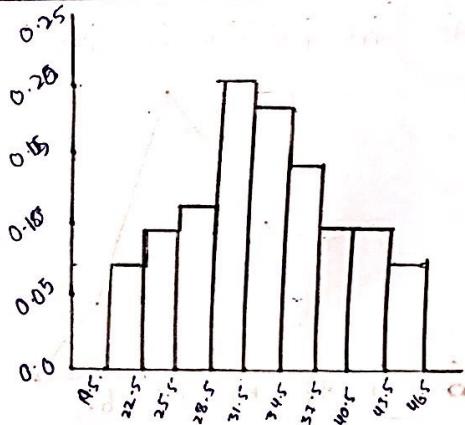
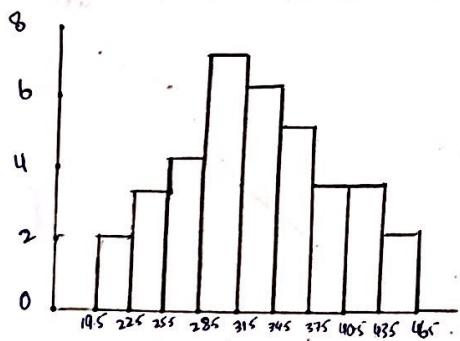
⑤

Class	freq	Rel. freq	C. f.	Class Boundary	Mid-Point
40 - 44	4	0.140	4	39.5 - 44.5	42
45 - 49	3	0.118	7	44.5 - 49.5	47
50 - 54	4	0.140	11	49.5 - 54.5	52
55 - 59	8	0.380	19	54.5 - 59.5	57
60 - 64	2	0.095	21	59.5 - 64.5	62
Total	24	1			



$$Q = 2.58$$

Class Value	f <sub>req</sub>	Rel-f <sub>req</sub>	C.F	Class Boundary	Mid-Point
20 - 29	2	0.057	2	19.5 - 22.5	21
23 - 32	3	0.086	5	22.5 - 25.5	24
26 - 28	4	0.114	9	25.5 - 28.5	27
29 - 31	7	0.19	16	28.5 - 31.5	30
32 - 34	6	0.171	22	31.5 - 34.5	33
35 - 37	5	0.143	27	34.5 - 37.5	36
38 - 40	3	0.086	30	37.5 - 40.5	39
41 - 43	3	0.086	33	40.5 - 43.5	42
44 - 46	2	0.057	35	43.5 - 46.5	45
Total	35	1			



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## STEM and LEAF Plot

2.71

STEM	LEAF	STEM	LEAF
91	4	0	2 2 3 4 7 9 9
92	-	1	1 1 1 4 5 5 6 6 6 8 9
93	-	2	0 2 3 4 7 9
94	6	3	0 0 4 5 5 5
95	7 9	4	1 9
96	4	5	5
97	4 5 7 7	6	9
98	4 6 7 8 9	7	9
99	0 1 5 6 7 9	8	-
100	1	9	3
101	0 4 7 8		
102	5 8		
103	0 1		
104	-		
105	-		
106	0		

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STEM	LEAF
1	2 3 8
2	1 6 7 8 8 9 9
3	3 4 4 5 9
4	0 4

## Mean, Mode, and Median

3.16:

$$\text{mean: } \frac{96 + 66 + 147 + 147 + 175 + 116 + 57 + 154 + 88 + 154}{10} \Rightarrow \frac{1200}{10}$$
$$\approx 120.0$$

median: 57, 66, 88, 96, 116, 147, 147, 154, 154, 175

$$= \frac{116 + 147}{2} \Rightarrow 131.5$$

Mode: 147, 154

- negative skewed since mean < median.

3.17

$$\text{mean: } \frac{3 + 9 + 47 + 118 + 204 + 97 + 68 + 86 + 62 + 57 + 98 + 99}{12} = \frac{941}{12}$$

$$\approx 78.4$$

Median: 2, 3, 47, 57, 68, 68, 86, 97, 98, 99, 118, 204

$$= \frac{68 + 86}{2} \Rightarrow 77.0$$

Mode: no mode.

- Positive skewed since mean > median

3.19

$$\text{mean: } \frac{57+50+27+23.4+23.3+23.9+23.9+20+19+19}{10} \Rightarrow \frac{285.1}{10} = 28.51$$

$$\text{median: } 19, 19, 20, 23.2, 23.2, 23.3, 23.4, 27, 50, 57 \rightarrow \frac{23.8+23.3}{2} = 23.25$$

mode: 19, 23.9

Positive skewed since mean &gt; median.

$$\text{mid.-Range: } (19+57)/2 \Rightarrow 38$$

3.20

$$\text{mean: } \frac{3141+2873+2116+1684+3470+1799+2539+3093}{8} \Rightarrow \frac{20715}{8} = 2589.4$$

$$\text{median: } 1684, 1799, 2116, 2539, 2873, 3093, 3141, 3470 \rightarrow \frac{2539+2873}{2} = 2706.0$$

Mode: no mode

$$\text{mid.-Range: } \frac{1684+3470}{2} \Rightarrow 2577$$

Negative skewed since mean &lt; median.

3.24(a)

Mean:  $\frac{25 + 38 + 38 + 56 + 61 + 59 + 50 + 90 + 67 + 51 + 64 + 40}{12} = \frac{632}{12} = 52.7$

Median:  $25, 38, 38, 40, 50, 51, 52, 56, 61, 64, 67, 90$

$$= \frac{51 + 59}{2} = 55$$

Mode: 38

Mid-Range: 57.5

\* Positive skewed since mean > median.

3.24(b)

Mean:  $\frac{16 + 9 + 26 + 48 + 73 + 72 + 91 + 69 + 71 + 28 + 19 + 12}{12} = \frac{534}{12} = 44.5$

Median:  $9, 12, 16, 19, 26, 28, 48, 69, 71, 72, 73, 91$   
 $\frac{28+48}{2} = 38.0$

Mode: no mode.

Mid-Range:  $\frac{9+91}{2} = \frac{100}{2} = 50$

\* Positive skewed.

Q. 3 - 34

①

Data	Frequency	C.F.
ABC	5	5
CBS	9	14
70x	6	20
Total	30	30

Mean:  $\frac{5+6+9}{3} \Rightarrow \frac{20}{3}$   
 $\Rightarrow 6.6$

Mode: CBS  $\rightarrow 9$ Median:  $\frac{20+1}{2} \Rightarrow 10.5 \simeq 11^{\text{th}}$  term. (CBS)

Q. 3 - 36

Data	Value	Frequency	C.F.
M	5	5	5
Tu	11	16	16
W	13	28	28
Th	11	39	39
F	18	57	57
Sa	7	64	64
Su	5	69	69
Total	69		

Mean:  $\frac{69}{7} \Rightarrow 9.85 \simeq 10$

Mode: F  $\rightarrow 18$ Median:  $\frac{69+1}{2} \Rightarrow \frac{70}{2} = 35^{\text{th}}$  value. (Th)

### First Data:

Class	Frequency	Mid-Points.
90 - 98	6	94
99 - 107	22	103
108 - 116	43	112
117 - 125	28	121
126 - 134	9	130
Total	108	

Mean:  $(94 \cdot 6) + (103 \cdot 22) + (112 \cdot 43) + (121 \cdot 28) + (130 \cdot 9) \Rightarrow \frac{12204}{108}$   
 $\Rightarrow 113$

Modal class:

108 - 116

Median:  $\frac{108+1}{2} \Rightarrow 54.5 \Rightarrow (108-116)$  (20) not true  $\Rightarrow 20.5 - 110.5$

### Second Data:

Class	Frequency	Mid-Point
2.48 - 7.48	7	4.98
7.49 - 12.49	3	9.99
12.50 - 17.50	1	15.00
17.51 - 22.51	7	20.01
22.52 - 27.52	5	25.09
27.53 - 32.53	5	30.03
Total	28	

Mean:  $\frac{495.15}{28} \Rightarrow 17.68$

Modal class: 2.48 - 7.48

Median: 17.51 - 22.51

### Third Data

(13)

Class	Frequency	Mid-Point
13 - 19	2	16
20 - 26	7	23
27 - 33	12	30
34 - 40	5	37
41 - 47	6	44
48 - 54	1	51
55 - 61	0	58
62 - 68	2	65
Total	35	

$$\text{Mean: } 1183/35 \Rightarrow 33.8 \simeq 40$$

modal class: 27 - 33

$$\text{Median: } \frac{35+1}{2} \Rightarrow \frac{36}{2} = 18$$

$$\Rightarrow 27 - 33$$

## Quantile, Percentile, Deciles

Q.1: 19, 24, 26, 27, 34, 39, 42, 44, 45, 47, 50, 51, 56, 57, 59, 59, 60, 62

$$\Rightarrow D_4 = (21) \times \frac{4}{10} \Rightarrow 8.4 \quad D_6 = (21) \times \frac{6}{10} \Rightarrow 12.6$$

$$\Rightarrow 44.4 \text{ kg}$$

$$\Rightarrow 12^{\text{th}} + 0.6(13^{\text{th}} - 12^{\text{th}}) \Rightarrow 51 + 0.6(56 - 51) \Rightarrow 51 + 3 \\ \Rightarrow 54 \text{ kg}$$

Q.9: 2, 2, 3, 3, 3, 4, 4, 5, 5, 5, 6, 6, 7, 8, 9, 9, 11, 12, 12

$$\frac{\rightarrow Q_1 = 20 \times \frac{1}{4}}{\rightarrow 3} \Rightarrow 5^{\text{th}}$$

$$Q_2 = 20 \times \frac{1}{2} \Rightarrow 10^{\text{th}}$$

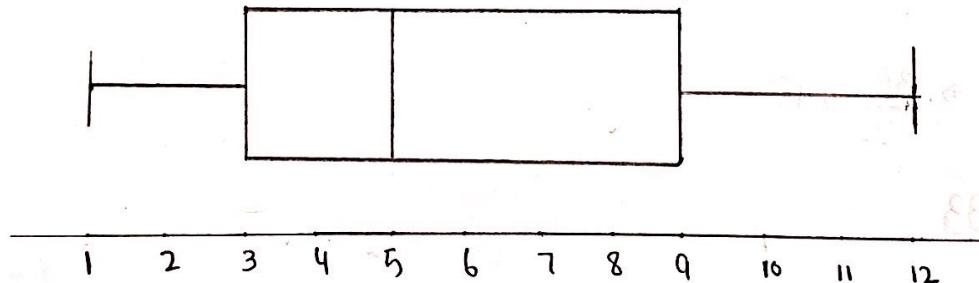
$$\Rightarrow 5$$

$$Q_3 = 20 \times \frac{3}{4} \Rightarrow 15^{\text{th}}$$

$$\Rightarrow 9$$

$$IQR: Q_3 - Q_1$$

$$\Rightarrow 9 - 3 \Rightarrow 6$$



Q.1

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Grouped Data:  
( $D_2$  and  $D_3$ )

Groups	Frequency	C.F
0 - 5	7	7
5 - 10	18	25
10 - 15	25	50
15 - 20	30	80
20 - 25	20	100
Total	100	

$$D_i = L + \frac{h}{f} \left\{ \left[ \left( i \times \frac{n}{10} \right) - C.F \right] \right\}$$

For  $D_2$ :

$$i \left[ \frac{n}{10} \right] = 2 \left[ \frac{100}{10} \right] \Rightarrow 20$$

$$D_2 = 5 + \frac{5}{18} \left[ \left( 2 \times \frac{100}{10} \right) - 7 \right]$$

$$\boxed{D_2 = 8.61} \text{ Ans}$$

For  $D_3$ :

$$3 \left[ \frac{100}{10} \right] = 30$$

$$D_3 = 10 + \frac{5}{25} \left[ \left( 3 \times \frac{100}{10} \right) - 25 \right]$$

$$\boxed{D_3 = 11}$$

Group	150 - 170	170 - 190	190 - 210	210 - 230	230 - 250
Frequency	30	50	80	30	10
C.F	30	80	160	190	200

$$Q_i = L + \frac{h}{f} \left[ \left( i \times \frac{n}{4} \right) - C.F \right]$$

For Q.1:

$$i \left[ \frac{n}{4} \right] = 1 \left[ \frac{200}{4} \right] = 50$$

$$Q_1 = 170 + \frac{20}{50} \left[ \left( 1 \times \frac{200}{4} \right) - 30 \right]$$

$$\boxed{Q_1 = 178.5}$$

For Q.3:

$$i \left[ \frac{n}{4} \right] = 3 \left[ \frac{200}{4} \right] \Rightarrow 150$$

$$Q_3 = 190 + \frac{20}{80} \left[ \left( 3 \times \frac{200}{4} \right) - 180 \right]$$

$$\boxed{Q_3 = 207.5} \text{ Ans.}$$

# ~~Variance~~ and Standard deviation:

(Q3) First Data:

Class	Frequency(f)	mid (x)	f·x	(f·x)·(x)
5.5 - 10.5	1	8	8	64
10.5 - 15.5	2	13	26	338
15.5 - 20.5	3	18	54	972
20.5 - 25.5	5	23	115	2645
25.5 - 30.5	4	28	112	3136
30.5 - 35.5	3	33	99	3267
35.5 - 40.5	2	38	76	8888
$\sum$	n = 20		490	13310

$$S^2 = \frac{\sum (f \cdot x^2) - \frac{(\sum f \cdot x)^2}{n}}{n-1} \Rightarrow \frac{13310 - \frac{(490)^2}{20}}{19} \Rightarrow 68.68$$

$$S^2 = 68.7 \quad \text{Sample Variance}$$

$$S = 8.3 \quad \text{Std deviation}$$

$$\text{Co-efficient of Variance} = \frac{S}{\bar{x}} \cdot 100\%$$

$$\bar{x} = \frac{\sum f \cdot x}{n}$$

$$\bar{x} = \frac{490}{20} \Rightarrow 24.5$$

$$\text{CVAR} = \frac{8.3}{24.5} \cdot 100\% \approx 33.87\%$$

$$= \frac{\sum f \cdot (x - \bar{x})^2}{\sum f}$$

$$= \frac{100 + 100 + 100 + 100 + 100 + 100 + 100 + 100}{80}$$

$$= \frac{800}{80} = 100$$

Second Data:

Class	$f$	$x$	$f \cdot x$	$f \cdot x^2$
52.5 - 63.5	6	58	348	20184
63.5 - 74.5	12	69	828	57132
74.5 - 85.5	25	80	2000	160000
85.5 - 96.5	18	91	1638	149058
96.5 - 107.5	14	109	1428	145656
107.5 - 118.5	5	113	565	63845
$\Sigma$	80		6807	595875

$$S^2 = \frac{595875 - (6807)^2}{80} \rightarrow 211.2$$

$$S = 14.5$$

$$\bar{x} = 85.1$$

$$VNR = 17.1\%$$

Question no 2

Europe

Asia

$X$	$X - MA$	$X$	$X - MB$
48,704	14067	26,852	10,525.7
41,441	6804	23,493	7,166.7
32,679	-1958	18,247	1,920.7
32,136	-2501	13,647	-2,679.3
30,384	-4253	9,857	-6,469.3
29,326	-5311	5,862	-10,464.3
27,789	-6848		
242,459	347,453,504	97,958	324,373,103.33

$$\sum (x - MA)^2 \rightarrow$$

$$X/n = 242,459 / 7 = \bar{x}$$

$$\Rightarrow 34,637$$

$$S^2 = \frac{\sum (x - MA)^2}{n-1} \Rightarrow \frac{347,453,504}{6}$$

$$\Rightarrow 57908917.33$$

$$S = \sqrt{S^2}$$

$$\Rightarrow 7609.790886$$

$$CVAR = \frac{S}{\bar{x}} \Rightarrow \frac{7609.79}{34,637}$$

$$\Rightarrow 21.98$$

Shortcut Method.

$$S^2 = \frac{n(\sum x^2) - (\sum x)^2}{n(n-1)}$$

$$\Rightarrow 579,08917.33$$

$$S = \sqrt{S^2}$$

$$\Rightarrow 7609.79$$

$$\bar{x} = 97,958 \div 6$$

$$\Rightarrow 16,326.33$$

$$S^2 = 324,373,103.33 \div 5$$

$$\Rightarrow 64,874,620.67$$

$$S = \sqrt{S^2}$$

$$\Rightarrow 8,054.47$$

$$CVAR = 49.33.$$

Asia is better.

Shortcut method.

$$S^2 = \frac{n(\sum x^2) - (\sum x)^2}{n(n-1)}$$

$$\Rightarrow 64,874,620.67$$

$$S = \sqrt{S^2}$$

$$\Rightarrow 8,054.47$$

Question no 2

$$H = \frac{579,809}{50} \Rightarrow 11596.18$$

$$\text{Range} = H - L \Rightarrow 47196 - 734 \\ = 46462.$$

Variance ( $\sigma^2$ ):

$$\sigma^2 = \frac{\sum (x - H)^2}{n}$$

$$R_1 = 24022813.9$$

$$R_2 = 225571953.5$$

$$R_3 = 283766352.4$$

$$R_4 = 1381297840$$

$$R_5 = 791536687.9$$

$$R_6 = 463759098.9$$

$$R_7 = 93683386.32$$

$$R_8 = 357632974.6$$

$$R_9 = 271347651.4$$

$$R_{10} = 203148095$$

$$\sum (x - H)^2 = 4311972653$$

$$\sigma^2 = \frac{4311972653}{50}$$

$$\sigma^2 = 86239453.06$$

$$\sigma = \sqrt{\sigma^2}$$

$$\sigma = 9286.52$$

$$\text{C.VAR: } \frac{\sigma}{H} \times 100 \Rightarrow \frac{9286.52}{11596.18} \times 100$$

$$\text{C.VAR: } 80.08\% \text{ Ans.}$$