

First Homework

Stat 101

- 1
- a) Number of children in a society,
 - b) The distance between cities.
 - c) Blood groups of people.
 - d) The weight of vegetable boxes.

- 2
- a) The number of children in 5 families: (5, 2, 4, 0, 1)
 - b) The weights of 5 persons: (78, 82, 110, 95, 67)
 - c) The grades of 7 students: (A, B, C, B, D, F, A)
 - d) The age of 10 students: (19, 18, 22, 21, 20, 18, 18, 19, 20, 21)

- 3
- a) Quantitative, b) Quantitative,
 - c) Qualitative, d) Quantitative, e) Qualitative.

- 4
- a) Continuous, b) Discrete, c) Discrete.
 - d) Continuous, e) Continuous.

- 5
- | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|----------|----------|
| x_1 | x_2 | x_3 | x_4 | x_5 | x_6 | x_7 | x_8 | x_9 | x_{10} | x_{11} | x_{12} |
| 3 | 4 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 |

a) The mean:

$$\bar{X} = \frac{\sum x_i}{n} = \frac{3+4+5+6+6+6+7+7+8+8+9+9}{12} = \frac{78}{12} = \boxed{6.5}$$

b) The Mode:

Mode: is a value, which has the highest frequency

$$\boxed{\tilde{x} = 6}$$

c) The standard deviation:

$$S = \sqrt{S^2} = \sqrt{\frac{n \sum X_i^2 - (\sum X_i)^2}{n(n-1)}} = \sqrt{\frac{12(546) - (78)^2}{12(12-1)}} \\ = \sqrt{3.545} = \boxed{1.883}$$

d) standard score for the value 7.

$$Z = \frac{X - \bar{X}}{S} = \frac{7 - 6.5}{1.883} = 0.266$$

e) Coefficient of variation.

$$C.V = \frac{S}{\bar{X}} \cdot 100 = \frac{1.883}{6.5} \cdot 100 = 28.97 \%$$

f) Using Empirical Rule:

$$(\bar{X} \pm 2S) = (6.5 - 2(1.883), 6.5 + 2(1.883)) \\ = (2.734), (10.266)$$

we note that all data are falling within this interval
(2.734, 10.266)

g)

$$\underline{Q_3}: \quad q_3 = \frac{r(n+1)}{4} = \frac{3(12+1)}{4} = \boxed{9.75} \begin{matrix} \rightarrow k=9 \\ \rightarrow S=0.75 \end{matrix}$$

$$Q_3 = X_k + S(X_{k+1} - X_k) = X_9 + 0.75(X_{10} - X_9)$$

$$Q_3 = 8 + 0.75(8 - 8) = \boxed{8}$$

$$\underline{D_5}: \quad d_5 = \frac{r(n+1)}{10} = \frac{5(12+1)}{10} = \boxed{6.5} \begin{matrix} \rightarrow k=6 \\ \rightarrow S=0.5 \end{matrix}$$

$$D_5 = X_k + S(X_{k+1} - X_k) = X_6 + 0.5(X_7 - X_6)$$

$$= 6 + 0.5(7 - 6) = \boxed{6.5}$$

$$\boxed{D_5 = Q_2 = 6.5}$$

(2)

$$\underline{P}_{25} : P_{25} = \frac{r(n+1)}{100} = \frac{25(12+1)}{100} = \boxed{3.25} \rightarrow K=3$$

$$P_{25} = X_K + S(X_{K+1} - X_K) = X_3 + 0.25(X_4 - X_3)$$

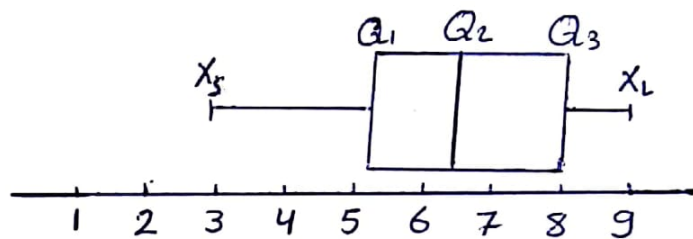
$$= 5 + 0.25(6 - 5) = \boxed{5.25} \quad \boxed{P_{25} = Q_1 = 5.25}$$

$$L.F = Q_1 - 1.5(Q_3 - Q_1) = 5.25 - 1.5(8 - 5.25) = \boxed{1.125}$$

$$H.F = Q_3 + 1.5(Q_3 - Q_1) = 8 + 1.5(8 - 5.25) = \boxed{12.125}$$

h) There is no values less than L-F or more than HF,
then, there is no extreme values.

i)



5

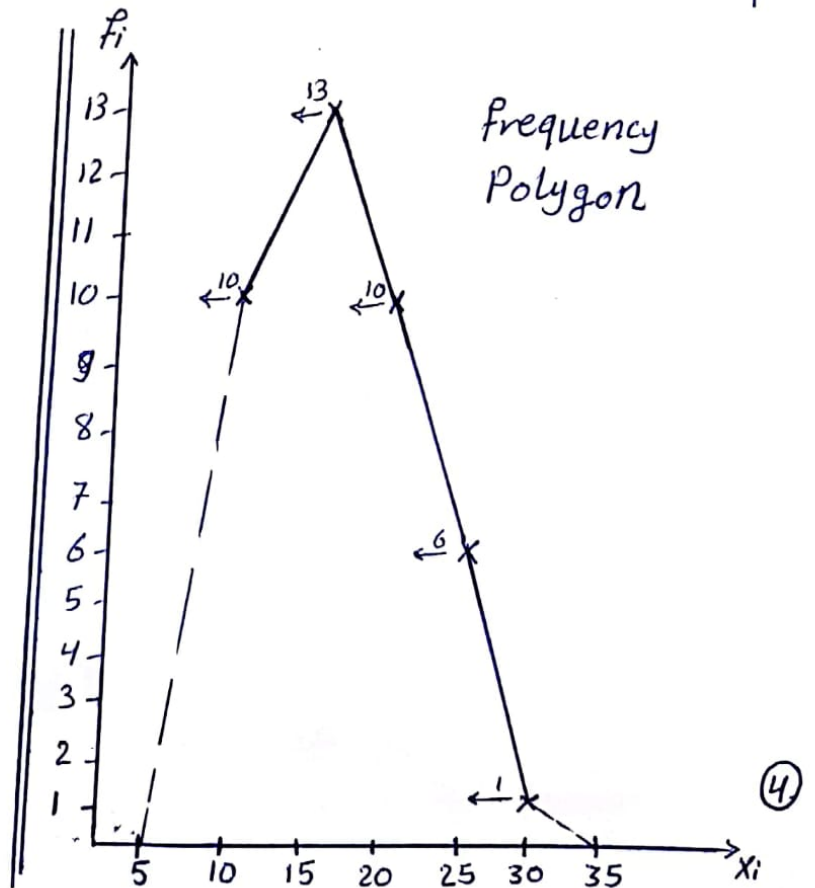
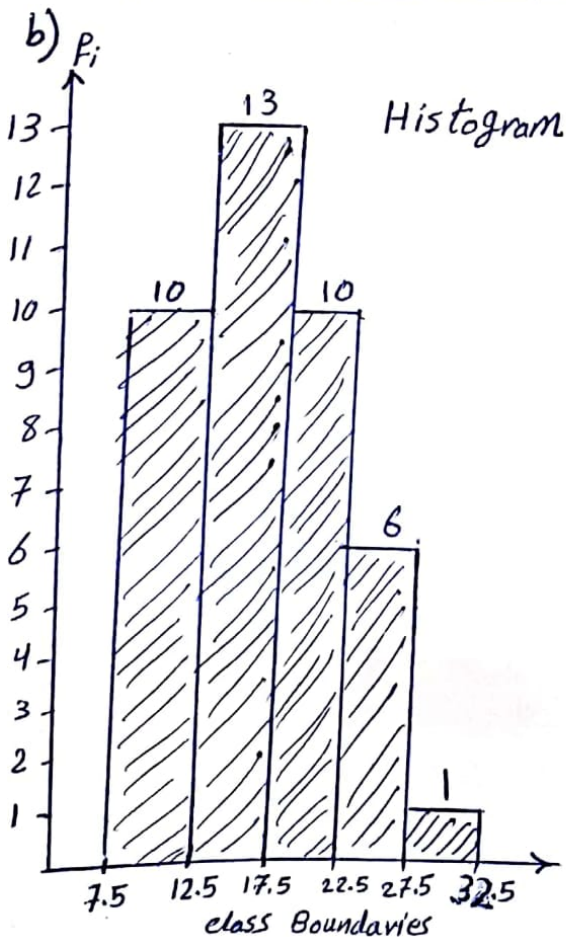
a) Number of classes $k = \lfloor 3.322 \log n \rfloor = \lfloor 3.322 \log 40 \rfloor = \lfloor 5.322 \rfloor$
 $k = 5$

- The Range: $R = X_L - X_S = 28 - 8 = 20$

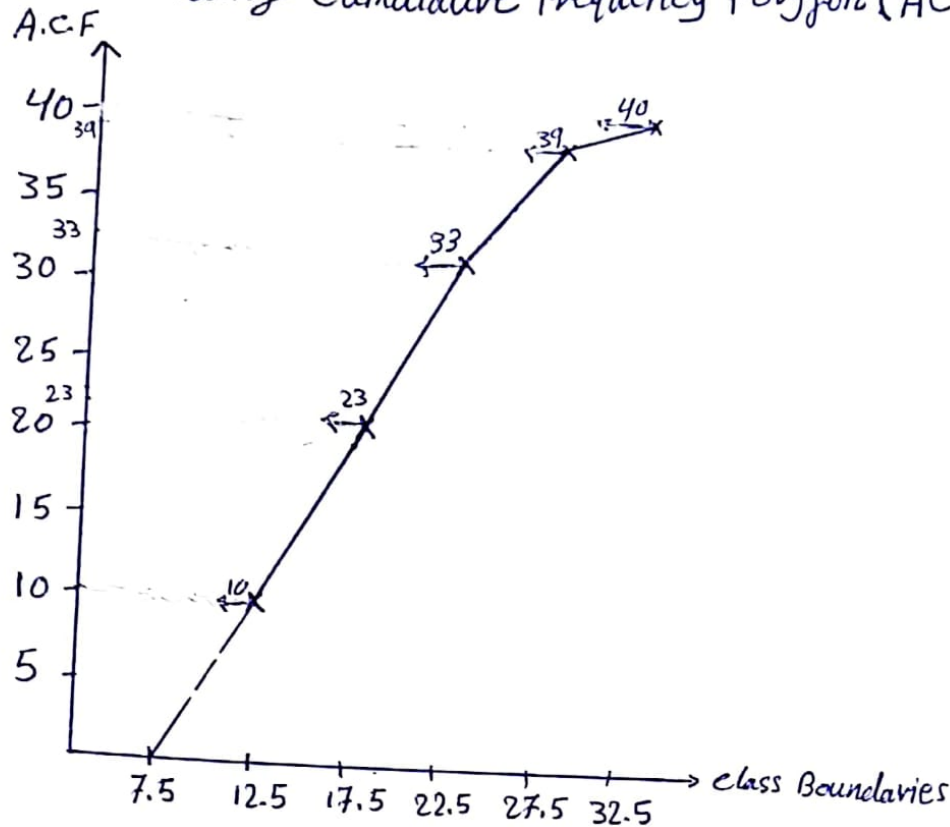
- Length of class Boundaries: $c = \frac{R+1}{k} = \frac{20+1}{5} = 4.2 \approx 5$

- Length of class limit: $c - 1 = 5 - 1 = 4$

class Limit	class Boundaries	class Midpoint X_i	Frequency f_i	Ascending cumulative Frequency (A.C.F) (F_i)
8 - 12	7.5 → 12.5	$\frac{7.5+12.5}{2} = 10$	10	10
13 - 17	12.5 → 17.5	15	13	23
18 - 22	17.5 → 22.5	20	10	33
23 - 27	22.5 → 27.5	25	6	39
28 - 32	27.5 → 32.5	30	1	40
-----	-----	-----	$\sum f_i = n = 40$	-----



c) Ascending Cumulative Frequency Polygon (ACFP)



d) - The Mean:

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = \frac{10(10) + 13(15) + 10(20) + 6(25) + 1(30)}{40} = \frac{675}{40} = 16.875$$

- The Median:

* The Median class: where $\sum f_i = 40$, therefore $\frac{\sum f_i}{2} = \frac{40}{2} = 20$

Then, the median class is 12.5 → 17.5

$$\begin{aligned} \tilde{X} &= \tilde{L} + \frac{\frac{\sum f_i}{2} - (F - \tilde{P})}{\tilde{f}} * C \\ &= 12.5 + \frac{20 - (23 - 13)}{13} * 5 = 16.346 \end{aligned}$$

- The Mode:

* The Modal class is the second class

$$\begin{aligned} \hat{X} &= \hat{L} + \frac{d_1}{d_1 + d_2} * C = \\ &= 12.5 + \frac{3}{3 + 3} * 5 = 15 \end{aligned}$$

- The standard deviation:

First we calculate the variance:

$$S^2 = \frac{\sum f_i (x_i - \bar{x})^2}{(\sum f_i) - 1}$$

$$S^2 = \frac{10(10 - 16.875)^2 + 13(15 - 16.875)^2 + 10(20 - 16.875)^2 + 6(25 - 16.875)^2 + 1(30 - 16.875)^2}{40 - 1}$$

$$S^2 = \frac{472.66 + 45.70 + 97.66 + 396.09 + 172.26}{39} = 30.37$$

$$S = \sqrt{S^2} = \sqrt{30.37} = 5.51$$

a)

class Boundaries	class Midpoint	Frequency f_i	Ascending cumulative Frequency	A.C.F F_i
-3.5 → 1.5	-1	10	10	
1.5 → 6.5	4	20	30	
6.5 → 11.5	9	20	50	
11.5 → 16.5	14	14	64	
16.5 → 21.5	19	6	70	
21.5 → 26.5	24	14	84	
---	---	$\Sigma f_i = n = 84$	---	---

b) The data have one mode.

c) we note that there is two modal class which second and third class, then

$$\hat{X}_1 = L + \frac{d_1}{d_1 + d_2} \times C = 1.5 + \frac{10}{10 + 0} \times 5 = \boxed{6.5}$$

$$\hat{X}_2 = L + \frac{d_1}{d_1 + d_2} \times C = 6.5 + \frac{0}{0 + 6} \times 5 = \boxed{6.5}$$

we note that $\hat{X}_1 = \hat{X}_2 = 6.5$, then the data have one mode

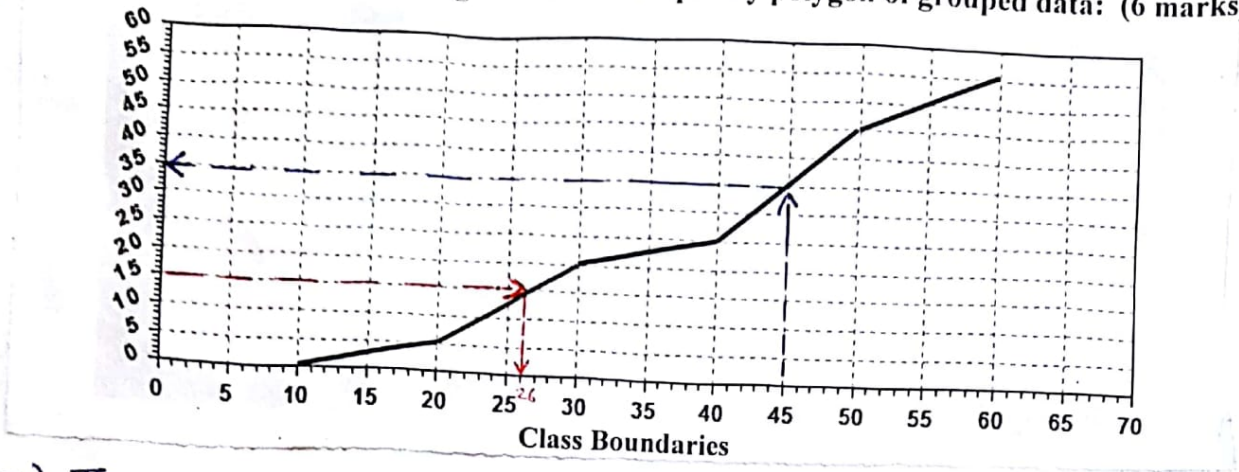
$$\boxed{\hat{X} = 6.5}$$

d) The median class: where $\Sigma f_i = 84$, therefore $\frac{\Sigma f_i}{2} = \frac{84}{2} = 42$
Then, the median class is 6.5 → 11.5

$$\tilde{X} = \tilde{L} + \frac{\frac{\Sigma f_i}{2} - (\tilde{F} - \tilde{f})}{\tilde{f}} \times C = 6.5 + \frac{42 - (50 - 20)}{20} \times 5$$

$$\boxed{\tilde{X} = 9.5}$$

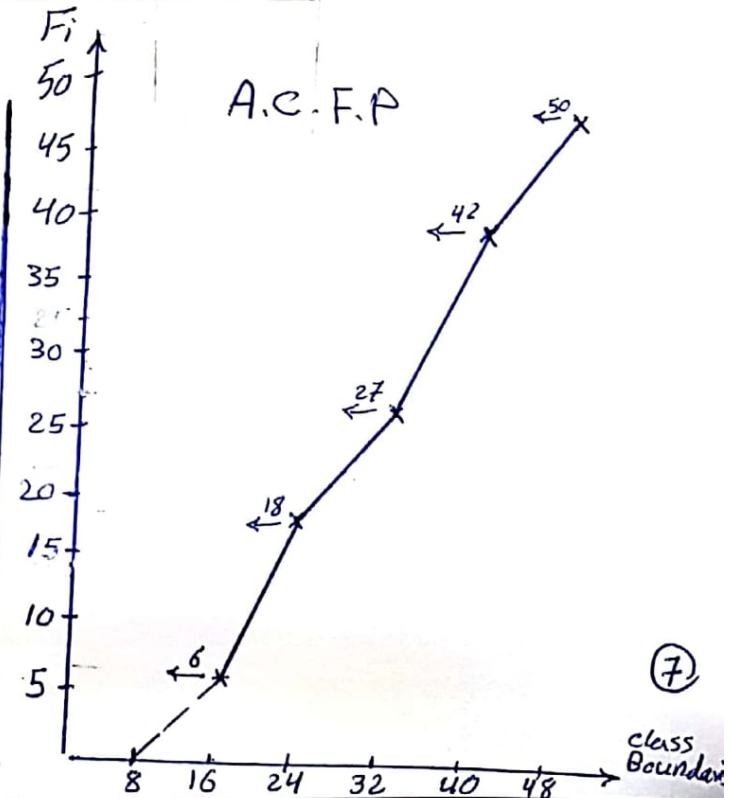
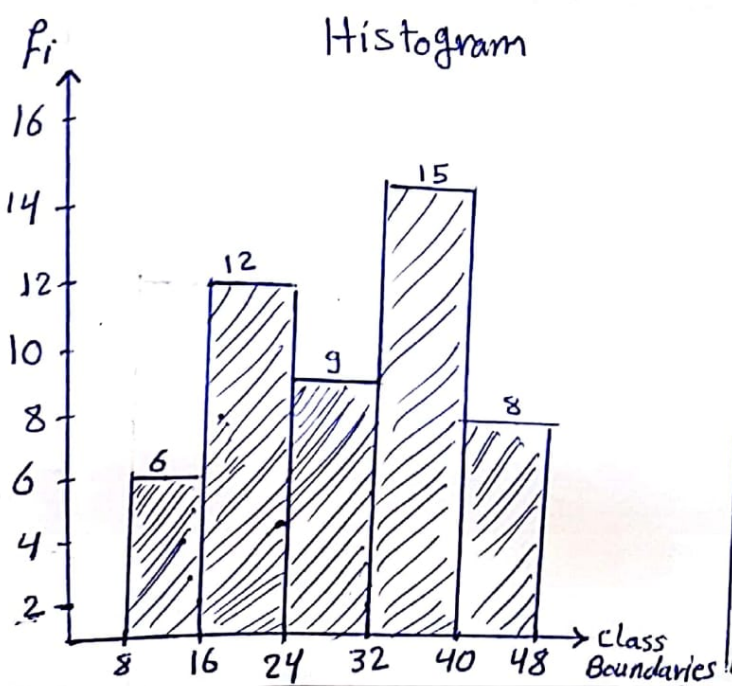
8) Consider the following ascending cumulative frequency polygon of grouped data: (6 marks)



- a) The A.C.F of the value 45 is 35
- b) The value, which has ACF 15 is 26

9)

class Boundaries	class Midpoint	Frequency f_i	A.C.F (F_i)
8 → 16	12	6	6
16 → 24	20	12	18
24 → 32	28	9	27
32 → 40	36	15	42
40 → 48	44	8	50
	---	$\Sigma f_i = n = 50$	---



(7)

10) The following two data sets represent grads of 45 students in two schools A and B: (8 marks)

	B	A	A	B	C	C	F	A	A	A	B	F	B	A	C
School A	A	C	A	A	F	A	B	A	C	B	B	C	F	B	B
	C	D	F	A	D	A	D	A	F	A	B	A	C	B	
School B	F	B	A	C	C	B	B	A	A	F	A	A	A	C	A
	B	B	A	A	C	A	A	A	D	A	B	D	D	C	A
	B	A	A	F	A	A	A	C	B	A	A	B	C	C	F

Complete the following frequency table for the above data, and draw the multiple bar graph for them.

Grad	Frequency for School A	Frequency for School B
A	16	21
B	11	9
C	8	8
D	4	3
F	6	4
Total	45	45

