

**Major Assignment Statistics**

**Spring 2020**

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**Subject: Basic Statistics**

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# STATISTICS:

UROOBT AFRIDI - 14080 - BS-MSMC. (1)

- Q1. Take 100 observations randomly and construct
- i) Discrete group frequency Distribution table
  - ii) Continuous Class Boundaries table.

# Data:

10, 8, 6, 2, 8, 7, 1, 3, 9, 4, 20, 18, 15, 19, 16,  
 18, 11, 17, 12, 40, 31, 28, 35, 27, 24, 22, 37, 21, 32,  
 25, 36, 39, 26, 33, 38, 34, 29, 30, 7, 9, 2, 18, 6,  
 14, 8, 20, 19, 8, 16, 17, 11, 10, 8, 30, 23, 32, 7,  
 38, 6, 9, 13, 4, 19, 3, 10, 40, 20, 12, 16, 11, 18,  
 12, 17, 34, 37, 18, 36, 38, 14, 39, 13, 20, 22,  
 17, 24, 18, 29, 39, 16, 26, 35, 28, 22, 37, 17,  
 12, 1, 15, 32, 11.

→ Discrete group Frequency Distribution Table.

Class	Tally	Frequency.
1 — 5		10
6 — 10		15
11 — 15		16
16 — 20		20
21 — 25	<del>    </del>	8
26 — 30		9
31 — 35		9
36 — 40		13
		<u><math>\Sigma f = 100</math></u>

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ii) Continuous Class Boundary Table.

Classes	Frequency	Class Boundary
1 - 5	10	0.5 - 5.5
6 - 10	15	5.5 - 10.5
11 - 15	16	10.5 - 15.5
16 - 20	20	15.5 - 20.5
21 - 25	8	20.5 - 25.5
26 - 30	9	25.5 - 30.5
31 - 35	9	30.5 - 35.5
36 - 40	13	35.5 - 40.5
$\Sigma f = 100$		

Finding the difference b/w upper limit of 1<sup>st</sup> class and lower limit of 2<sup>nd</sup> class and divide by 2

$$\begin{aligned} \text{Upper limit of 1<sup>st</sup> class} &= 5 \\ \text{Lower limit of 2<sup>nd</sup> class} &= 6 \end{aligned}$$

$$6 - 5 = 1$$

⇒ Now dividing by 2.

$$\frac{1}{2} = 0.5$$

⇒ Now add 0.5 to all the ~~lower~~ upper limits of the classes and subtract it from the lower limits of all the classes.



Q2. Find averages of the above mentioned Frequency Distribution table.

→ Finding Arithmetic Mean.

Formula :

$$\bar{X}_{AM} = \frac{\sum f x_i}{\sum f}$$

Classes	$x_i$	f	$f x_i$
1-5	3	10	30
6-10	8	15	120
11-15	13	16	208
16-20	18	20	360
21-25	23	8	184
26-30	28	9	252
31-35	33	9	297
36-40	38	13	494
		$\sum f = 100$	$\sum f x_i = 1945$

Putting values into the formula.

$$\bar{X}_{AM} = \frac{\sum f x_i}{\sum f}$$

$$= \boxed{19.45}$$

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Now finding Geometric & Harmonic Mean

$$\text{Geometric Mean} = X_{GM} = \text{Antilog} \left[ \frac{\sum f_i \log x_i}{\sum f} \right]$$

$$\text{Harmonic Mean} = X_{HM} = \frac{\sum f}{\sum (f/x_i)}$$

Class	f	$x_i$	$f \log x_i$	$f/x_i$
1-5	10	3	4.77	3.33
6-10	15	8	13.55	1.875
11-15	16	13	17.82	1.23
16-20	20	18	2.55	1.11
21-25	8	23	2.26	0.35
26-30	9	28	2.401	0.321
31-35	9	33	2.47	0.27
36-40	13	38	2.69	0.34
	$\sum f = 100$		$\sum f \log x_i = 48.511$	$\sum (f/x_i) = 8.826$

$$\text{Geometric Mean} = \text{Antilog} \left[ \frac{\sum f_i \log x_i}{\sum f} \right]$$

$$= \text{Antilog} \left[ \frac{48.511}{100} \right]$$

$$= \text{Antilog} (0.485)$$

$$X_{GM} = \boxed{3.055}$$

$$\text{Harmonic Mean} = \frac{\sum f}{\sum (f/x_i)}$$

$$= \frac{100}{8.826}$$

$$X_{HM} = \boxed{11.33}$$



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## \* Finding Median and Mode.

~~Median~~  
Finding cumulative frequency first.

Class.	Frequency	Cumulative frequency (Cf)
1-5	10	10
6-10	15	25
11-15	16	41
16-20	20	61
21-25	8	69
26-30	9	78
31-35	9	87
36-40	13	100
	$\Sigma f = 100$	

$$\frac{N}{2} = \frac{100}{2} = 50$$

$$\text{Median Class} = 16-20$$

Finding Median;

$$\text{Formula} \rightarrow l + \left( \frac{\frac{N}{2} - Cf}{f} \right) h$$

Here;

$$\text{Lower limit (l)} = 16$$

$$Cf = 41 \quad (\text{taking preceding value of taken class})$$

$$f = 20 \quad (\text{taking upper limit value of chosen class})$$

$$h = 4 \quad (\text{Difference b/w the class})$$

$\Rightarrow$  Putting values in above formula; we get.

$$\text{Median} = 16 + \left( \frac{50 - 41}{20} \right) 4 = \boxed{28.8}$$

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Mode

Class	f
1-5	10
6-10	15
11-15	16
16-20	20
21-25	8
26-30	9
31-35	9
36-40	13
$\Sigma f = 100$	

~~16~~  $L = 16$   
 $f_m = 20$   
 $f_1 = 16$   
 $f_2 = 8$   
 $h = 4$

$$\begin{aligned} \text{Mode} &= L + \frac{f_m - f_1}{(f_m - f_1) + (f_m - f_2)} \times h \\ &= 16 + \frac{20 - 16}{(20 - 16) + (20 - 8)} \times 4 \\ &= 16 + \frac{4}{4 + 12} \times 4 \\ &= \left( \frac{16}{1} + \frac{4}{16} \right) 4 \\ &= 65 \end{aligned}$$



Q3. Find quartiles of the discrete frequency distribul. Table.

	Class	f	CF
	1-5	10	10
Q <sub>1</sub> = -	6-10	15	25
	11-15	16	41
Q <sub>2</sub> →	16-20	20	61
	21-25	8	69
Q <sub>3</sub> -	26-30	9	78
	31-35	9	87
	36-40	13	100
		∑f = 100	

Finding Q<sub>1</sub>.

$$Q_1 = \frac{N}{4} = \frac{100}{4} = 25^{th}$$

$$Q_1 = L_1 + \frac{N_1 - CF}{f} \times i \quad \therefore i = \text{class interval}$$

$$= 6 + \frac{25 - 10}{100} \times 4$$

$$= 6 + \frac{15}{100} \times 4$$

$$= 24.6 \rightarrow 25$$

Finding Q<sub>2</sub>.

$$Q_2 = \frac{2N}{4} = \frac{2(100)}{4} = 50$$



$$Q2 = L + \frac{2N/4 - CF}{f} \times i$$

$$= 16 + \frac{50 - 41}{100} \times 4$$

$$= 16 + \frac{9}{100} \times 4$$

$$= 64.36 \Rightarrow$$

$$Q3 = \frac{3N}{4}$$

$$= \frac{3(100)}{4} = 75$$

$$Q3 = L + \frac{3N/4 - CF}{f} \times i$$

$$= 26 + \frac{75 - 69}{100} \times 4$$

$$= 26 + \frac{6}{100} \times 4$$

$$= 104.24$$

~~Question 4~~



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Q4. Find the following of discrete frequency distribution.

1) Range = Max value - Min value.  
= 40 - 1  
=  $\boxed{39}$

2) Quartile Range:  $Q_3 - Q_1$

Putting values.  
= 104.24 - 24.6  
= 79.64  
=  $\boxed{80}$

3) ~~Variance~~ Semi Inter Quartile Range.

$$= \frac{Q_3 - Q_1}{2}$$
$$= \frac{80}{2} \Rightarrow \boxed{40}$$

4) Variance.

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

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



x	f	$x_i$	$f_x$	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
1-5	10	3	30	19.45	*16.45	270.6	2706
6-10	15	8	120	19.45	11.45	131.1	1966.5
11-15	16	13	208	19.45	6.45	41.6	665.6
16-20	20	18	360	19.45	1.45	4.42	88.4
21-25	8	23	184	19.45	3.55	12.6	100.8
26-30	9	28	252	19.45	8.55	73.1	657.9
31-35	9	33	297	19.45	13.55	183.6	1652.4
36-40	13	38	494	19.45	18.55	344.1	4473.3
	$\sum f = 100$		$\sum f_x = 1945$				$\sum f(x - \bar{x})^2 = 1061.12$

$$\text{Variance} = S^2 = \frac{\sum f(x - \bar{x})^2}{\sum f + n}$$

$$S^2 = \frac{12,310.9}{100}$$

$$S^2 = 123.1$$

⑤ Standard Deviation:

$$S = \sqrt{\text{Variance}}$$

~~$$= \sqrt{123.1}$$~~

$$= \sqrt{\frac{1061.12}{100}}$$

$$S = 3.25$$



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- Co-efficient of Variance:

$$C.V = \frac{S.D}{\bar{x}} \times 100$$

$$= \frac{3.25}{19.45} \times 100$$

$$= 16.7$$