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Q: 1 A) For man:

Consumption of fresh vegetables
Mean = $\frac{\text{Sum of all observation}}{\text{total number of observation}}$

Putting the values:

$$\bar{x} = \frac{204 + 259 + 266 + 317}{4}$$

$$\bar{x} = \frac{1046}{4} = \boxed{261.5} \rightarrow \text{Ans}$$

mean consumption for fruits

$$\bar{x} = \frac{31 + 45 + 69 + 105}{4} = \frac{250}{4} = \boxed{62.5} \text{ Ans}$$

mean consumption for rice

$$\bar{x} = \frac{367 + 337 + 269 + 246}{4} = \frac{1219}{4} = \boxed{304.75} \text{ Ans}$$

mean consumption for fish:

$$\bar{x} = \frac{23 + 28 + 31 + 44}{4} = \frac{126}{4} = \boxed{31.5} \rightarrow \text{Ans}$$

mean consumption for meat:

$$\bar{x} = \frac{70 + 61 + 69 + 77}{4} = \frac{277}{4} = \boxed{69.25} \rightarrow \text{Ans}$$

Overall mean Consumption for women:

(2)

mean consumption for fresh vegetable

$$\frac{178 + 235 + 266 + 304}{4} = \frac{983}{4} = \boxed{245.75} \rightarrow \text{Ans}$$

For Rice:

$$\frac{315 + 276 + 243 + 220}{4} = \frac{1054}{4} = \boxed{263.5} \rightarrow \text{Ans}$$

For Fish:

$$\frac{19 + 21 + 28 + 46}{4} = \frac{114}{4} = \boxed{28.5} \rightarrow \text{Ans}$$

For meat:

$$\frac{48 + 43 + 54 + 63}{4} = \frac{208}{4} = \boxed{52} \rightarrow \text{Ans}$$

Now combined means consumption for both men and women:

For Fresh vegetables:

$$\frac{204 + 259 + 266 + 317 + 178 + 235 + 266 + 304}{8} = \frac{2029}{8} = \boxed{253.625} \rightarrow \text{Ans}$$

For Rice:

$$\frac{367 + 337 + 269 + 246 + 315 + 276 + 243 + 220}{8}$$

$$= \frac{\cancel{2870}}{8} = \frac{2273}{8} = \boxed{284.125} \rightarrow \text{Ans}$$

For Combined Fruits..

③

$$\frac{31+45+69+105+88+46+70+121}{8} = \frac{515}{8} = \boxed{64.375}$$

$$\boxed{64.375} \rightarrow \text{Ans}$$

For meat.

$$\frac{70+61+69+77+48+43+54+63}{8} = \frac{485}{8} = \boxed{60.625}$$

$$\boxed{60.625} \rightarrow \text{Ans}$$

For Fish :-

$$\frac{23+28+31+44+19+21+28+46}{8} = \frac{240}{8} = \boxed{30}$$

$$\boxed{30} \rightarrow \text{Ans}$$

For milk

$$\frac{2+3+23+39+1+4+15+48}{8} = \frac{135}{8} = \boxed{16.875}$$

$$\boxed{16.875} \rightarrow \text{Ans}$$

Now underlying Standard deviation for each case.

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The formula for Standard deviation is

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

and Standard error is = $\frac{S.D}{\sqrt{n}}$

$S.E = \frac{S}{\sqrt{n}}$ so Standard deviation is

$S.D = S.E \times \sqrt{n}$ For men S.D for each

For Fresh vegetable the Standard deviation

$$S.D = 0.9 \times \sqrt{4} = \boxed{1.8}$$

Fruits: S.D

$$S.D = 0.5 \times \sqrt{4} = \boxed{1}$$

Rice:

$$S.D = 1.0 \times \sqrt{4} = \boxed{2}$$

Wheat Flour:

$$S.D = 1.0 \times \sqrt{4} = \boxed{2}$$

Whole grain:

$$S.D = 0.1 \times \sqrt{4} = \boxed{0.2}$$

Meat:

$$S.D = 0.1 \times \sqrt{4} = \boxed{0.2}$$

Fish:

$$S.D = 0.4 \times \sqrt{4} = \boxed{0.8}$$

Standard deviation for women

05

Fresh vegetables:

$$S.D = 0.8 \times \sqrt{4} = \boxed{1.6}$$

For Fruits

$$S.D = 0.4 \times \sqrt{4} = \boxed{0.8}$$

For Rice

$$S.D = 0.8 \times \sqrt{4} = \boxed{1.6}$$

For wheat ~~grain~~ flour:

$$S.D = 0.8 \times \sqrt{4} = \boxed{1.6}$$

For whole grain:

$$S.D = 0.1 \times \sqrt{4} = \boxed{0.2}$$

For meat:

$$S.D = 0.3 \times \sqrt{4} = \boxed{0.6}$$

For root vegetables:

$$S.D = 0.1 \times \sqrt{4} = \boxed{0.2}$$

For Fish

$$S.D = 0.2 \times \sqrt{4} = \boxed{0.4}$$

For Milk

$$S.D = 0.3 \times \sqrt{4} = \boxed{0.6}$$

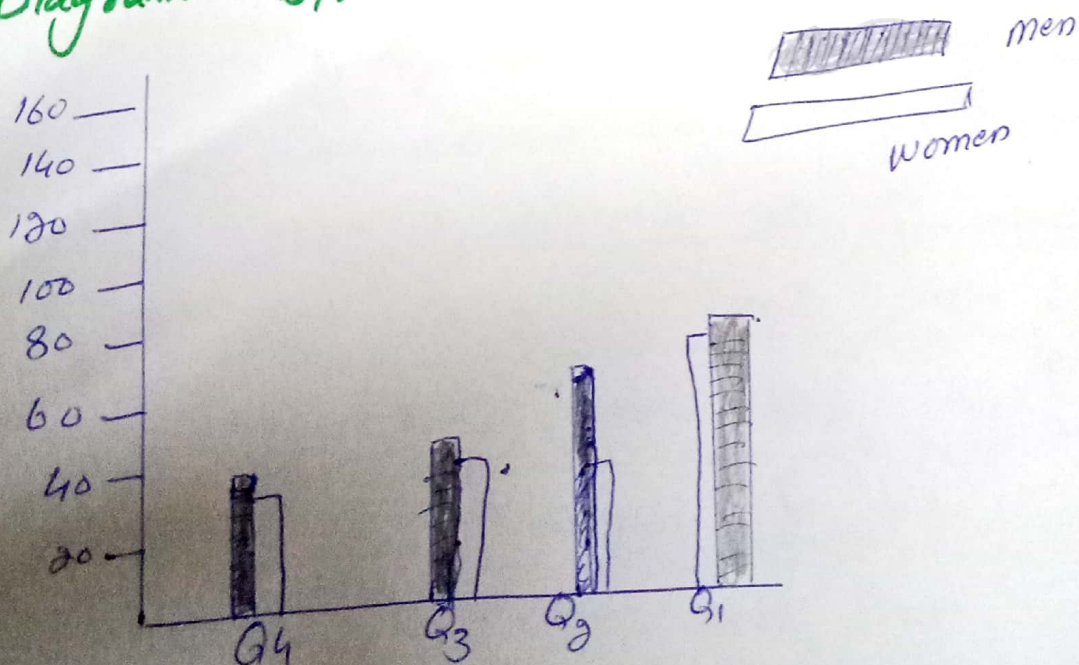
Q1 (B)

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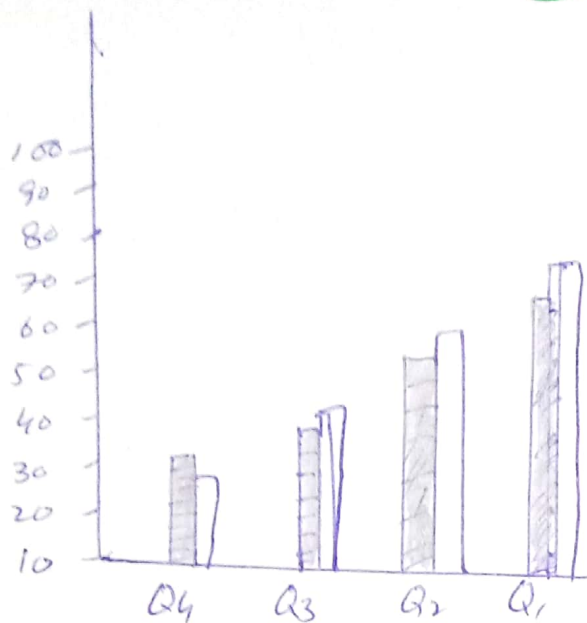
Milk, root, vegetables and wheat flour are very low for both men and women in G₄ and G₃ it increase high in G₂ and G₁. Such as that eat most vegetable consume much more milk, root vegetables and wheat flour than those who eat less fresh vegetable.

(C) value : \rightarrow of mean in rice decreasing from G₄ to G₁ but in fruit and fish mean value of rice from G₄ to G₁ in men and women.

Diagram b/w men and women for fish



For
Fruits



men
women

(E)

According to the information of the given table it shows that men need more food to maintain their energy level.

(F)

Standard deviation $S = \frac{\sigma}{\sqrt{n}}$

According to the mentioned formula the value of the standard deviation of mean is more than in fresh vegetables,

Fruits, flour, total grain and meat the value of standard deviation is same for both men and women for remaining categories.

Q. A: Describe the purpose of census? (3)

Ans: A census is the process of collecting and recording information about the number given population.

• Purpose of census to count the entire — population objects in given observation.

→ The census tell us where are going as a nation. It help the govt decide how to distribute funds and assistance.

(B) Explaining how it different from a sample survey and Difference b/w censuses and sample survey

⇒ Sample Survey ⇒

Census and Sampling Survey are two methods of collecting data about the population

→ Survey Sampling describe the process of selecting a sample of element from a target population to conduct a survey.

→ A Sample Survey refers to a group of or section of a group of a population from which information is to be obtained the process of sampling is to reduce the cost or the amount of work that it would take to survey the entire target population.

* Census :->

(09)

② A Survey that measure the entire target population is called a census.

→ The census tell us that who are and where we are going as a nation
It helps the government to distribute funds and assistance.

③ Ans :->

From the given information 2011 UK census attracted a response rate of about 94% which is good but it can rise any kind of error until situation of complete it can be cause of an error or any be rise-error or more.

④ Ans :- In The census about asking a specific group/region may cause of bad behavior or any misunderstanding. It possible that someone not like to answer of these-kind of question.

(E) Ans: There is a lot of potential problem in conducting the 2011 UK census online the first and main issue is that the availability of online connection and internet to every person of country is almost impossible. (10)

The second thing is that there is also increase the problem in personal behavior of person they may give the response or not according to their own taste or behavior.

The only way to overcome this problem is giving the connection to the whole country and make sure and punctual to every person to give the response.

(F) Ans: -

(11)

According to Government agencies census
it self mean study of every object under
the observation and it is quit complicated
to government agencies to go to every single
person and collect the total information because
There are a lot of thing that have been
done by these agencies not only to
complete the census.

Q3

Ans: \Rightarrow

Given Information \Rightarrow

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Rain fall	Number	Class boundary	x	fx	logx	flogx	f/x	C.F	x - \bar{x}	(x - \bar{x}) ²	fx - \bar{x} f	fx ²
20 - 24	1	19.5 - 24.5	20	20	1.34	1.34	0.0454	1	-14.8	14.8	14.8	484
25 - 29	3	24.5 - 29.5	27	81	1.43	4.29	0.111	4	-9.8	9.8	29.4	2187
30 - 34	5	29.5 - 34.5	32	160	1.50	7.52	0.1562	9	→ -4.8	4.8	24.0	5120
35 - 39	8	34.5 - 39.5	37	296	1.568	12.54	0.2162	17	0.2	0.2	1.6	10.952
40 - 44	5	39.5 - 44.5	42	210	1.623	8.11	0.1190	22	5.2	5.2	26	8820
45 - 49	2	44.5 - 49.5	47	94	1.672	3.34	0.425	24	10.2	10.2	20.4	4418
50 - 54	0	49.5 - 54.5	52	0	1.716	0	0	24	15.2	15.2	0	0
55 - 50	1	54.5 - 59.5	57	57	1.755	1.75	0.0175	25	20.2	20.2	20.2	3249
Total Sum	25			920		38.89		0		136.4		35,230

① Find Arithmetic mean \bar{x}

$$A.M = \bar{x} = \frac{\sum fx}{\sum f} = \frac{920}{25} = 36.80$$

A.M 36.80

Ans

② Find Geometric mean \Rightarrow

$$G.M = \text{Antilog } \frac{\sum f \log x}{\sum f}$$

$$G.M = \text{Antilog } \frac{38.89}{25}$$

$$G.M = \text{Antilog } (1.55)$$

$$G.M = 36.06 \text{ Ans}$$

③ Find Harmonic mean:-

$$H.M = \frac{\sum f}{\sum (f/x)} = \frac{25}{1.0903}$$

$$H.M = 22.9294 \Rightarrow \text{Ans.}$$

④ median \Rightarrow

$$m = l + \left(\frac{\frac{n}{2} - Cf}{f} \right) \times h$$

$$\frac{n}{2} = 12.5, h = 5, Cf = 22, f = 25, l = 34.5$$

$$\text{median} = 34.5 + \left(\frac{12.5 - 22}{25} \right) \times 5$$

$$\text{median} = 34.5 + 2$$

$$\text{median} = 36.5 \Rightarrow \text{Ans.}$$

⑤ Find mode \Rightarrow

$$\text{Formula for mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

There maximum frequency is f_1

$$f_1 = 8, f_0 = 5, f_2 = 5, h = 5$$

$$l = 34.5 - 39.5$$

$$\text{mode } l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

$$= 34.5 + \left(\frac{8 - 5}{2(8) - 5 - 5} \right) \times 5$$

$$= 34.5 + \left(\frac{3}{6} \right) \times 5$$

$$= 34.5 + 2.5 = 37$$

$$\text{mode} = 37 \Rightarrow \text{Ans.}$$

⑥ Find the Range for given data:-

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$$\begin{aligned} \text{Range} &= X_{\text{maximum}} - X_{\text{minimum}} \\ &= 57 - 22 = 35 \end{aligned}$$

$$\boxed{\text{Range} = 35} \Rightarrow \text{Ans}$$

⑦ Finding the quartile 1st and 3rd for data,

The formula for Quartile size is " $\frac{n}{4}$ "
here for grouped data.

$$Q_1 = d_1 + \frac{h}{f} \left(\frac{n}{4} - C \right) \quad Q_1 = \frac{25}{4} = \boxed{6.25^{\text{th}} \text{ observation}}$$

$$d = 29.5 \quad h = 5, \quad f = 5, \quad C = 4$$

from the table we have find out

$$Q_1 = 29.5 + \frac{5}{5} (6.25 - 4)$$

$$= 29.5 + 1 (2.25) = 31.75$$

$$\boxed{Q_1 = 31.75} \text{ Ans}$$

$$Q_3 = d_1 + \frac{h}{f} \left(\frac{3n}{4} - C \right) \quad Q_3 = \frac{3(25)}{4} = \boxed{18.75}$$

$$= 39.5 + \frac{5}{5} (18.75 - 17)$$

$$= 39.5 + 1.75 = 41.25$$

$$\boxed{Q_3 = 41.25} \Rightarrow \text{Ans}$$

Interpretation: Q_1 means that 25% of the rain fall have below 31.75 and 75% have above 31.75

Q_3 show that 75% of rain fall have above 41.25 and 25% have below 41.25.

⑧ Finding Deciles for the given data \Rightarrow

D_2, D_5, D_8

Formula for Decile is $\frac{n}{10}$

$$\text{For } D_2 = \frac{2n}{10} = \frac{2(25)}{10} = \frac{50}{10} = 5^{\text{th}} \text{ observation}$$

For grouped data the observation 5th is in Formula

$$D_2 = l + \frac{h}{f} \left(\frac{2n}{10} - c \right)$$

$l = 29.5, h = 5, f = 5, c = 4$ From table

$$D_2 = 29.5 + \frac{5}{5} (5 - 4)$$

$$= 29.5 + 1 = 30.5$$

$$\boxed{D_2 = 30.5} \text{ Ans}$$

$$\text{Now } D_5 = l + \frac{h}{f} \left(\frac{5n}{10} - c \right) \quad D_5 = \frac{5(25)}{10} = \frac{125}{10} = 12.5$$

From the table

$$l = 34.5 + \frac{5}{8} (12.5 - 9)$$

$$= 34.5 + 0.625 (3.5)$$

$$= 34.5 + 2.1875 = 36.687$$

$$\boxed{D_5 = 36.687}$$

Ans.

$$\text{Now } D_8 = L + \frac{h}{7} \left(\frac{8n}{10} - C \right)$$

$$\text{So size of } D_8 = \frac{8(25)}{10} = \frac{200}{10} = 20^{\text{th}} \text{ observation}$$

From the data of table:

$$L = 39.5, h = 5, 7 = 5, C = 17$$

$$D_8 = 39.5 + \frac{5}{5} (20 - 17)$$

$$= 39.5 + 1 (3)$$

$$\boxed{D_8 = 42.5} \text{ Ans}$$

Interpretation: $\Rightarrow D_8$ means that 20% of the rainfall have below 30.5 and 80% of rainfall have above 30.5

$\Rightarrow D_5$ means 50% of the rainfall have above 36.68 and 50% have below 36.68.

$\Rightarrow D_8$ show the 80% of rainfall have below 42.5 and 20% of the rainfall have above 42.5.

(9) Finding Percentiles For given data:-

Formula for Percentile $\frac{P_n}{100}$

here for grouped data we have to find

P_{25} , P_{50} , P_{75}

$$\text{Formula } P_{25} = L + \frac{h}{7} \left(\frac{25(25)}{100} - C \right)$$

$$\text{Size of observation } \frac{25(25)}{100} = \frac{625}{100} = \boxed{6.25 \text{ th observation}}$$

From the table we have find out

$$L = 29.5, h = 5, f_{25} = 4$$

So

$$\begin{aligned} P_{25} &= L + \frac{h}{7} (6.25 - 4) \\ &= 29.5 + \frac{5}{7} (6.25 - 4) \\ &= 29.5 + 1 (2.25) \\ &= 29.5 + 2.25 = 31.75 \end{aligned}$$

$$\boxed{P_{25} = 31.75} \text{ Ans}$$

$$\text{Now } P_{50} = \frac{50(25)}{100} = \frac{1250}{100} = \boxed{12.5 \text{ th observation}}$$

$$\text{here } P_{50} = L + \frac{h}{7} (12.5 - C)$$

From table 1st

$$L = 34.5, h = 5, f_{50} = 8, C = 9$$

$$\begin{aligned} P_{50} &= 34.5 + \frac{5}{8} (12.5 - 9) \\ &= 34.5 + \frac{5}{8} (3.5) \end{aligned}$$

$$= 34.5 + 0.625(3.5)$$
$$= 34.5 + 2.1875 = 36.687$$

(18)

$$\boxed{P_{50} = 36.687} \quad \text{Ans}$$

Now $P_{75} = \frac{75(0.5)}{100} = \frac{18.75}{100} = \boxed{18.75}^{\text{th}}$ observation

and here from the table we have find

$$P_{75} = L + \frac{h}{f} (18.75 - C)$$

$$P_{75} = 39.5 + \frac{5}{5} (18.75 - 17)$$

$$= 39.5 + 1 (1.75)$$

$$= 39.5 + 1.75 = 41.25$$

$$\boxed{P_{75} = 41.25}$$

Percentile have the same interpretation
like Quartile.

10 Finding mean deviation for given data:

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Formula for mean Deviation is

$$M.D = \frac{\sum f|x - \bar{x}|}{\sum f}$$

$$M.D = \frac{136.4}{25} = 5.456$$

$$\boxed{M.D = 5.456} \text{ Ans}$$

11 Variance for the given data.

Formula for variance is $S^2 = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$

$$\text{Variance} = S^2 = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$$

From the table we calculate

$$\begin{aligned} S^2 &= \frac{35030}{25} - \left(\frac{900}{25}\right)^2 \\ &= 1409.2 - (36.8)^2 \\ &= 1409.2 - 1354.24 \end{aligned}$$

$$\boxed{\text{Variance} = S^2 = 54.96} \text{ Ans.}$$

12 Standard deviation for given data:

Formula is $S.D = \sqrt{\frac{\sum fx^2}{\sum f} - \frac{(\sum fx)^2}{\sum f}}$

$$S.D = S = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

$$= \sqrt{1409.2 - 1354.24}$$

$$S = \sqrt{54.96} = 7.413$$

The dispersion from $\boxed{S.D = 7.413}$ \Rightarrow Ans
mean is 7.413 is value.

13) Quartile deviation:

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{41.05 - 31.75}{2}$$
$$= \frac{9.5}{2} = 4.75$$

$Q.D = 4.75 \Rightarrow$ Ans

14) Co-efficient of variation \Rightarrow

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

$$C.V = \frac{7.143}{36.80} \times 100$$

$C.V = 20.144 \Rightarrow$ Ans

Q No 3 (part B)

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B) Converting given information into ungrouped data:

Given information :-						
x	No	log x	1/x	x - \bar{x}	x - \bar{x}	x ²
22	1	1.34	0.045	-17.5	17.5	484
27	2	1.43	0.037	-12.5	12.5	729
32	3	1.50	0.031	-7.5	7.5	1024
37	4	1.568	0.027	-2.5	2.5	1369
42	5	1.623	0.023	2.5	2.5	1764
47	6	1.672	0.021	7.5	7.5	2209
52	7	1.716	0.019	12.5	12.5	2704
57	8	1.755	0.017	17.5	17.5	3249
316 total		12.604	0.2205		80	13532 13532

$$\textcircled{1} A.M = \frac{\sum x}{n} = \frac{22+27+32+37+42+47+52+57}{8}$$

$$= \frac{316}{8} = \boxed{39.5} \rightarrow \text{Ans}$$

$$\textcircled{2} G.M = \text{Anti log} \left(\frac{\sum \log x}{n} \right)$$

$$= \text{Anti log} \frac{12.604}{8}$$

$$= \text{Anti log} (1.5755) = \boxed{0.454} \rightarrow \text{Ans}$$

$$\textcircled{3} H.M \Rightarrow$$

$$H.M = \frac{\sum \frac{1}{x}}{n}$$

$$H.M = \frac{n}{\sum \frac{1}{x}} = \frac{8}{0.2205} = \boxed{36.2811} \rightarrow \text{Ans}$$

(22)

$$(4) \text{ Median} = \frac{n+1}{2} = \frac{9}{2} = 4.5^{\text{th}} \text{ observation}$$

$$\text{Median} = \frac{4^{\text{th}} + 5^{\text{th}}}{2}$$

$$\text{Median} = \frac{37 + 49}{2} = \boxed{39.5} \rightarrow \text{Ans}$$

(5) Quartile

Formula for Quartile

$$Q_1 = \frac{\sqrt{n}}{4} = \frac{1(8)}{4} = 2^{\text{th}} \text{ observation}$$

$$\boxed{Q_1 = 27} \rightarrow \text{Ans}$$

$$Q_3 = \frac{3n}{4} = \frac{3(8)}{4} \\ = \frac{24}{4} = 6^{\text{th}} \text{ observation}$$

$$\boxed{Q_3 = 47} \rightarrow \text{Ans}$$

(6) Decile: Formula for Decile

$$D = \frac{Dn}{10}$$

$$D_2 = \frac{2(8)}{10} = \frac{16}{10} = 1.6 = 2^{\text{th}} \text{ observation}$$

$$\boxed{D_2 = 27} \rightarrow \text{Ans}$$

$$D_5 = \frac{5(8)}{10} = \frac{40}{10} = 4^{\text{th}} \text{ observation}$$

$$\boxed{D_5 = 37} \rightarrow \text{Ans}$$

$$D_8 = \frac{8(8)}{10} = 6.4 = 7^{\text{th}} \text{ observation}$$

$$\boxed{D_8 = 59} \rightarrow \text{Ans}$$

7) Percentile

(23)

Formula for Percentile

$$P = \frac{Pn}{100}$$

So

$$P_{25} = \frac{25(8)}{100} = \frac{200}{100} = 2^{\text{th}} \text{ observation}$$

Ans \leftarrow $P_{25} = 27 \Rightarrow$ Ans

$$P_{40} = \frac{40(8)}{100} = \frac{320}{100} = 3.2^{\text{th}} \text{ observation}$$

Ans \leftarrow $P_{40} = 37 \Rightarrow$ Ans

$$P_{50} = \frac{50(8)}{100} = \frac{400}{100} = 4^{\text{th}} \text{ observation}$$

$P_{50} = 37 \Rightarrow$ Ans

$$P_{75} = \frac{75(8)}{100} = \frac{600}{100} = 6^{\text{th}} \text{ observation}$$

$P_{75} = 47 \Rightarrow$ Ans

8) Range

$$= x_{\text{maximum}} - x_{\text{minimum}}$$

$57 - 22 =$
 $R = 35 \Rightarrow$ Ans

9) Mean deviation:

Formula for mean deviation

$$M.D = \frac{\sum(x - \bar{x})}{n} = \frac{80}{8} = 10$$

M.D = 10 ⇒ Ans

10) Standard deviation:

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

$$S = \sqrt{\frac{13530}{8} - \left(\frac{316}{8}\right)^2}$$

$$S = \sqrt{1691.5 - (39.5)^2}$$

$$S = 1691.5 - 1560.25$$

$$S = \sqrt{131.25} = 11.45 \Rightarrow Ans$$

11) Variance =

$$\frac{\sum(x - \bar{x})^2}{n} = \sum x^2 - \left(\frac{\sum x}{n}\right)^2$$

$$S^2 = \frac{13530}{8} - \left(\frac{316}{8}\right)^2$$

$$S^2 = 1691.5 - (39.5)^2$$

S² = 131.25 ⇒ Ans

12) Quartile deviation:

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{47 - 27}{2} = \frac{20}{2}$$

Q.D = 10 ⇒ Ans

13) Co-efficient of variation.

$$C.V = \frac{S}{\bar{x}} \times 100 = \frac{11}{39.5} \times 100 = 27.84 \Rightarrow Ans$$