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Program # B.S Radiology

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Semester # 6th

Subject # Statistics

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Q No # 1: (a)

→ For men

overall mean consumption of fresh vegetables:-

$$\text{Mean} = \frac{204 + 259 + 266 + 217}{4}$$

$$= 236.5$$

Mean of fruits:-

$$\text{Mean} = \frac{31 + 45 + 69 + 105}{4} = 62.5$$

Mean of Fish:-

$$\bar{x} = \frac{23 + 28 + 31 + 44}{4} = 31.5$$

Mean of Rice:-

$$\bar{x} = (367 + 337 + 269 + 246) / 4 = 304.75$$

(P.T.O)

Page (2)
Mean of Meat:-

Page # 2

$$\bar{x} = \frac{70+61+69+77}{4} = 69.25$$

∴ → For women:-

Mean of fresh vegetables:-

$$\bar{x} = \frac{178+235+266+304}{4} = 245.75$$

Mean of fruits:-

$$\bar{x} = \frac{28+46+70+121}{4} = 66.25$$

Mean of Rice:-

$$\bar{x} = \frac{315+276+243+220}{4} = 263.5$$

Mean of Meat:-

$$\bar{x} = \frac{48+43+54+63}{4} = 52$$

Mean of fish:-

$$\bar{x} = \frac{19+21+28+46}{4} = 28.5$$

i. combined mean of fresh vegetables:- Page (3)

$$\bar{X}_{combined} = \frac{\bar{X}_{n_1} + \bar{X}_{n_2} + \dots + \bar{X}_{n_i}}{n_1 + n_2 + \dots + n_i}$$

$$= \frac{[(236.5)(204) + (236.5)(259) + (236.5)(266) + (236.5)(217)]}{204 + 259 + 266 + 217}$$

$$\bar{X}_{comb} = 236.5$$

Combined of Rice:-

$$\bar{X}_{comb} = \frac{(367)(304.75) + (337)(304.75) + (269)(304.75) + (246)(304.75)}{367 + 337 + 269 + 246}$$

$$\bar{X}_{comb} = 304.75$$

combined of fish:-

$$\bar{X}_c = \frac{(23)(31.5) + (31.5)(28) + (31)(31.5) + (31.5)(44)}{23 + 28 + 31 + 44}$$

$$\bar{X}_c = 31.5$$

Combined of Meat:-

$$\bar{X}_c = \frac{(69.25)(70) + (69.25)(61) + (69.25)(69) + (69.25)(70)}{70 + 61 + 69 + 70}$$

$$\bar{X}_c = 69.25$$

(P.T.O)

is Combined Mean of women:-

combined^{mean} of fresh vegetables:-

$$\bar{x}_c = \frac{[(245.75)(178) + (245.75)(235) + (245.75)(266) + (245.75)(304)]}{178 + 235 + 266 + 304}$$

$$\bar{x}_c = 245.75$$

Combined Mean of Meat:-

$$\bar{x}_c = \frac{(52)(48) + (52)(43) + (52)(54) + (52)(63)}{48 + 43 + 54 + 63}$$

$$\bar{x}_c = 52$$

Combined Mean of fish:-

$$\bar{x}_c = \frac{(28.5)(19) + (28.5)(21) + (28.5)(28) + (28.5)(46)}{19 + 21 + 28 + 46}$$

$$\bar{x}_c = 28.5$$

Combined of Rice:-

$$\bar{x}_c = \frac{[(263.5)(315) + (263.5)(276) + (263.5)(243) + (263.5)(220)]}{315 + 243 + 276 + 220}$$

$$\bar{x}_c = 263.5$$

(P.T.)

Q No 1- (C)

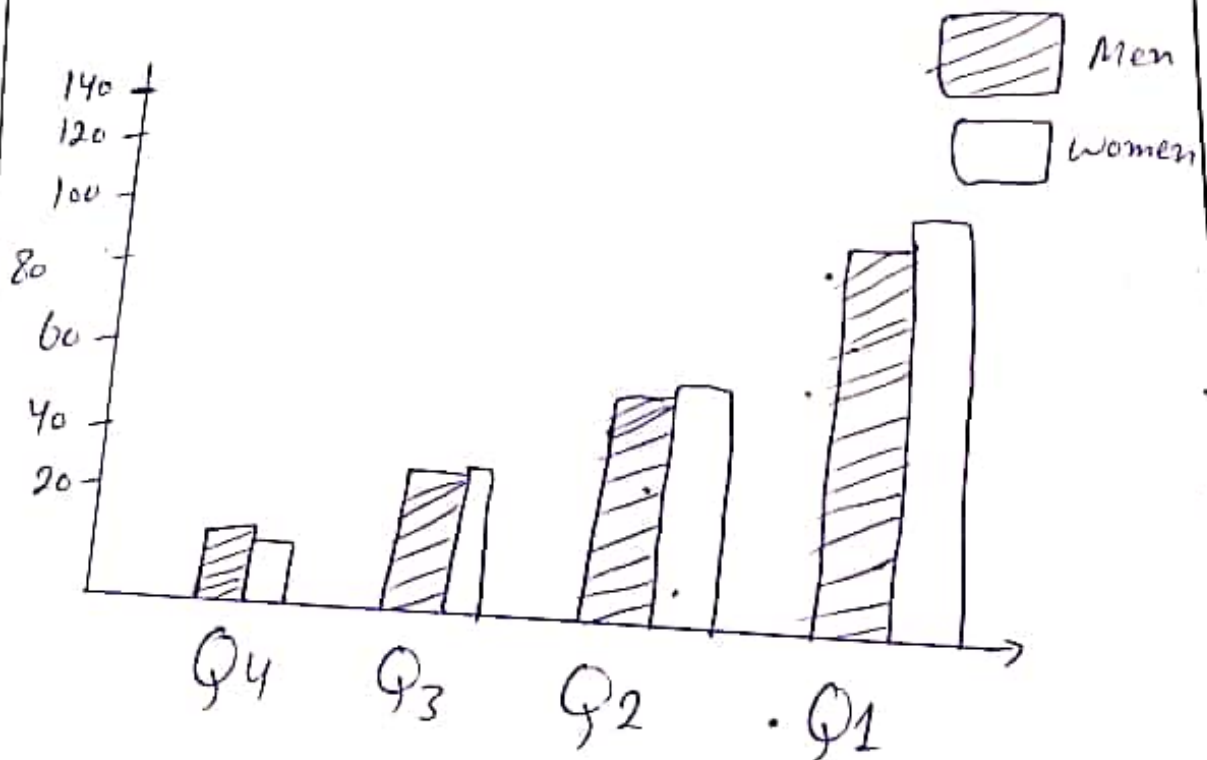
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→ In fruit and fish the value of mean increasing from Q_4 to Q_1 in men and women. But in Rice the value of mean decreasing from Q_4 to Q_1 .

Q No 1 (d):-

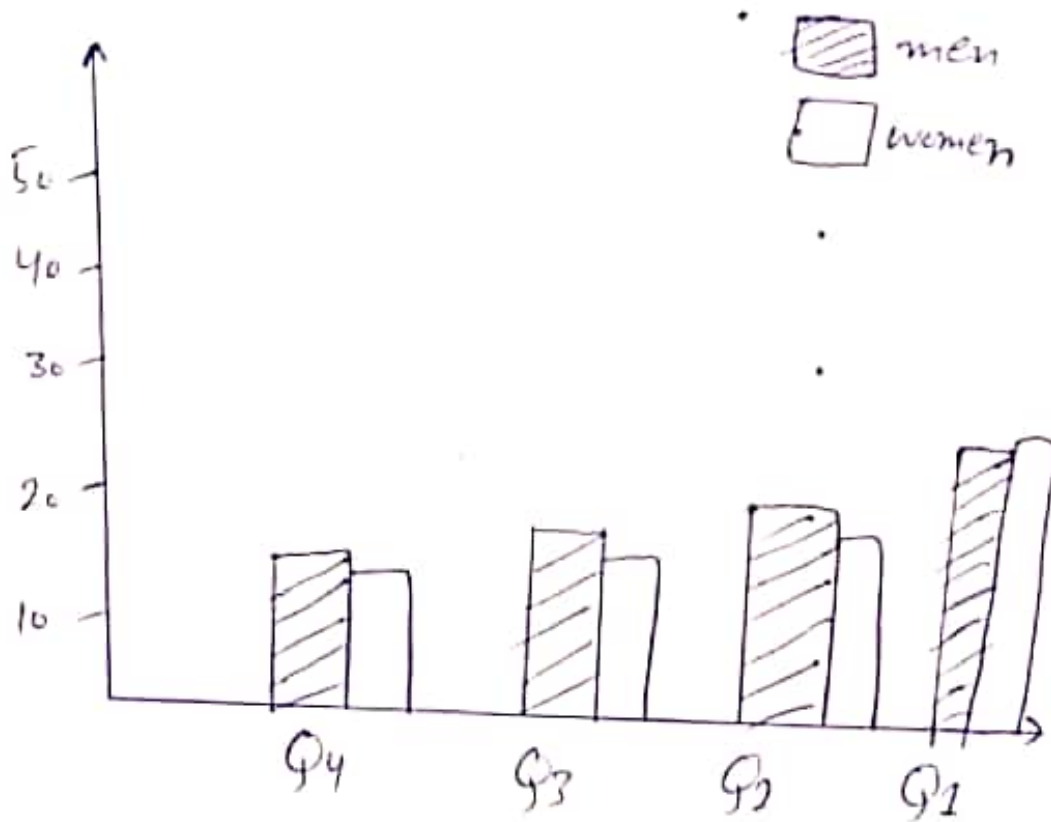
Draw a Suitable diagram:-

For Fruits:-



CP.T.O)

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For fish :-Q No 2(f) :-

→ Standard deviation = $f \cdot E \times \sqrt{n}$

By using above formula the value of Standard deviation of men is more than women in Fresh vegetable, Fruit, wheat flour, whole grain and meat.

And the value of Standard deviation is same for both men and women in remaining categories.

Q No 1(c):-

- By using the information of given table it is true that men needs more food. to maintain its energy level.



→ Q No 2(a):-

Purpose of census:-

- census is a survey conducted the whole set of observation objects which is belonging to population.

The Purpose of census to Count the entire Population or every object in given observation. In census ask every type of question to get the complete data.

→ (b) differs from Sample Survey:-

- In Sample Survey we go through some selected parts from the population. our concern about information is totally based upon the selected data. The some (P.T.O)

Proceduse done by Government a gencies, they get the data by picking some selected part of Population. But in census it is compulsory to go through from every object of Population that is why census is differs from Sample Survey.

* (C) :-

→ From the given information 2011 UK census attacted a response rate of 94%, which is good. But it can rise any kind of error until it should complete to 100%. In the Situation of incomplete it can be cause of an error or may increase error further.

* (D) :-

→ In the census about asking a specific religion or group may cause of harsh behaviour or any mishappen. It is possible that someone do not like to answer of these kind of question.

→ (e):-

→ There is a lot of potential problem in conducting the 2021 UK census online, the first and main issue is that the availability of online connection and internet to every person of the country is almost impossible.

The second thing that also can increase the problem is the personal behaviour of persons, they may give the response or not according to their own taste or behaviour.

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

→ (f):-

→ Census, itself means the study of every object under the observation. And in real it is such a difficult task to perform. Also it is quite difficult to Government agencies to go to every single person and collect the whole information because there are a lot of things that have been done by these agencies not only to complete the census.

(P.T.)

Q No #3(a) :-

classes	No of years
20-24	1
25-29	3
30-34	5
35-39	8
40-44	5
45-49	2
50-54	0
55-59	1

→ A.M :-

$$\bar{x} = \frac{\sum fx}{\sum f}$$

classes	f	x	fx
20-24	1	22	22
25-29	3	27	81
30-34	5	32	160
35-39	8	37	296
40-44	5	42	210
45-49	2	47	94
50-54	0	52	0
55-59	1	57	57
	25		920

(P.T.O)

$$\bar{x} = \frac{920}{25} = 36.8$$

→ Cr.M :-

$$\text{Cr.M} = \text{Antilog} \left[\frac{1}{\Sigma f} \Sigma f \log x \right]$$

Classes	f	x	f log x
20-24	1	22	1.342
25-29	3	27	4.294
25-29	5	32	7.526
30-34	8	37	12.546
35-39	5	42	8.116
40-44	2	47	3.344
45-49	0	52	0
50-54	1	57	1.756
55-59			
	25		38.924

$$\text{Cr.M} = \text{Antilog} \left[\frac{1}{25} (38.924) \right]$$

$$\text{Cr.M} = 36.05$$

→ H.M :-

Classes	f	x	f/x
20-24	1	22	0.455
25-29	3	27	0.111
30-34	5	32	0.156
35-39	8	37	0.216
40-44	5	42	0.119
45-49	2	47	0.042
50-54	0	52	0
55-59	1	57	0.175
	25		1.116

(P. 10)

$$H.M = \frac{\sum f}{\sum f/n} = \frac{25}{1.116} = 22.401$$

→ Median :-

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

Classes	f	Class boundary	C.F
20-24	1	19.5-24.5	1
25-29	3	24.5-28.5	4
30-34	5	29.5-34.5	9 → Median class for Q1.
35-39	8	34.5-39.5	17 → Median class.
40-44	5	39.5-44.5	22 → Median class for Q3.
45-49	2	44.5-49.5	24
50-54	0	49.5-54.5	24
55-59	1	54.5-59.5	25

$$\frac{n}{2} = \frac{\sum f}{2} = \frac{25}{2} = 12.5$$

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

$$\bar{x} = 36.687$$

→ Quartiles :-

1st Quartile :- Q1

$$Q_1 = l + \frac{h}{f} \left(\frac{n}{4} - c \right)$$

(P.T.O)

$$\frac{n}{4} = \frac{\Sigma f}{4} = \frac{25}{4} = 6.25$$

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

$$Q_1 = 31.75$$

∴ 2nd Quartile:-

$$Q_2 = \bar{X} = 37.687$$

∴ 3rd Quartile:-

$$Q_3 = l + \frac{h}{f} \left(\frac{3n}{4} - c \right)$$

$$\frac{3n}{4} = 18.75$$

$$Q_3 = 39.5 + \frac{5}{5} (18.75 - 17)$$

$$Q_3 = 41.25$$

→ Deciles:-

One usual formula

$$D_m = l + \frac{h}{f} \left(\frac{mn}{10} - c \right)$$

$$D_8 = l + \frac{h}{f} \left(\frac{8n}{10} - c \right)$$

$$\frac{8n}{10} = \frac{8(25)}{10} = \frac{200}{10} = 20$$

By using the median table

(p. 70)

$$D_8 = 39.5 + \frac{5}{8} (20 - 17)$$

$$D_8 = 42.5$$

→ Percentile :-

General formula :-

$$P_m = l + \frac{h}{f} \left(\frac{m \cdot n}{100} - c \right)$$

Say

$$P_{45} = l + \frac{h}{f} \left(\frac{45n}{100} - c \right)$$

$$\frac{45n}{100} = \frac{45(25)}{100} = 11.25$$

By using median table.

$$P_{45} = 34.5 + \frac{5}{8} (11.25 - 9)$$

$$P_{45} = 35.906$$

→ Mode :-

$$\tilde{x} = L + \frac{f_m - f_1}{f_m - f_1}$$

Classes	f	Class boundaries
20-24	1	19.5-24.5
25-29	3	24.5-29.5
30-34	5	29.5-34.5
35-39	8	34.5-39.5 \rightarrow Modal class
40-44	5	39.5-44.5
45-49	2	44.5-49.5
50-54	0	49.5-54.5
55-59	1	54.5-59.5
	25	

$$\hat{x} = 38.5 + \frac{8-5}{(8-5) + (8-5)} \times 5$$

$$\hat{x} = 37$$

\rightarrow Range:-

$$\text{Range} = (\text{Height class boundary}) - (\text{lowest class boundary})$$

$$= 59.5 - 19.5$$

$$\text{Range} = 40$$

CP 10

Quartile Deviation :-

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{41.25 - 31.75}{2} = 4.75$$

Mean deviation :-

classes	f	X	$ x - \bar{x} f$
20-24	1	22	14.8
25-29	3	27	29.4
30-34	5	32	24
35-39	8	37	1.6
40-44	5	42	26
45-49	2	47	20.4
50-54	0	52	0
55-59	1	57	20.2
			171.4

Classes	f	X	fx^2
20-24	1	22	484
25-29	3	27	2187
30-34	5	32	5120
35-39	8	37	10952
40-44	5	42	8820
45-49	2	47	4418
50-54	0	52	0
55-59	1	57	3249
			35230

$$S^2 = \frac{35230}{25} - (36-8)^2$$

$$= 1409.2 - 1354.24$$

$$S^2 = 54.96$$

∴ Standard deviation :-

* Skewness:-

$$S_k = \frac{\text{Mean} - \text{Mode}}{\text{Standard deviation}}$$

$$S_k = \frac{36.8 - 37}{7.413}$$

$$S_k = -0.02698$$

* ungroup data:-

A.M

$$x = 1, 3, 5, 8, 5, 2, 0, 1$$

$$\bar{x} = \frac{1+3+5+8+5+2+0+1}{8}$$

$$= \frac{25}{8} = 3.125$$

* Cr.M and H.M:-

$$\text{Cr.M} = \text{Antilog}\left(\frac{1}{n} \sum \log x\right)$$

(P.T.O)

X	log n
1	0
3	
5	
8	
5	
2	
0	
1	
2.5	

$$X = 1, 3, 5, 8, 5, 2, 0, 1$$

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

$$\frac{\sum n}{H}$$

The geometric mean and harmonic mean is not possible because there is zero in the data.

Q. Median :-

$$\tilde{X} = \left(\frac{n+1}{2} \right)^{th} \text{ observation}$$

$$= \left(\frac{8+1}{2} \right)^{th} = 4.5^{th} \text{ observation}$$

$$\tilde{X} = 4^{th} \text{ observation} + 0.5 (5^{th} \text{ observation} - 4^{th} \text{ observation})$$

→ Arrange the data

0, 1, 1, 2, 3, 5, 5, 8

$$\tilde{X} = 2 + 0.5(3-2)$$

$$\tilde{X} = 2 + 0.5 = \boxed{2.5 = \tilde{X}}$$

(P.T.O)

→ Quartiles:-

(20)

 Q_1 1st Quartile.

$$Q_1 = \left(\frac{n+1}{4} \right)^{\text{th}} \text{ observation}$$

$$= \left(\frac{8+1}{4} \right)^{\text{th}} = 2.25$$

$$Q_1 = 2^{\text{nd}} \text{ observation} + 0.25 (3^{\text{rd}} \text{ obs} - 2^{\text{nd}} \text{ observation})$$

$$= 1 + 0.25 (1 - 1)$$

$$\boxed{Q_1 = 1}$$

 Q_3 3rd quartile.

$$Q_3 = \left[3 \left(\frac{n+1}{4} \right) \right]^{\text{th}} \text{ observation}$$

$$= 3 \left(\frac{9}{4} \right)^{\text{th}} \text{ observation}$$

$$= 6.75^{\text{th}} \text{ observation}$$

$$Q_3 = 6^{\text{th}} \text{ obs} + 0.75 (7^{\text{th}} \text{ obs} - 6^{\text{th}} \text{ obs})$$

$$= 5 + 0.75 (5 - 5)$$

$$\boxed{Q_3 = 5}$$

→ Decile:-General formula

$$D_m = m \left(\frac{n+1}{10} \right)^{\text{th}} \text{ observation}$$

C.P. + v)

$$D_4 = 4 \left(\frac{n+1}{10} \right)^{\text{th}} \text{observation}$$

$$= 4 \left(\frac{8+1}{10} \right)^{\text{th}} \text{observation}$$

$$= 3.6^{\text{th}} \text{observation}$$

$$D_4 = 3^{\text{rd}} \text{obs} + 0.6 (4^{\text{th}} \text{obs} - 3^{\text{rd}})$$

$$= 1 + 0.6 [2 - 1]$$

$$\boxed{D_4 = 1.6}$$

→ Percentile :-

General formula

$$P_m = m \left(\frac{n+1}{100} \right)^{\text{th}} \text{observation}$$

$$P_{72} = 72 \left(\frac{8+1}{100} \right)^{\text{th}} \text{observation}$$

$$= 6.48^{\text{th}} \text{observation}$$

$$P_{72} = 6^{\text{th}} \text{obs} + 0.48 (7^{\text{th}} \text{obs} - 6^{\text{th}} \text{obs})$$

$$= 5 + 0.48 (5 - 5)$$

$$\boxed{P_{72} = 5}$$

→ Mode :- → Most repeated value of data

1, 3, 5, 8, 5, 2, 0, 1

$$\boxed{\hat{x} = 1, 5}$$

(p. 4.0)

* Range :-

$$\text{Range} = \text{max} - \text{min} \\ = 8 - 0 = 8$$

* Quartile deviation :-

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

$$Q.D = \frac{5 - 1}{2} = \frac{4}{2} = 2$$

→ Mean deviation :-

$$M.D = \frac{\sum |x - \bar{x}|}{n} = \bar{x} = 3.125$$

<u>X</u>	<u> x - \bar{x} </u>
1	2.125
3	0.125
5	1.875
8	4.875
5	1.875
2	1.125
0	3.125
1	2.125
	<hr/> 17.25

$$M.D = \frac{17.25}{8}$$

$$M.D = 2.156$$

(P.f.o)

Variance :-

(23)

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

<u>X</u>	<u>X²</u>
1	1
3	9
5	25
8	64
5	25
2	4
0	0
1	1
	<u>129</u>

$$S^2 = \frac{129}{8} - \left(\frac{25}{8} \right)^2$$

$$= 16.125 - 9.766$$

$$S^2 = 6.359$$

Standard deviation :-

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

$$S = \sqrt{\frac{129}{8} - \left(\frac{25}{8} \right)^2}$$

$$S = \sqrt{6.359} = 2.521$$

(P.T.O)

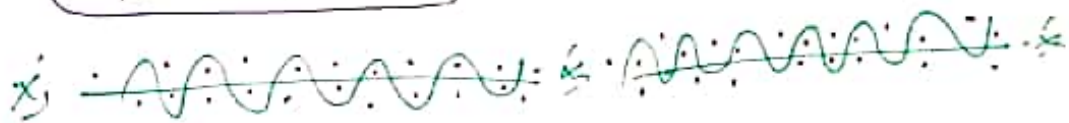
→ Skewness:-

(24)

$$S_k = 3 \left(\frac{\text{Mean} - \text{median}}{s} \right)$$

$$= \frac{3(3.125 - 2.5)}{2.521}$$

$$S_k = 0.745 \quad \text{Ans:-}$$



Q2(B):-

Ans:-

→ Milk, root vegetable and wheat Flour are very Low for Both Men and women in Q4 and Q3.

But it rises high in Q2 and Q1. So

Those who eat Most vegetable consume much more milk, root vegetable and wheat-Flour Than Those who eat less Fresh vegetable.

THE END