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PROGRAM BS DT

PAPER BIOSTATISTIC

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A.H.S (INU)

Q NO 1

Men (Sample size 1308)

	Q4 Mean	Q3 Mean	Q2 Mean	Q1 Mean	SE
Fresh veg.	204	259	266	317	0.9
Fruits	31	45	69	105	0.5
Rice	367	337	269	246	1.0
wheat flour	79	114	197	253	1.0
wheat grain	2	2	6	27	0.1
Root veg.	7	11	16	29	0.1
Meat	70	61	69	77	0.4
Fish	23	28	31	44	0.2
Milk	2	3	23	39	0.3

Women (Sample size 1540)

	Q4	Q3	Q2	Q1	SE
Fresh veg.	178	235	266	304	0.8
Fruits	28	46	70	121	0.4
Rice	315	276	243	320	0.8
wheat flour	56	118	141	180	0.8
wheat grain	1	3	6	22	0.1
Root veg.	6	12	17	28	0.1
Meat	48	43	54	63	0.3
Fish	19	21	28	46	0.2
Milk	1	4	15	48	0.3

Day: _____
 . ANSWER No 1

a Formula for over all mean.

For Men

$$\text{Mean} = \frac{\sum x_i}{n}$$

$$\text{Mean} = \frac{3748}{36} = 104.11$$

Overall mean for men = 104.11

Now Overall mean finding for Women

For overall Mean

$$\text{Mean} = \frac{\sum x_i}{n}$$

$$= \frac{3292}{36} = 91.16$$

Overall mean for women = 91.16

- Finding combined mean for men and women for fresh veg. Rice fish and meat

$$\text{Mean} = \frac{\sum x_i}{n} = \frac{5027}{32}$$

$$\text{Mean} = 157.09$$

Hence combined mean for
Men and Women is
157.09.

b Describe in words what the figures for milk, root vegetables, wheat, flour, consumption indicates.

- Consumption of milk for both men and women are low in Q₃ and Q₄. But it is sharply rise in Q₁ and Q₂.
- Fresh vegetables consumption in Q₃ and Q₄ is very low. But it is rise sharply in Q₁ and Q₂.
- Consumption of wheat flour for both men and women is very low in Q₃ and Q₄. But it is rise sharply in Q₁ and Q₂.

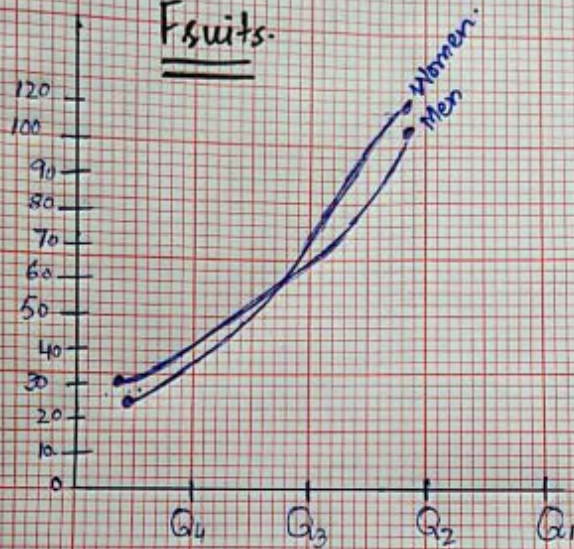
C What distinctive pattern is there for both men and women in rice, fruits and fish consumption across the four parts Q_4 to Q_1 .

- Consumption for rice fall for both men and women.
- Consumption of fruits rises for both men and women.
- Consumption of fish also fall for both men and women.

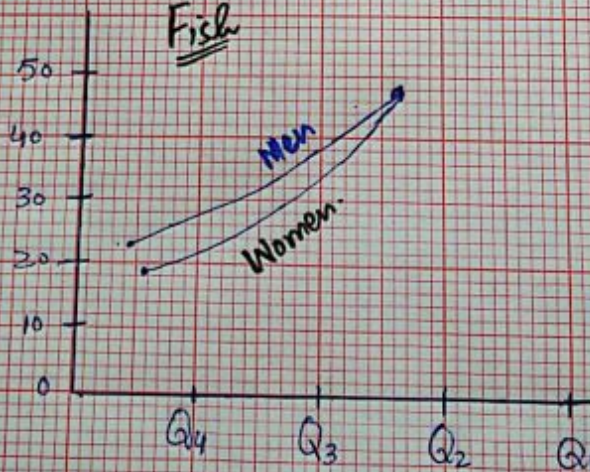
ANSWER ① PART (d)

Page ⑤

Fruits.



Fish



Men required on average about 20% more food per day than women to maintain energy level. Use the information to compare the consumption of the main food groups by men in Q4 and women Q1.

Group	Men(Q4)	Women(Q1)
Fresh Vega	204	304
Fruits	31	181
Rice	367	202
wheat Flour	79	180
Meat	70	63
Fish	23	48

- There are very large differences in pattern of consumption
- men eat more meat and rice and women eat more fresh vegetables, fruits wheat flour and fish

f. Explain in your own words what the standard deviation of the above commodities show for men and women and which one show better result.

- Standard deviation of whole grain and root vegetable for men and women is very less. Therefore root vegetables and grain whole result is best.

ANSWER NO 1. Completed.

Q. NO 2.

ANSWER.

A Describe the purpose of census?

The purpose of census is to know the exact figure of population living in the said country. In census a country will know the living standard of their population. Census report help for policy makers because future needs and budgets allocation totally depends on this.

b Explain how it differs from a sample survey and from routine collection of data by government agencies?

Ans In sample survey, only a part of population is selected and considered these results as approximation of population.

In census the whole data is under consideration.

In census we study each and every element in

the population. While in

sample survey and agencies

survey there is a limited

sample of data is collected.

c The 2011 UK Census attracted a response rate of about 94% of the population. Discuss whether or not this is a problem for the accuracy of the census.

⇒ Out of hundred %/100%

the 94% response rate shows that the online census have nearer to accuracy

d In the 2011 UK Census almost 170,000 people stated their religion as 'Jedi Knight'..... asking a question about religion?

Ans Since 'Jedi Knight' is not in any real sense a religion. This indicates that people do not always take the census seriously.

on the accuracy of other responses - they give...
It may also indicate a contempt for, or a distrust of, government and the collection of data by government agencies.

While this example indicates that not all responses can be taken seriously. There may still be value in asking the question. For example, the 2011 census quantified the decline in Christianity and the rise in Islam - these are likely to be real phenomena.

e
a. Discuss the potential problem in conducting the 2021 UK census online and explain how these problems might be overcome.

Acc
The potential problem in conducting the 2021 UK census online is accuracy time and engagement.

on online census there is limitation from the (census) masses. To overcome this

a oath should be taken

To overcome the time spending on the data collection there must be specified time given for completion.

f Discuss the potential problems in incorporating additional data held by government agencies.

Ans Whenever we add additional data in our sample size. It gives more accurate data and the data becomes reliable. But incorporating the additional data is not easy to tackle. For this, help of highly expert Statistician should be taken.

ANSWER NO 2 . Completed.

Q NO 3

- a. Find A.M, G.M, H.M, Mode, Quartiles, Percentiles, Range, M.D, Q.D, Variance, Standard Deviation, Coefficient of Variation, skewness for the following data.

Rainfall (inches)	Number 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

- b. Convert the above given data in form of ungrouped data and then find A.M, G.M, H.M, Median, Mode, Quartiles, Percentiles, Range, M.D, Q.D, Variance, Standard Deviation, Coefficient of variation, Skewness for the converted data.

Ans.

P.T.O.

Solution

Classes	(f)	x	fx	f log x	f ₂	C _f
20-24	1	22	22	1.34	0.015	1
25-29	3	27	81	4.29	0.11	4
30-34	5	32	160	7.52	0.15	9
35-39	8	37	296	12.54	0.21	17
40-44	5	42	210	8.11	0.19	22
45-49	2	47	94	3.34	0.042	24
50-54	0	52	0	0	0	24
55-59	1	57	57	1.75	0.017	25

$$\Sigma = 25 \quad \Sigma = 920 \quad \Sigma = 30.29 \quad \Sigma = 0.708$$

⇒ Formula for A.M

$$AM = \frac{\Sigma fx}{\Sigma f} = \frac{920}{25} = 36.8$$

$$AM = 36.8$$

⇒ Formula for GM

$$GM = \text{antilog} \left\{ \frac{\Sigma f \log x}{\Sigma f} \right\}$$

$$= \text{antilog} \left\{ \frac{30.29}{25} \right\}$$

$$= \text{antilog} (1.2116)$$

$$GM = 35.48$$

⇒ Formula for H.M. is: ...

$$H.M. = \frac{\sum f}{\sum \frac{1}{x}} = \frac{25}{0.708} = 35.31$$

$$H.M. = 35.31$$

Now for Median

Classes	f	C.B	Cf
20-24	1	19.5 - 24.5	1
25-29	3	24.5 - 29.5	4
30-34	5	29.5 - 34.5	9
35-39	8	34.5 - 39.5	17
40-44	5	39.5 - 44.5	22
45-49	2	44.5 - 49.5	24
50-54	0	49.5 - 54.5	24
55-59	1	49.5 - 59.5	25

⇒ Formula for median:

$$\text{Median} = l_1 + \frac{n}{f} \left(\frac{n}{2} - C.f \right)$$

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

$$l_1 = 34.5, l_2 = 39.5, n = 12.5, f = 8, C.f = 9$$

Putting the value in formula:

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

$$\text{Median} = 36.68$$

⇒ Formula for Mode

$$\text{Mode} = l_1 + \frac{f_m - f_0}{2f_m - f_0 - f_2} \times h$$

We see in modal group
 $l_1 = 34.5$, $l_2 = 39.5$, $n = 5$, $f_m = 8$
 $f_0 = 5$, $f_2 = 5$

Putting the value in formula

$$\begin{aligned} \text{Mode} &= 34.5 + \frac{8-5}{2(8)-5-5} \times 5 \\ &= 34.5 + \frac{3 \times 5}{16-10} \\ &= 34.5 + \frac{15}{6} \\ \text{Mode} &= 37 \end{aligned}$$

⇒ Formula for Quartiles

$$Q_s = l_1 + \frac{h}{f} \left(\frac{n+1}{4} + c.f \right)$$

$$f \text{ is } s = 1, 2, 3$$

$$Q_1 = l_1 + \frac{h}{f} \left(\frac{n+1}{4} + c.f \right)$$

$$\frac{n+1}{4} = \frac{5+1}{4} = \frac{6}{4} = 1.5$$

$$l_1 = 29.5, l_2 = 34.5, h = 5, f = 5 (c.f = 0)$$

$$Q_1 = 29.5 + \frac{5}{5} (6.5 - 4)$$

$$Q_1 = 29.5 + 1 (2.5)$$

$$Q_1 = 32$$

→ For Q_2 Now $Q_2 = \text{Median}$

$$\text{for } Q_2 = l_1 + \frac{h}{f} \left(\frac{n+1}{4} - C.f \right)$$

$$3 \left(\frac{n+1}{4} \right) = 3 \left(\frac{25+1}{4} \right) = 3 \left(\frac{26}{4} \right) = \frac{3(26)}{4}$$

$$= 19.5$$

$$l_1 = 39.5, l_2 = 44.5, h = 5, f = 5,$$

$$C.f = 17$$

$$Q_2 = 39.5 + \frac{5}{5} (19.5 - 17)$$

$$Q_2 = 42$$

⇒ Formula for Decile.

$$D_s = l_1 + \frac{h}{f} \left(\frac{5s}{10} - C.f \right)$$

$$\text{For } s = 1, 8.$$

$$D_1 = l_1 + \frac{h}{f} \left(\frac{n}{10} - C.f. \right)$$

$$\frac{n}{10} = \frac{\sum f}{10} = \frac{25}{10} = 2.5$$

$$l_1 = 24.5, l_2 = 29.5, f = 3, C.f. = 1$$

$$D_1 = 24.5 + \frac{5}{3} (2.5 - 1)$$

$$D_1 = 27$$

For D_8

$$D_8 = l_1 + \frac{h}{f} \left(\frac{8n}{10} - C.f. \right)$$

$$D_8 = 8 \left(\frac{25}{10} \right) = 20$$

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

$$D_8 = 42.5$$

⇒ Formula for Percentile:

$$P_s = l_1 + \frac{h}{f} \left(\frac{S_n}{100} - C.f. \right)$$

$$\text{Note } S_n = \frac{\sum f}{100}$$

$$\text{Now } S_n = \frac{S \cdot f}{100}$$

$$\text{for } S = 6, 2, 3, \dots, 99$$

We find P_{15} , P_{54} and P_{89}

$$P_{15} = L_1 + \frac{n}{f} \left(\frac{15n}{100} - C.f \right)$$

$$\frac{15n}{100} = \frac{15 \cdot f}{100} = \frac{15 \times 25}{100} = 3.75$$

$$P_{15} = 24.5 + \frac{5}{8} (3.75 - 1)$$

$$= 24.5 + 2.7$$

$$P_{15} = 27.25$$

$$\text{Now } P_{54} = L_1 + \frac{b}{f} \left(\frac{54n}{100} - C.f \right)$$

$$\text{Now } \frac{54(25)}{100} = 13.5$$

$$P_{54} = 34.5 + \frac{5}{8} (13.5 - 9)$$

$$= 34.5 + 2.8125$$

$$P_{54} = 37.3125$$

For P_{89}

$$P_{89} = L_1 + \frac{n}{f} \left(\frac{89 \cdot n}{100} - C.f \right)$$

$$\frac{89 \cdot n}{100} = \frac{89 \times 25}{100} = 22.25$$

$$P_{89} = 44.5 + \frac{5}{2} (22.25 - 22)$$
$$44.5 + 2.05 (0.25)$$

$$P_{89} = 45.125$$

 \Rightarrow Formula for Range.

$$\text{Range} = L - S$$

$$\text{Range} = 59 - 20 = 39$$

 \Rightarrow Formula for Q.D

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

$$Q.D = \frac{42 - 32}{2} = \frac{10}{2} = 5$$

$$Q.D = 5$$

⇒ Formula for MD:

$$MD = \frac{\sum f |x - \bar{x}|}{\sum f}$$

$$MD = \frac{136}{25} = 5.44$$

$$MD = 5.44$$

x	f	$f x - \bar{x} $	$f (x - \bar{x})^2$
12	1	14.8	219.04
27	3	29.4	288.12
32	5	24	115.2
37	8	1.6	0.32
42	5	26	135.2
47	2	20.4	20.4
52	0	0	0
57	1	20.2	0

$$\sum = 136$$

$$408.04$$

$$\sum = 1685.68$$

→ Formula for Variance-

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

$$Vas = \frac{16258.8}{25} = 67.42$$

$$S.D = \sqrt{67.42}$$

$$S.D = 8.210$$

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

$$C.V = \frac{8.210}{36.8} \times 100$$

$$C.V = 22.30$$

→ Formula for Skewness-

$$SK = \frac{\text{Mean} - \text{Mode}}{S.D}$$

$$SK = \frac{36.8 - 37}{8.210}$$

$$SK = -0.024$$

Q. No 3. (b)
For ungrouped data:

x	$\log x$	$1/x$	x^2	$(x - \bar{x})$
22	1.34	0.04	22	15.58
27	1.43	0.03	729	10.58
32	1.50	0.03	1024	5.58
37	1.56	0.02	1369	0.58
42	1.62	0.023	1764	4.42
47	1.67	0.021	2209	1.42 9.42
52	1.71	0.021	2704	14.42
57	1.75	0.017	3249	14.42

$$\Sigma x = 316 \quad \Sigma \log x = 12.6 \quad \Sigma 1/x = 0.222 \quad \Sigma x^2 = 13070 \quad \Sigma (x - \bar{x}) = 80$$

$$AM = \frac{\Sigma x}{n} = \frac{316}{8} = 39.5$$

Formula for GM

$$\begin{aligned} GM &= \text{Anti}^{\left(\frac{\Sigma \log x}{n}\right)} \\ &= \text{Anti}^{\left(\frac{12.6}{8}\right)} \\ &= GM = 37.58 \end{aligned}$$

Formula For H.M

$$HM = \frac{n}{\Sigma 1/x} = \frac{8}{0.222}$$

$$HM = 36.03$$

Formula for Median.

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

$$\text{Median} = 37$$

In this case Mode = 0.

Formula for Quartile.

$$Q_s = \frac{s(n+1)}{4}$$

$$s = 1, 2, 3$$

$$Q_1 = \frac{1(8+1)}{4} = \frac{9}{4} = 2.25^{\text{th}}$$

$$Q_1 = 27 + 0.25(32 - 27)$$

$$Q_1 = 28.25$$

For Q_3

$$Q_3 = \frac{3(n+1)}{4} = \frac{3(8+1)}{4} = \frac{3(9)}{4}$$

$$\left(\frac{27}{4}\right)^{\text{th}} = 6.75^{\text{th}}$$

$$Q_3 = 47 + 0.75(52 - 47)$$

$$Q_3 = 49.75$$

$$Q_3 = 47 + 0.75(5)$$

$$Q_3 = 50.75$$

Formula for Decile.

$$D_k = \frac{k(n+1)}{10}^{\text{th}}$$

$$k = 1, 6, 9$$

$$D_1 = 1 \left(\frac{3+1}{10} \right) = \frac{4}{10} = 0.4$$

$$= 0 + 0.4(1-0)$$

$$= 0.4(22)$$

$$D_1 = 8.8$$

⇒ For D_6

$$D_6 = \frac{6(n+1)}{10} = \frac{6(3+1)}{10} = \frac{24}{10}$$

$$= 2.4^{\text{th}}$$

$$D_6 = 5 + 0.4(6-5)$$

$$D_6 = 42 + 0.4(47-42)$$

$$D_6 = 42 + 0.4(5)$$

$$D_6 = 4/6$$

For D_9

$$D_9 = \frac{9(n+1)}{10} = \frac{9(8+1)}{10} = \frac{9(9)}{10}$$

$$\frac{81}{10} = 8.1^{\text{th}}$$

$$D_9 = 8 + 0.1(9-8)$$

$$D_9 = 8 + 0.1(1)$$

$$D_9 = 8.1 \approx 8$$

Formula for Percentile.

$$P_s = \frac{s(n+1)}{100}$$

For $s = 1, 2, 3, \dots, 100$

Now find $P_3 \rightarrow P_{45} \rightarrow P_{75}$

$$P_3 = \frac{3(n+1)}{100} = \frac{3(8+1)}{100} = \frac{27}{100}$$

$$P_3 = 0.27$$

$$= 0 + 0.27(1)$$

$$P_3 = 0 + 0.27(22) \dots \dots \dots$$

$$P_3 = 5.94$$

⇒ Formula for P_{45}

$$P_{45} = \frac{45(n+1)}{100} = \frac{45(8+1)}{100} = \frac{45(9)}{100}$$

$$\Rightarrow 4.05$$

$$4 + 0.5(5-4)$$

$$= 4 + 0.5(42-37)$$

$$P_{41} = 37 + 0.5(5) = 39.5$$

$$P_{42} = 39.5$$

Formula for P_{75}

$$P_{75} = \frac{75(n+1)}{100} = \frac{75(8+1)}{100} = \frac{75(9)}{100}$$

$$= 6.75$$

Now

$$P_{75} = 6 + 0.75(7-6)$$

$$= 47 + 0.75(52-47)$$

$$P_{75} = 47 + 0.75(5)$$

$$P_{75} = 50.75$$

Range:

$$\text{Range} = L - S$$

$$57 - 22$$

$$\text{Range} = 35$$

$$\text{Now } Q_D = \frac{Q_3 - Q_1}{2}$$

$$= \frac{50.75 - 29.25}{2}$$

$$Q_D = 11.25$$

Formula for M.D:

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

$$\text{M.D.} = 10$$

Formula for variance.

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

$$= \frac{13070}{8} - \left(\frac{316}{8}\right)^2$$

$$\text{Var} = 1633.75 - (39.5)^2$$

$$\text{Var} = 1633.75 - 1560.25$$

$$\text{Var} = 73.5$$

$$\text{New SD} = \sqrt{73.5}$$

$$\text{SD} = 8.57$$

$$\text{C.V} = \frac{\text{SD}}{\bar{x}} \times 100$$
$$= \frac{8.57}{39.5} \times 100$$

$$\text{C.V} = 21.69$$

Formula for Skewness.

$$\text{SK} = \frac{\text{Mean} - \text{Mode}}{\text{S.D.}}$$

$$\frac{39.5 - 0}{8.57}$$

$$\text{SK} = \frac{39.5}{8.57}$$

$$\text{SK} = 4.60$$

Q.No 3 (a) (b) Completed.