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Subject Bio-statistic

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Question NO- 1

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 year
20-24	1
25-29	3
30-34	5
35-39	8
40-44	2
45-49	0
50-54	2
55-59	1

b. Convert the above given data in the form of ungrouped and then find A.M, G.M, H.M Median, Mode, Quartiles, Deciles, Percentile Range M.D, Q.D variance, Standard Deviation, coefficient of variation, Skewness for the converted data.

Solution of Question. 1.

Rainfall

Number of year

20-24

1

25-29

3

30-34

5

35-39

40-44

45-49

50-54

55-59

f

22

27

32

37

42

47

52

57

fx

22

81

160

296

210

94

0

57

f log x

1.34

4.29

7.52

12.54

8.11

3.34

0

1.75

f/x

0.045

0.11

0.15

0.21

0.19

0.042

0

0.017

c.f

1

4

9

17

22

24

24

25

$\Sigma = 25$

$\Sigma = 920$

$\Sigma = 0.708$

a. formula for A.M

$A.M = \frac{\Sigma fx}{\Sigma f} = \frac{920}{25} = 36.8$

A.M = 36.8 Ans.

formula for G.M

$G.M = \text{antilog} \left\{ \frac{\Sigma f \log x}{\Sigma f} \right\}$
 $= \text{anti log} \left(\frac{38.92}{25} \right)$

$$G.M = 35.48 \text{ Ans}$$

Formula for H.M

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

$$H.M = 35.31$$

Now for Median

Class	f	C.B	C.f
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	54.5-59.5	25

Formula for Median

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

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

$$l_1 = 34.5, l_2 = 39.5, h = 5, f = 8, cf = 9$$

Putting the values in formula

$$\text{Median} = 34.5 + 2.1875$$

$$\text{Median} = 36.68 \text{ Answer}$$

formula for Mode

$$\text{Mode} = l_1 + \frac{f_m - f_0}{2f_m - f_0 - f_1} \times h \quad \text{or} \quad \frac{f_m - f_0}{2f_m - f_0 - f_1} \times h = \text{M.D}$$

we see in modal group. ref above

$$l_1 = 34.5, \quad l_2 = 39.5 \quad h = 5, \quad f_m = 8$$

putting the value in formula

$$\text{mode} = 34.5 + \frac{8 - 5}{2(8) - 5 - 5} \times 5$$

$$= 34.5 + \frac{3}{16 - 10} \times 5$$

$$= 34.5 + \frac{15}{6}$$

$$\text{Mode} = 37 \quad \text{Answer}$$

formula for Quartiles

$$Q_r = l + \frac{(n+1)}{4}$$

$$\text{for } r = 1, 2, 3$$

$$Q_r = l + \frac{h}{f} \left\{ \frac{(n+1)}{4} - C.f \right\}$$

$$\frac{n+1}{4} = \frac{\sum f + 1}{4} = \frac{25 + 1}{4} = \frac{26}{4} = 6.5$$

$$l_1 = 29.5, \quad l_2 = 34.5 \quad h = 5 \quad f = 5, \quad C.f = 4$$

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

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

$$Q_1 = 32 \quad \text{Ans}$$

for Q_2 Now $Q_2 = \text{Median}$ $\frac{n+1}{2}$ element
Now for $Q_3 = l_1 + \frac{h}{f} \left(\frac{3(n+1)}{4} - c.f \right)$

$$\frac{3(n+1)}{4} = 3 \left(\frac{f+1}{4} \right) = 3 \left(\frac{25+1}{4} \right) = 3 \left(\frac{26}{4} \right) \\ = 19.5$$

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

$$c.f = 17$$

$$Q_3 = 39.5 + \frac{5}{5} (19.5 - 17)$$

$$Q_3 = 42 \text{ Answer}$$

formula for Decide

$$D_r = l_1 + \frac{h}{f} \left(\frac{rn}{10} - c.f \right)$$

for $n=1, 8$ $\frac{25 \times 8}{10} = 20$

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

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

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

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

$$D_1 = 27$$

for D_8

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

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

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

$$D_8 = 42.5 \text{ Answer}$$

Formula for Percentile.

$$P_r = l_1 + \frac{h}{f} \left(\frac{rn}{100} - c.f \right)$$

$$\text{Now } rn = \frac{rf}{100}$$

for $r = 1, 2, 3, \dots, 99$
we find P_{15} , P_{54} & P_{89}

$$P_{15} = l_1 + \frac{h}{f} \left(\frac{15n}{100} - c.f \right)$$

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

$$P_{15} = 24.5 + \frac{5}{3} (3.75 - 1)$$
$$= 24.5 + 2.7$$

$$P_{15} = 27.2.5 \text{ Answer}$$

Now

$$P_{54} = l_1 + \frac{h}{f} \left(\frac{54n}{100} - c.f \right)$$

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

$$P_{54} = 34.5 + \frac{5}{8} (13.5 - 9)$$
$$= 34.5 + 2.8125$$

$$P_{54} = 37.3125$$

For P_{89}

$$P_{89} = l_1 + \frac{h}{f} \left(\frac{89n}{100} - c.f \right)$$

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

$$= 44.5 + 2.5 (0.25)$$

P89 = 45.125 Answer.

formula for Range

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

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

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 Answer

formula for M.D

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

$$M.D = \frac{136}{25} = 5.44$$

M.D = 5.44

x	f	f/x	$(x - \bar{x})^2$
12	1	14.8	219.04
27	3	29.4	288.12
37	5	24	115.2
42	8	1.6	0.32
52	5	26	135.2
57	2	20.4	2.04
37	0	2.4	
		$\sum = 136$	$\sum = 1685.68$

Formula for Variation:

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

$$= \frac{168568}{25} = 67.42$$

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

$$S.D = 8.210 \text{ - Answer.}$$

Now

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

$$C.V = \frac{8.210 \times 100}{35.8}$$

$$C.V = 22.30 \text{ Ans}$$

Skewness

Formula for SK

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

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

$$SK = -0.024$$

find partial Q (0.2)
for ungrouped Data:

x	$\log x$	$1/x$	x^2	$(x - \bar{x})^2$
22	1.34	0.04	29	15.58
27	1.43	0.03	729	5.58
32	1.50	0.031	1024	0.58
37	1.56	0.02	1369	4.42
42	1.62	0.023	1764	7.42
47	1.67	0.021	2209	14.42
52	1.71	0.019	2704	14.42
57	1.75	0.017	3249	
$\Sigma = 316$	$\Sigma = 12.6$	$\Sigma = 0.222$	$\Sigma = 15070$	$\Sigma = 80$

$$A.M = 39.5$$

formula for G.M

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

$$= \text{anti} \left(\frac{12-6}{8} \right)$$

$$G.M = 37.58 \text{ Ans.}$$

formula for H.M

$$H.M = \frac{n}{\sum \frac{1}{x}} = \frac{8}{0.222} = 36.03$$

$$H.M = 36.03$$

formula for Median

$$\text{Median} \left(\frac{n}{2} \right)^{\text{th}} = \left(\frac{8}{2} \right)^{\text{th}} = 4^{\text{th}}$$

Median 37 Answer.

In this case mode = 0.

formula for Quartile

$$Q_k = \frac{k(n+1)}{4}$$

$$k = 1, 2, 3.$$

for Q_3

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

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

$$Q_3 = 6 + 0.75(7-6)$$

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

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

$$Q_3 = 50.75$$

Formula for Decile

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

$$k = 1, 1$$

$$6, 9$$

$$D_1 = 1 \left(\frac{8+1}{10} \right) = \frac{9}{10} = 0.9$$

$$D_1 = 0 + 0.9(2-0)$$

$$D_1 = 0.9(22)$$

$$= 19.8 \text{ Answer}$$

for D_6

$$D_6 = 6 \left(\frac{n+1}{10} \right) = 6 \left(\frac{8+1}{10} \right) = \frac{9}{10} 6$$

$$= 5.4^{\text{th}}$$

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

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

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

$$D_6 = 44 \text{ Ans}$$

for D_9

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

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

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

$$D_9 = 57 + 0.1(2)$$

$$D_9 = 57.1 \times 57$$

Formula for Percentile

$$P_x = x \frac{(n+1)}{100}^{\text{th}}$$

for $x = 1, 2, 3, \dots, 100$

W.W we find P_3, P_{45}, P_{75}

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

$$P_3 = 0.27$$

$$\Rightarrow 0 + 0.27(1)$$

$$= 0 + 0.27(22)$$

$$P_3 = 5.94$$

Formula for P_{45}

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

$$\Rightarrow 4.05$$

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

$$= 4 + 0.5(1/2 - 37)$$

$$P_{45} = 37 + 0.5(5) = 39.5$$

Formula for P_{75}

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

$$= 6.75$$

Now

$$P_{75} = 6 + 0.75(7-6) \\ = 47 + 0.75(52-47)$$

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

$$P_{75} = 50.75 \text{ Answer}$$

Range = ?

$$L - S$$

$$= 57 - 22$$

$$= 35 \text{ Answer}$$

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

$$= \frac{50.75 - 28.25}{2}$$

$$Q.D = 11.25 \text{ Answer}$$

Formula for M.D

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

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

Formula for Var

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

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

$$= 1633.75 - (39.5)^2$$

$$= 1633.75 - 1560.25$$

$$= 73.5$$

Now

$$S.D = \sqrt{73.5}$$

$$S.D = 8.57$$

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

$$= \frac{8.57}{39.5} \times 100$$

$$C.V = 21.69\%$$

Skewness

$$Sk = \frac{\text{Mean} - \text{mode}}{S.D}$$

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

$$Sk = \frac{39.5}{8.57}$$

$$Sk = 4.60 \text{ Answer.}$$

Question NO-2

In the United Kingdom there has been a national census every 10 years since 1801 (with the exception of 1941). At the time of the 2011 UK census a government minister described the census as expensive, inaccurate and inefficient, and out of date almost before it's done. The minister also said that data held by the National Health Service, local councils, the Postal Service, the electoral register

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tax return credit card firms & pharmacies
can do the jobs.

- a. Describe the purpose of a census.
- b. Explaining how it differs from a sample survey & form retains collection of data by government agencies.
- c. The 2011 UK Census attracted a response rate of about 94% of the population.
- d. In the UK 2011 Census almost ----- accuracy of the census.
- e. Discuss the potential ----- agencies.
- f. Discuss the potential ----- agencies.

Answer of Question 2

(Part a)

The purpose of census is to know the exact figure of population living standard of their people. Census report helps for policy makers, because needs and budgets allocation totally depends on this.

(Part B)

In sample survey only a part of population is selected as approximation of population.

In census the whole data is under consideration. In census we study each and every elements in the population which samples survey and agencies survey their limited sample data collection.

Part C)

Out of 100% the 94% response rate shows that the online census have never to accuracy.

Part D)

Since Jedi knight is not in any real sense a religion thus indications that people do not always take census seriously. This may therefore cast doubt on the accuracy of their response they give. It may also indicate a contempt for or a distant of government and the collection of data by government agencies while this example indicate that not all responses can be taken seriously there may still be value in asking question.

Part E) The potential problem in conducting the 2021 UK census online is accuracy time {

and engagement.
In online census there is limitation of accurate data collection from the masses. To overcome this a path should be taken to overcome the time spending on the data collection there must be specified time given for completion.

(Part F)

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 take. For this help of highly expert statistician should be taken.

Question NO-3

The data in the table are taken from a survey of the diet of 1308 men & 1540 women in total 2848 adults in a region in a region of Pakistan. The number of men and women survey were divided - - - - - The column headed SE given the standard error of the mean food consumption by all men & all women.

	Q4	Q3	Q1	Q4	Q3
Fresh veg	mean	mean	3.7	-	-
Fruit	204	259	105	-	-
Rice	31	45	1.0	-	-
Wheat flour	367	269	1.0	-	-
Whole grain	79	197	0.1	-	-
Root veg	2	6	6	-	-
Meat	7	16	48	-	-
Fish	70	69	6	-	-
Milk	23	31	0.2	-	-
	2	23	0.3	-	-

Answer of Question 3

P. T. O

Men Sample Size 1308

	Q ₁ Mean	Q ₃	Q	Q	S.E	Max	Q ₃	Q ₁ E
Fresh veg	204	259	266	317	0.9	-	-	-
Fruit	31	45	69	105	0.5	-	-	-
Rice	367	337	289	246	1.0	-	-	-
Wheat flour	79	114	197	253	1.0	-	-	-
whole 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	-	-	-
Σ	785	812	966	1137		625	840	1032

Part A

Formula for over all mean

for Men

$$\text{Mean} = \frac{\sum \bar{x}_i}{n}$$

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

Overall Mean for Mean = 104.11

Now finding over all mean for Women

$$\frac{\sum \bar{x}_i}{n}$$

$$= \frac{3282}{36} = 91.16$$

Mean 91.16

Overall mean for women = 91.6

And finding combined mean for men & women for fresh veg.

Rice - fish - meat

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

$$\text{Mean} = 157.09$$

Hence combined mean for men & women is 157.09.

Part B)

Consumption of milk for both men and women are low in Q3 & Q4

but it is sharply rise in Q1 & Q2

- Fresh vegetable consumption is very low in Q3 & Q4 but it is

sharply rise in Q1 & Q2

Consumption for wheat flour for both men & women is very low

in Q3 & Q4 but it is sharply in Q1 & Q2.

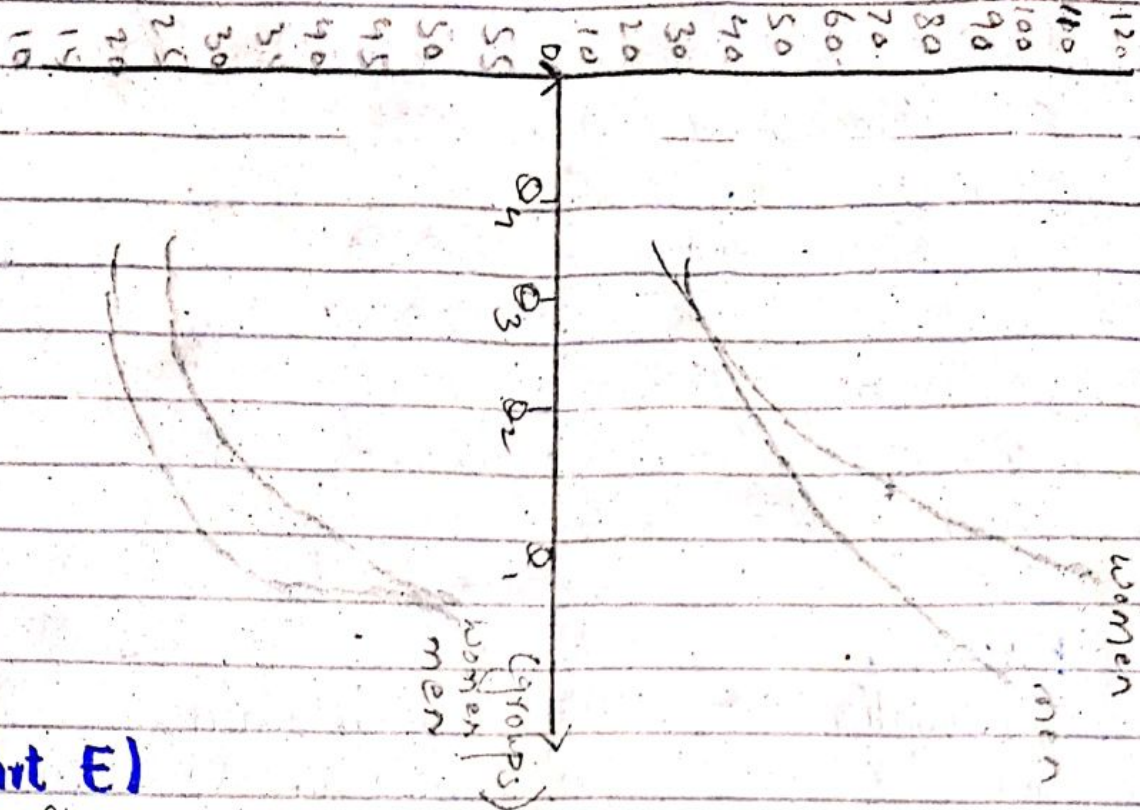
Part C

Consumption of rice fall for both men and women

Consumption for fruits rises for both men & women

- Consumption of fish also fall for both men & women

Part D



(Part E)

Group	Men Q_1	Women Q_1
Fresh veg	204	304
Fruit	31	121
Rice	367	202
wheat flour	79	180
meat	70	63
Fish	23	48

There are very large difference in pattern of consumption - men eat more meat & rice & women eat more fresh vegetable, fruits, wheat flour & fish.

(Part F) standard deviation of whole grain & root vegetable for men & women is very less therefore root veg & grain whole result is best.