

# MID TERM EXAM

Paper : Biostatistics

ID : 13847

## QUESTION / ANSWERS:

| *           | Men (Sample size 1308) |      |      |      |     | Women (Sample size 1540) |      |      |      |     |
|-------------|------------------------|------|------|------|-----|--------------------------|------|------|------|-----|
|             | Q4                     | Q3   | Q2   | Q1   | SE  | Q4                       | Q3   | Q2   | Q1   | SE  |
|             | Mean                   | Mean | Mean | Mean | SE  | Mean                     | Mean | Mean | Mean | SE  |
| Fresh veg   | 204                    | 259  | 266  | 317  | 0.9 | 178                      | 235  | 266  | 304  | 0.8 |
| Fruit       | 31                     | 45   | 69   | 105  | 0.5 | 28                       | 46   | 70   | 121  | 0.4 |
| Rice        | 367                    | 337  | 269  | 246  | 1.0 | 315                      | 276  | 243  | 220  | 0.8 |
| Wheat flour | 79                     | 114  | 197  | 253  | 1.0 | 56                       | 118  | 141  | 180  | 0.8 |
| Whole grain | 2                      | 2    | 6    | 27   | 0.1 | 1                        | 3    | 6    | 22   | 0.1 |
| Root veg    | 7                      | 11   | 16   | 29   | 0.1 | 6                        | 12   | 17   | 28   | 0.1 |
| Meat        | 70                     | 61   | 69   | 77   | 0.4 | 48                       | 43   | 54   | 63   | 0.3 |
| Fish        | 23                     | 28   | 31   | 44   | 0.2 | 19                       | 21   | 28   | 46   | 0.2 |
| Milk        | 2                      | 3    | 23   | 39   | 0.3 | 1                        | 4    | 15   | 48   | 0.3 |

\*a Calculate the overall mean consumption of fresh vegetable, fruit, rice, fish and meat for men and women separately -----  
 Calculate also ----- meat for men and women combined-

②

## OVERALL MEAN (MEN):

$$\text{Fresh vegetable} : \frac{(204 + 259 + 266 + 317)}{4} = 261.5 \text{ gram}$$

$$\text{Fruit} : \frac{(31 + 45 + 69 + 105)}{4} = 62.5 \text{ gram}$$

$$\text{Rice} : \frac{(367 + 337 + 269 + 246)}{4} = 304.75 \text{ gram}$$

$$\text{Fish} : \frac{(23 + 28 + 31 + 44)}{4} = 31.5 \text{ gram}$$

$$\text{Meat} : \frac{(70 + 61 + 69 + 77)}{4} = 69.25 \text{ gram}$$

## OVERALL MEAN (WOMAN):

$$\text{Fresh vegetables} : \frac{(178 + 235 + 266 + 304)}{4} = 245.7 \text{ gram}$$

$$\text{Fruits} : \frac{(28 + 46 + 70 + 121)}{4} = 66.25 \text{ gram}$$

$$\text{Rice} : \frac{(19 + 21 + 28 + 46)}{4} = 28.5 \text{ gram}$$

(3)

$$\text{Fish} : \frac{(19+21+28+46)}{4} = 28.5 \text{ gram}$$

4

$$\text{Meat} : \frac{(48+43+54+63)}{4} = 52 \text{ gram}$$

4

## \* STANDARD DEVIATION =

The formula of standard deviations is =

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

## \* STANDARD DEVIATION (Men)

$$\text{Fresh vegetables} : \text{Mean} = 261.5$$

$$S.D = \sqrt{\frac{(204-261.5)^2 + (259-261.5)^2 + (266-261.5)^2 + (317-261.5)^2}{4}}$$

$$S.D = \sqrt{\frac{3306.25 + 6.25 + 20.25 + 3080.25}{4}}$$

$$S.D = \sqrt{1603.25}$$

$$= 40.04$$

$$\text{Fruits} = \text{Mean} = 62.5$$

$$\sigma = \sqrt{\frac{(31-62.5)^2 + (45-62.5)^2 + (69-62)^2 + (105-62.5)^2}{4}}$$

$$\sigma = \sqrt{\frac{992.25 + 306.25 + 1806.25}{4}}$$

$$\text{S.D} = \sqrt{786.75}$$

$$\text{S.D} = 28.05$$

Rice

Using same the above equation and formula-

$$\text{S.D} = 49.1$$

$$\text{Fish} \& \text{ Mean} = 31.5$$

$$\sqrt{\frac{(23-31.5)^2 + (28-31.5)^2 + (31-31.5)^2 + (44-31.5)^2}{4}}$$

$$\text{S.D} \sqrt{60.25}$$

$$\text{S.D} = 7.8$$

$$\text{Meat} \& \text{ Mean} = 69.25$$

$$S.D = \sqrt{\frac{(70-69.25)^2 + (61-69.25)^2 + (69-69.25)^2 + (77-69.25)^2}{4}}$$

$$S.D = \sqrt{32.2}$$

$$S.D = 5.7$$

\* STANDARD DEVIATION (WOMEN) :-

Fresh vegetable : Mean = 245.75

$$S.D = \sqrt{\frac{(178-245.75)^2 + (235-245.75)^2 + (266-245.75)^2 + (304-245.75)^2}{4}}$$

$$S.D = \sqrt{2127}$$

$$S.D = 47$$

Fruits : Mean 66.25

$$\sqrt{\frac{(28-66.25)^2 + (46-66.25)^2 + (70-66.25)^2 + (121-66.25)^2}{4}}$$

$$S.D = \sqrt{1221}$$

$$\sigma = 34.9$$

(6)

Rice = Mean 263.5

$$\sqrt{\frac{(315-263.5)^2 + (276-263.5)^2 + (243-263.5)^2 + (220-263.5)^2}{4}}$$

$$S.D = \sqrt{5121}$$

$$S.D = 71.6$$

Meat & Mean = 52

$$S.D = \sqrt{\frac{(48-52)^2 + (43-52)^2 + (54-52)^2 + (63-52)^2}{4}}$$

$$S.D = \sqrt{222}$$

$$S.D = 14.9$$

OVERALL CONSUMPTION (MEN & WOMEN)-

|                 | Men    | Women  | Combined   |
|-----------------|--------|--------|------------|
| Fresh vegetable | 26.5   | 245.75 | 253.6 gram |
| Fruits          | 62.5   | 66.25  | 64.4 gram  |
| Rice            | 304.75 | 263.5  | 284.1 gram |
| Fish            | 31.5   | 28.5   | 30 gram    |
| Meat            | 69.25  | 52     | 60.6 gram  |

(7)

QUESTION NO: 1

\* Part (b)

Describe in other word. What the figures for milk, root vegetable, wheat flour?

Ans: The calculation indicate that use of root vegetable are more than milk, while use of wheat flour is much more than milk and root vegetables.

\* Part (c)

What descriptive method is there for both men and women ----- across the four parts-

Ans- The men use more rice than female while in fruits women are more user than men. In fish both male and female are consume equally - they are equally consumer in this case.

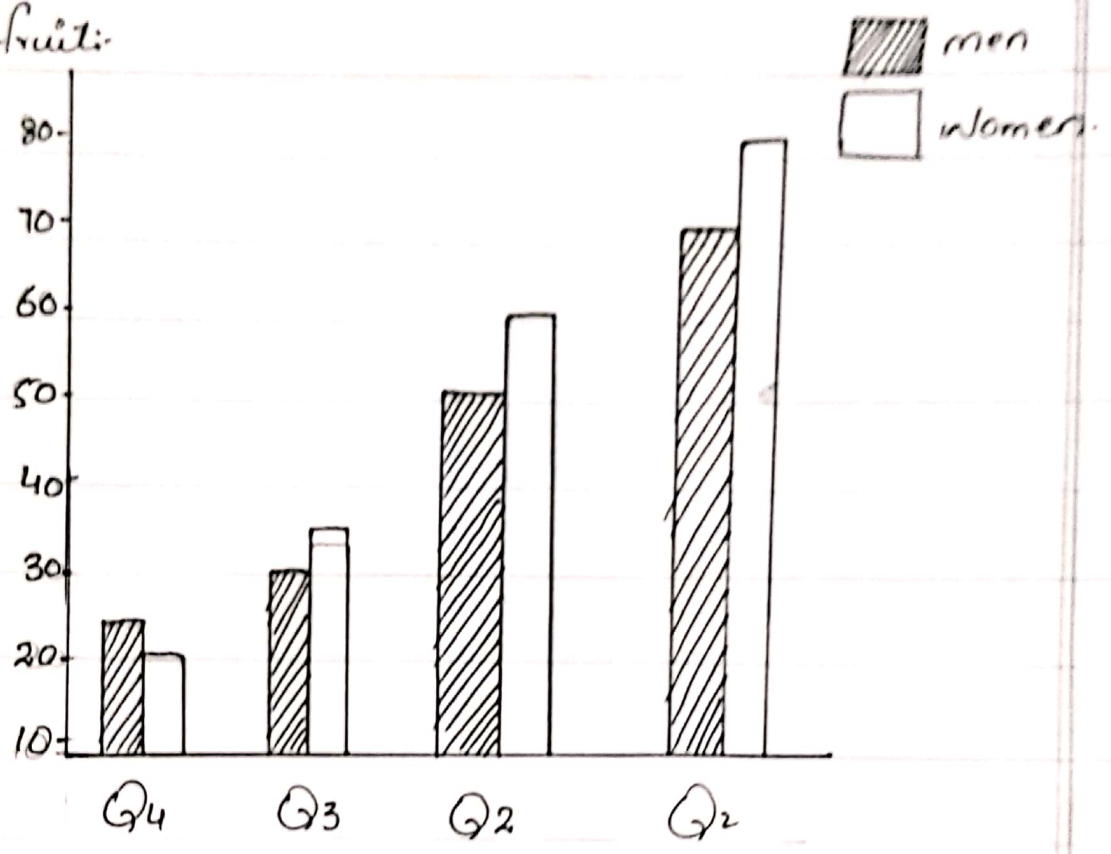
\* Part D a

Draw a suitable diagram to show the difference b/w fish and fruit b/w men and women-

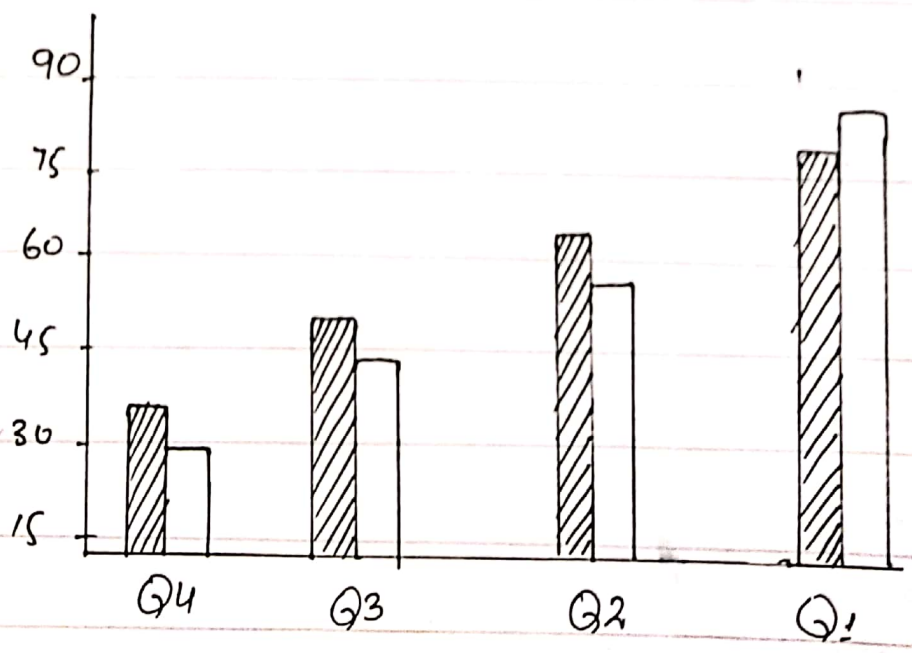
(9)

(d) Draw a suitable diagram to show .....  
Draw a suitable diagram b/w men and women.

For fruit:



For fish:-





(1)  
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\* Part E:

Man require on average about ----- or milk?

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

\* Part F

Explain in your own words - - - - show better result -

Ans: Standard deviation =  $SE \times \sqrt{n}$

The value of standard deviation is more than women in fresh vegetable, wheat flour, whole gram and meat

In remaining categories the standard deviation is similar or equal in both the male and female.

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# QUESTION NO : 2

## Part (a)

| Rainfall (Inches) | f  | X                      | fx  | Log x  | f log x | $1x - 36.81$ | $f(1x - 36.81)$ |
|-------------------|----|------------------------|-----|--------|---------|--------------|-----------------|
| 20-24             | 1  | $\frac{20+24}{2} = 22$ | 22  | 1.3424 | 1.3424  | 14.8         | 14.8            |
| 25-29             | 3  | 27                     | 81  | 1.4313 | 4.2940  | 9.8          | 29.4            |
| 30-34             | 5  | 32                     | 160 | 1.5051 | 7.5257  | 4.8          | 24              |
| 35-39             | 8  | 37                     | 296 | 1.5682 | 12.5456 | 0.2          | 1.6             |
| 40-44             | 5  | 42                     | 210 | 1.6232 | 8.1162  | 5.2          | 26              |
| 45-49             | 2  | 47                     | 94  | 1.6720 | 3.3441  | 10.2         | 20.4            |
| 50-54             | 0  | 52                     | 0   | 1.7160 | 0       | 15.2         | 0               |
| 55-59             | 1  | 54                     | 57  | 1.7558 | 1.7558  | 20.2         | 20.2            |
|                   | 25 |                        | 920 |        | 38.9238 |              | 136.4           |

\* ARITHMETIC MEAN :-

$$A.M = \frac{\sum fx}{\sum f}$$

$$A.M = \frac{920}{25}$$

(10)

$$A.M = 36.8 \text{ inches}$$

## \* GEOMETRIC MEAN &

$$G.M = \text{Antilog} \left[ \frac{\sum f \log x}{\sum f} \right]$$

$$G.M = \text{Antilog} \left( \frac{3.8 \cdot 9238}{25} \right)$$

$$G.M = \text{Antilog} (1.5569)$$

$$G.M = 36.05 \text{ inches}$$

## \* HARMONIC MEAN &

$$H.M = \frac{(36.05)^2}{36.8}$$

$$H.M = \frac{1299.6025}{36.8}$$

$$H.M = 35.31 \text{ inches}$$

## \* MEDIAN:

| Rainfall<br>inches | f  | C-B         | Cof |
|--------------------|----|-------------|-----|
| 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  |
|                    | 25 |             |     |

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

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

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

$$\bar{x} = 36.687$$

⑫

\* MODE :-

$$\bar{x} = d + \frac{f_m - f_1}{(f_m - f_1) + (f_m + f_2)} \times h$$

| 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      |
| 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  |                  |
|         | $\bar{x} = 39.5 + \frac{8-5}{(8-5)+(8-5)} \times 5$ |                  |

$$(8-5)(8-5)$$

Mode  $\bar{x} = 37$  inches

\* QUANTILES :-

# QUANTILES :-

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1<sup>st</sup> quartiles

$$Q_1 = L + h/f (n/4 - c)$$

$$L = 29.5, h = 5, f = 5, c = 4$$

$$Q_1 = 29.5 + \frac{5}{5} \left( \frac{25-4}{4} \right)$$

$$Q_1 = 29.5 + (6.25 - 4)$$

$$Q_1 = 29.5 + 2.25$$

$$Q_1 = 31.75 \text{ inches}$$

$Q_2$

$$n/4 = \frac{\sum f}{4} = \frac{25}{4} = 6.25$$

$$Q_2 = 34.5 + \frac{5}{5} (6.25 - 4)$$

$$Q_2 = 34.5 + 2.25$$

$$Q_2 = 36.68 \text{ inches}$$

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

$$L = 39.5, h = 5, f = 5, c = 17$$

$$Q_3 = 39.5 + \frac{5}{5} \left( \frac{3 \times 25}{4} - 17 \right)$$

$$Q_3 = 39.5 + (18.75 - 17)$$

$$Q_3 = 39.5 + (18.75 - 17)$$

$$Q_3 = 39.5 + 1.75$$

$$Q_3 = 41.25 \text{ inches}$$

## \* DECPLES 2

$$\text{Formula} = D_m = d + \frac{h}{f} \left( \frac{m \cdot n}{10} - c \right)$$

$$L = \del{24.5} 24.5, h = 5, f = 3$$

$$D_1 = 24.5 + \frac{5}{3} \left( \frac{25}{10} - 1 \right)$$

$$D_1 = 24.5 + (1.66)(2.5 - 1)$$

$$D_1 = 24.5 + (1.66)(1.5)$$

$$D_1 = 24.5 + 2.5$$

$$D_1 = 27 \text{ inches}$$

## \* DECILES

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

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

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

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

$$D_8 = 42.5$$

## \* PERCENTILES

General formula

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

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

By using median table

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

$$P_{45} = 35.906$$



## \* RANGE

$$\text{Range} = \text{Max} - \text{Min}$$

$$\text{Max} = 59.5, \text{Min} = 19.5$$

$$\text{Range} = 59.5 - 19.5$$

$$\text{Range} = 40 \text{ inches}$$

## \* QUARTILE DEVIATION

$$\text{Quartile deviation} = \frac{Q_3 - Q_1}{2}$$

$$\Rightarrow Q_3 = 41.25 \text{ inches}, Q_1 = 31.75 \text{ inches}$$

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

$$Q.D = \frac{9.5}{2} \Rightarrow 4.75 \text{ inches}$$

MEAN

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DEVIATION:-

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

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

$$M.D = 5.456 \text{ inches}$$

| Rainfall<br>inches | f  | x  | fx  | fx <sup>2</sup> |
|--------------------|----|----|-----|-----------------|
| 20-24              | 1  | 22 | 22  | 484             |
| 25-29              | 3  | 27 | 81  | 2187            |
| 30-34              | 5  | 32 | 160 | 5120            |
| 35-39              | 8  | 37 | 296 | 10952           |
| 40-44              | 5  | 42 | 210 | 8820            |
| 45-49              | 2  | 47 | 94  | 4417            |
| 50-54              | 0  | 52 | 0   | 0               |
| 55-59              | 1  | 57 | 57  | 3249            |
|                    | 25 |    | 920 | 35229           |

VARIANCE:-

$$\frac{\sum fx^2}{\sum f} - \left( \frac{\sum fx}{\sum f} \right)^2$$

$$= \frac{3.5229^{18}}{25} - \left( \frac{920}{25} \right)^2$$

$$= 1409.16 - (36.8)^2$$

$$= 1409.16 - 1354.24$$

$$\text{Variance} = 54.92 \text{ inches}$$

\* STANDARD DEVIATION

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

$$S.D = \sqrt{\frac{35230 - (36.8)^2}{25}}$$

$$S.D = \sqrt{54.96}$$

$$S.D = 7.413$$

\* COEFFICIENT OF VARIATION<sup>19</sup>

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

$$C.V = \frac{7.413}{36.8} \times 100$$

$$C.V = 20.13\%$$

\* SKEWNESS :-

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

$$SK = \frac{36.8 - 37}{7.143}$$

$$SK = 0.02698$$

\* QUESTION NO 23  
(Part B)

Convert above given data in the form of ungrouped and then find A, M ----- Skewness for the converted data.

## \* ARITHMETIC MEAN

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

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

$$\bar{x} = \frac{25}{8} \Rightarrow 3.125$$

## \* GEOMETRIC &amp; HARMONIC MEAN

$$G.M = \text{Anti-log} (\frac{1}{n} \sum \log x)$$

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

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

These both are not possible the data is zero here-

## \* MEDIAN

$$\bar{x} = \frac{(n+1)^{\text{th}} \text{ term}}{2}$$

$$\bar{x} = \frac{(8+1) \text{ term}}{2}$$

$$\Rightarrow 4.5^{\text{th}}$$

$$\bar{x} = 2 + 0.5 = 2.5$$

$$\bar{x} = 2.5$$

\* MODE :-

Most frequent value is 37 whose frequency is 8, the mode is 8 -

\* QUANTILES :-

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

$$Q_1 = \left(\frac{8+1}{4}\right)^{th}$$

$$Q_1 = \left(\frac{9}{4}\right)^{th}$$

$$Q_1 = 2.25^{th}$$

$$Q_2 = 1 + 0.25$$

$$Q_2 = 1$$

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

$$3 \left(\frac{9}{4}\right) \Rightarrow 6.75^{th}$$

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

$$Q_3 = 5$$

$$Q_2 = \text{median} = 2.5$$

### \* DECILES

$$D_m = \frac{m(n+1)}{10} \text{ obs}$$

$$D_4 = \frac{4(8+1)}{10} \text{ obs}$$

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

$$D_4 = 1 + 0.6(2-1)$$

$$D_4 = 1.6$$

### \* Percentile

$$P_m = \frac{m(n+1)}{100} \text{ obs}$$

$$P_{72} = \frac{72(8+1)}{100} \text{ obs}$$

$$6.48^{\text{th}} \Rightarrow P_{72} = 5-$$

### \* Range

$$\text{Range} = 8-$$

$$\begin{aligned}\text{Range} &= \text{Max} - \text{Min} \\ &= 57 - 22 \\ &= 135 \text{ inches-}\end{aligned}$$

### \* MEAN DEVIATION

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

$$M.D = \frac{1364}{25} \Rightarrow 5.456 \text{ inches-}$$

### \* QUARTILE DEVIATIONS

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

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

$$Q.D = 10/2 \Rightarrow 5 \text{ inches-}$$

### \* VARIANCE

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

$$= \frac{35230}{25} - \left(\frac{920}{25}\right)^2$$

$$\text{variance} = 54.96 \text{ inches-}$$

### \* STANDARD DEVIATIONS



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

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

$$S = \sqrt{6.359}$$

$$S = 2.521$$

\* SKENNESS:-

$$Sk = \frac{Q_3 + Q_1 - 2Q_2}{Q_3 - Q_1}$$

$$Sk = \frac{42 + 32 - 2(37)}{42 - 32}$$

$$Sk = \frac{74 - 74}{10} = 0$$

it is normal.

## \* QUESTION NO : 3

(a) Describe the purpose of census?

The main purpose of the census is to count the entire population of a country and location where they live.

In other ~~the~~ words we can

say that a type of survey they conduct the total set of observation.

(b) Explaining how its differ from a sample survey ----- government agencies

Ans- We describe two modern type of survey. The first method is the development of government statistics and census and the general statistical methodology especially for ratio estimation.

Second is movement from census to sample method.

but in census it is compulsory to go from every object of population.

Q3 Part (c)

The 2011 UK census attracted -----  
 ----- for the accuracy of the census-

Ans:

A participation of 94% is high and might be regarded but it can rise any kind of error until it should complete to 100%. The nature of the missing 6% is an issue. 94% population people who are participated.

\* Part (d)

On the 2011 UK census almost 170,000 people ----- invalid data asking question religion

Ans:

"Jedi knight" indicates that people don't always take the census seriously. There may be still be value in asking

the question probably sample.

⇒ Routine collection data is

widely used for medical research.

⇒ They include the step of disease

registries and clinical based data  
at regional, national and international.

\* PART (e)

Discuss the potential problems - - - - -

- - - - these problem might overcome.

\* Ans:

The potential problem should be  
faced by UK is 2021 census.

⇒ Difficulties in accessing secure apartments  
and enumerating usage area.

⇒ The availability of online connection to  
every person of the country is almost

impossible.

The only way to overcome from this problem to provide connection to all the ~~for~~ country and to give response to all-

\* Part (e)

Discuss the potential problems incorporating additional held by government agencies-

\* Ans:

Potential problems

Government agencies and census mean "to study every object under the observation"

It may be difficult for the government agencies to guide all the ~~peoply~~ people properly and to complete the census-