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Paper Biostatistics

Exam Mid TERM

page = 01

Question no; 01 ANSWER

Q No. (01)

	Men sample size 1308					Women 1540				
	Q4 Mean	Q3 Mean	Q2 Mean	Q1 Mean	S.E	Q4 M	Q3 M	Q2 M	Q1 M	S.E
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
	Σ=785	Σ=860	Σ=966	Σ=1137		652 Σ=	Σ= 758	Σ= 840	Σ= 1032	

(a) Red 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 Men = 104.11

Pg-02

Now finding over all Mean for Women

Formula for over all Mean

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

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

Mean = 91.16

over all Mean for Women = 91.16

And

(*) Finding Combined mean for Men and Women for Fresh veg., Rice, Fish, Meat

$$\text{Mean} = \frac{\Sigma \bar{x}_i}{n} = \frac{5027}{32}$$

Mean = 157.09

Hence Combined Mean for Men and Women is 157.09

End part (a)

Pg-03

Q no; 01 PART-(B)

* Consumption of milk for both men & women are low in Q_3 & Q_4 but it is sharply rise in Q_1 & Q_2
* Fresh vegetable consuption is very low in Q_3 & Q_4 but it is sharply rise in Q_1 & Q_2.
* Consumption of wheat flour for both men & women is very low in Q_3 & Q_4 but it is rise sharply in Q_1 & Q_2.

Q no; 01 PART-(C)

* Consumption of rice fall, for both men & women.
* Consumption of fruits rises, for both men & women.
* Consumption of fish also fall, for both men & women.

Q no; 01 PART-(CE)

Group	Men Q_4	Women Q_1
Fresh vega	204	304
Fruit	31	121
Rice	367	202
Wheat Flour	79	180
Meat	70	63
Fish	23	48

There are a very large differences in pattern of consumption

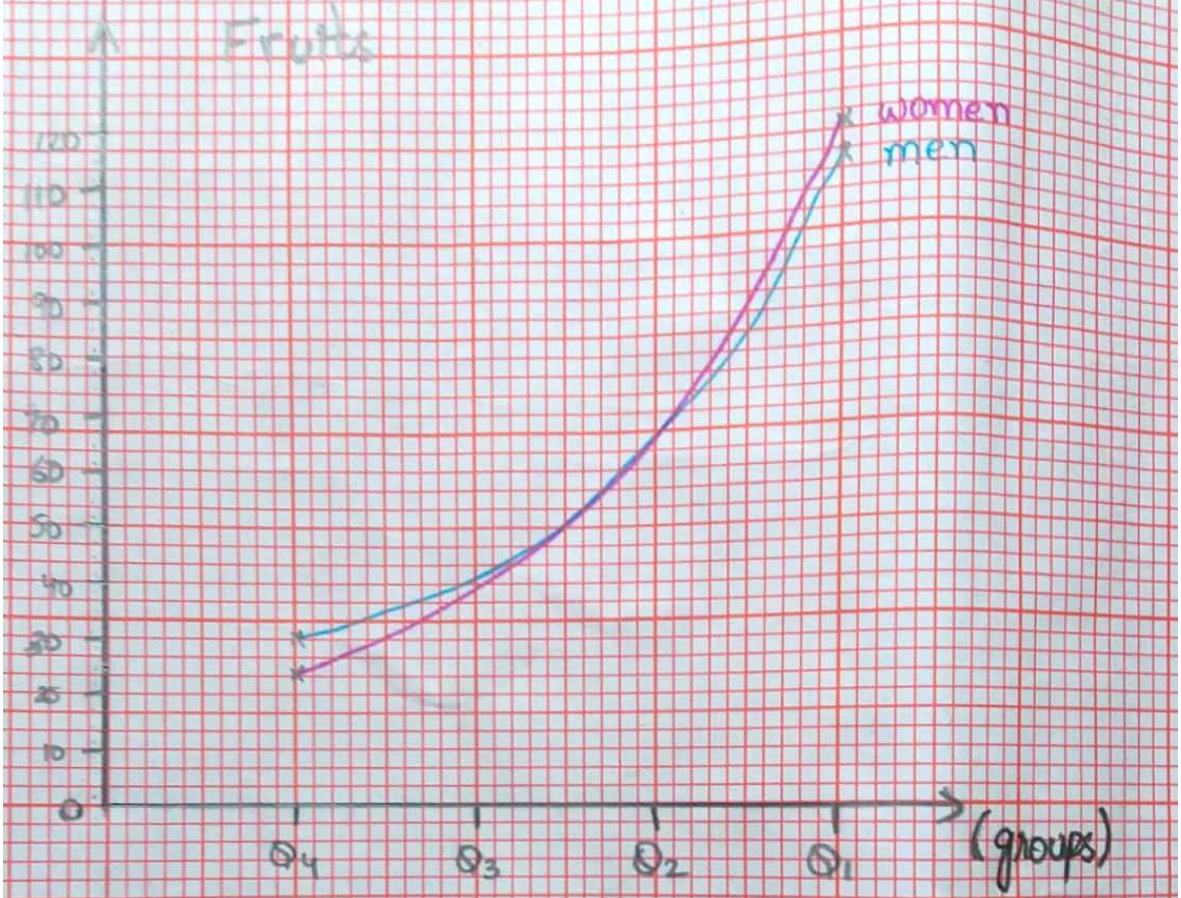
* Men eat more meat & rice & women eat more fresh vegetables, fruits, wheat flour & fish.

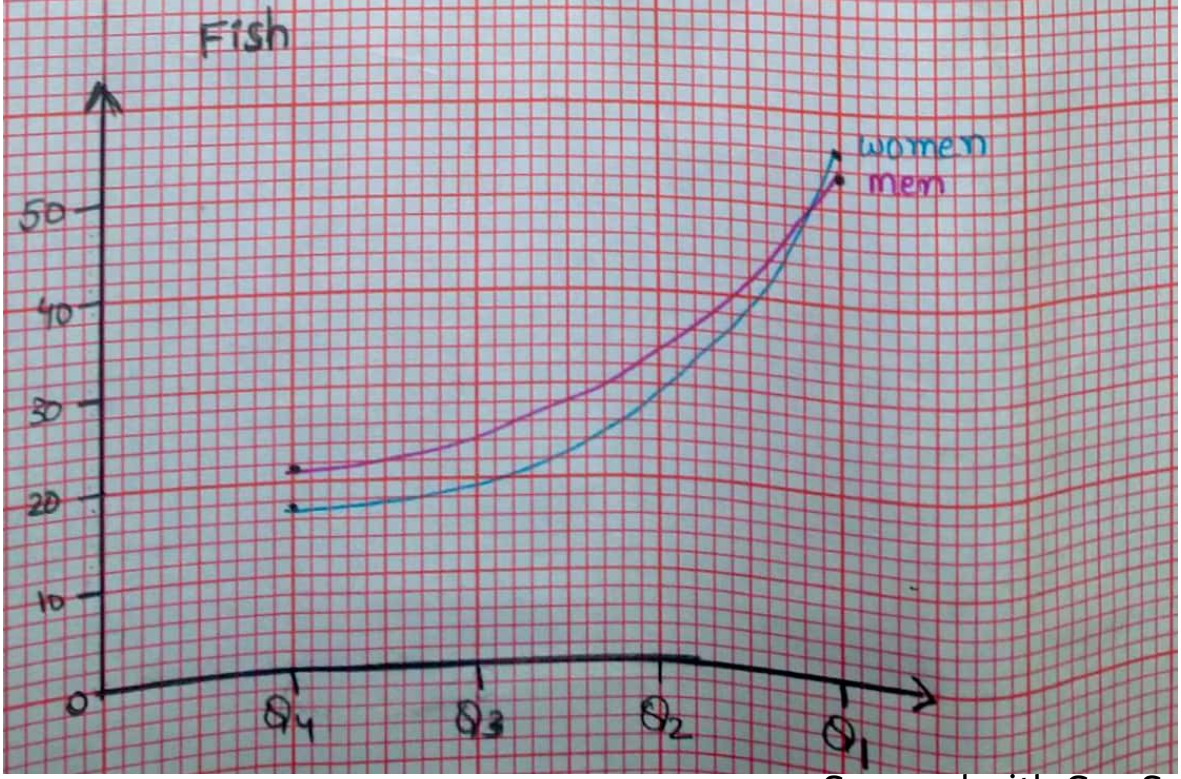
Pg-04

Question no; 1. PART-(F)

standard deviation of whole grain Ep root vegetable, foo men Ep women is very less, therefore root vegetable Ep grain whole result is best.

PART - D





Question no; 02 ANSWER.

PART (A)

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 people. Census report helps for policy makers, because future needs & budget allocation totally depends on this.

PART (B)

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

In census the whole data is under consideration. In census we study each & every element in the population, while sample survey & agencies survey their limited sample data collected.

PART (C)

Out of 100%, the 94% response rate shows that the online census have neared to accuracy.

PART (D)

Since 'Jedi knight is not in any real sense a religion, this indicates that people do not always take census seriously. This may therefore cast doubt on the accuracy of other

responses they give.

It may also indicate a contempt for, or a distrust of, government & 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 question.

PART (E)

The potential problem in conducting the 2021 UK census online is accuracy, time & engagement.

In online census their is limitation of accurate data.

Collection from the 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.

PART (F)

Whenever we add additional data in over sample size, it gives more accurate data & the data become reliable.

But incorporating the additional data is not easy to tackle.

For this help of highly expert statician should be taken.

Q No: (03) Question no; 3 ANSWER

Rain fall (inches)	Number of year
20-24	1
25-29	3
30-34	5
35-39	8
40-44	5
45-49	2
50-54	0
55-59	1

classes	(f)	x	fx	f log x	f/x	c.f
20-24	1	22	22	1.34	0.045	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	0.119	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
	$\Sigma=25$		$\Sigma=920$	$\Sigma=38.92$	$\Sigma=0.708$	

Part A

(a) Formula for A.M

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

Now A.M = 36.8 Ans

Formula for **G.M**

$$G.M = \text{anti log}\left\{\frac{\Sigma f \log x}{\Sigma f}\right\}$$

$$= \text{anti log}\left(\frac{38.92}{25}\right)$$

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

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

Formula for **H.M**

$$H.M = \frac{\Sigma f/x}{\Sigma f/x} = 0.708$$

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

$$H.M = 35.31$$

Ans.

Now for **Median**

classes	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 :

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

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

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

putting the values in formula

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

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

$$\text{Median} = 36.68 \text{ Ans.}$$

Formula for Mode :-

$$\text{Mode} = l_1 + \frac{f_m - f_0}{2f_m - f_0 - f_1} \times h$$

We see in Moded group

$l_1 = 34.5$, $l_2 = 39.5$ $h = 5$ & $f_m = 8$

$f_0 = 5$, $f_1 = 5$

putting the values in formula

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

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

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

Mode = 37 Ans.

Formula for Quartiles :-

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

for $k = 1, 2, 3$.

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

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

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

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

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

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

For Q_2 Now Q_2 = Median

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

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

$$= 19.5$$

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

$c.f = 17$

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

$$\boxed{Q_3 = 42} \quad \text{Ans.}$$

Formula for Decile :-

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

For $x = 1, 8$

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

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

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

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

$$D_1 = 27$$

For D_8

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

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

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

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

Formula for percentile :-

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

Now $kn = \frac{k\Sigma f}{100}$

for $k = 1, 2, 3, \ldots 99$

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

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

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

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

$$= 24.5 + 2.7$$

$$P_{15} = 27.25 \text{ Ans}$$

Now

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

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}

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

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

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

$$= 44.5 + 2.5(0.25)$$

$$P_{89} = 45.125 \quad \text{Ans.}$$

Formula for Range :-

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

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

Formula for Q.D :-

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

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

$$Q.D = 5 \text{ Ans.}$$

Formula for M.D :-

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

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

$$M.D = 5.44$$

x	f	$f\lvert x-\bar{x}\rvert$	$f(x-\bar{x})^2$
22	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	6
	$\Sigma = 136$		408.04
			$\Sigma = 1685.68$

Formula for var. so

$$\text{var.} = \frac{\Sigma f(x-\bar{x})^2}{\Sigma f}$$

$$\text{var.} = \frac{1685.68}{25} = 67.42$$

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

$$S.D = 8.210 \text{ Ans.}$$

Now

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

$$C.V = \frac{8.210}{38.8} \times 100$$

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

Skewness

Formula for Sk

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

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

$$Sk = -0.024$$

End part (a)

Q(03) part (B) Pg-18

For ungrouped data :-

x	$\log x$	$1/x$	x^2	$\lvert x-\bar{x}\rvert$
22	1.34	0.04	22	15.58
27	1.43	0.03	729	10.58
32	1.50	0.031	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	9.42
52	1.71	0.019	2704	14.42
57	1.75	0.017	3249	19.42
$\Sigma=316$	$\Sigma=12.6$	$\Sigma=0.272$	$\Sigma=13070$	$\Sigma=80$

$$A.M = \frac{\Sigma x}{n} = \frac{316}{8} = 39.5$$

A.M = 39.5

Formula for G.M :-

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

$$= \text{ant}\left(\frac{12.6}{8}\right)$$

G.M = 37.58 Ans

Formula for H.M :-

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

H.M = 36.03

Formula for Median :-

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

Median = 37 Ans

in this case Mode = 0

Formula for Quartile :-

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

$k = 1, 2, 3,$

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

$$Q_1 = 2 + 0.25(3-2)$$

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

$$Q_1 = 28.25$$

For Q_3

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

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

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

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

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

$$Q_3 = 50.75$$

Formula for Decile

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

$k = 1, 6, 9$

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

$$D_1 = 0 + 0.9(1-0)$$

$$= 0.9\,(21)$$

$$D_1 = 19.8 \text{ Ans.}$$

For D_6

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

$$= 5.4^{th}$$

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

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

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

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

For D_9

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

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

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

$$D_9 = 57 + 0.1(1)$$

$$D_9 = 57.1 \approx 57$$

Formula for Percentile

$$P_k = k\left(\frac{n+1}{100}\right)^{th}$$

For $k = 1, 2, 3, \ldots 100$

Now we find $P_3 \to P_{45}$ P_{75}

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

$$P_3 = 0.27$$

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

$$= 0 + 0.27(22)$$

$$P_3 = 5.94$$

Formula for P_{45}

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

$$\Rightarrow 4.05$$

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

$$= 4 + 0.5(41 - 37)$$

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

Formula for P_{75} =

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

$$= 6.75$$

Now

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

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

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

$$P_{75} = 50.75 \text{ Ans.}$$

Range = ?

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

$$= 57 - 22$$

$$= 35 \text{ Ans.}$$

Now

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

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

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

Pg-24

Formula for M.D :-

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

M.D = 10 Ans

Formula for var. :-

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

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

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

$$= 1633.75 - 1560.25$$

$$\text{var.} = 73.5$$

Now

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

$$S.D = 8.57$$

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

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

$$C.V = 21.69$$

(20)

✱ Skewness ✱

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

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

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

$Sk = 4.60$ Ans.

End part (b) Q(03)