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Subject = Biostatistics

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Midterm Paper

= . =

Q1

(a)

→ For men  
Overall mean consumption of Fresh vegetables

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

$$= \boxed{236.5}$$

→ Mean of Fruits:

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

→ Mean of Rice:

$$\bar{X} = \frac{(367 + 337 + 269 + 246)}{4}$$

$$= \boxed{304.75}$$

→ Mean of fish

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

$$= \boxed{31.5}$$

→ Mean of meat:

$$\bar{X} = \frac{70 + 62 + 69 + 77}{4}$$

$$= \boxed{69.25}$$

→ For women

mean of fresh vegetables

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

p-t-o

Mean of Fruits:

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

$$= \boxed{66.25}$$

Mean of Rice:

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

$$= \boxed{263.5}$$

Mean of meat

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

$$= \boxed{52}$$

Mean of fish:

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

$$= \boxed{28.5}$$

Combined Mean

Combined mean for Men

C.M of Fresh Vegetables

$$\bar{x}_{comb} = \frac{\bar{x}_1 n_1 + \bar{x}_2 n_2 + \dots + \bar{x}_n n_n}{n_1 + n_2 + \dots + n_n}$$

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

$$(236.5)(47)]}{204 + 259 + 266 + 217}$$

$$= \boxed{236.5}$$

Com Mean of Rice:

$$\bar{x}_c = \frac{(367)(304.75) + (337)(304.75) + (269)(304.75) + (246)(304.75)}{367 + 337 + 269 + 246}$$

$$\bar{x}_c = \boxed{304.75}$$

P-T-0

Com Mean  
c.m of fish..

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

C. mean of meet..

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

Combined Mean of womanz.

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

Com. Mean of Meet

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

C.m of fish:

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

P-T-0

Com. mean of Rice:

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

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

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.

(c)

Ans

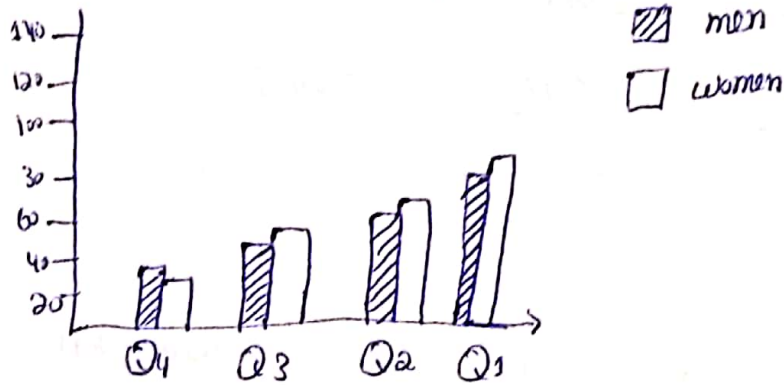
In fruit and fish the value of mean  
increasing from Q4 to Q1 in men and  
women. But in Rice the value of  
mean decreasing from Q4 to  
Q1.

P-T-O

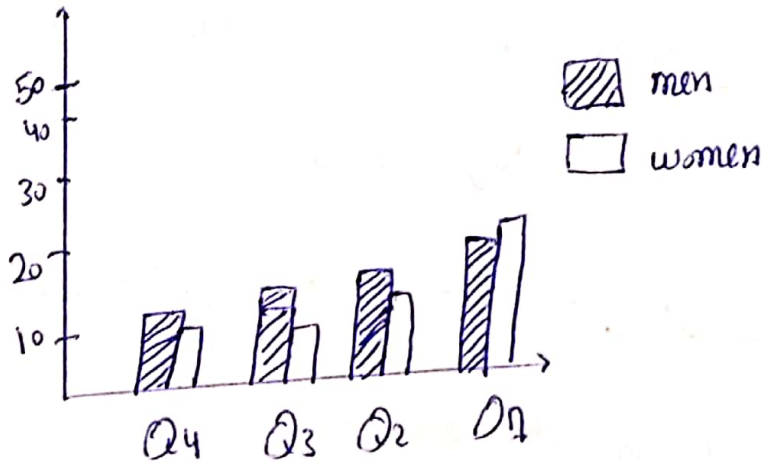
Q2 (d)

Draw a suitable diagram.

For Fruits



For Fish



(F)

Ans  $\text{Standard deviation} = S.E \times \sqrt{n}$

By using above formula the value of standard

deviation of men is more than women wheat

flour, vegetable, fruit, wheat flour, whole grain

and meat.

Ans the value of standard deviation is

P-T-0

And value of its standard deviation  
is same to both men and women  
in remaining categories.

Q1

(e)

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

Q2

(a)

Purpose of Census:

Ans

Census is a survey conducted the whole set  
of observation object which is belonging to  
Population.

The purpose of census to count the  
entire population of every object in given  
observation. In census ask every type  
of question to get the complete data.

P-T-O

Q2 (b)

Differences from sample survey.

Ans

In sample survey we go through some

selected part from the population. our

concern about information is totally based

upon the selected data. The same

procedure done by government agencies,

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

different from sample survey.

Q2 (c)

Ans

From the given information 2011 UK census

attached a response rate of 94%

which is good. But it can rise any

kind of error until it should complete

of incomplete it can be cause -  
P-T=0



of an error. It may increase error

Further.

Q2

(d)

Ans In the census about asking a

Specific religion or group may cause its

harmful behavior or many mishappen.

It is possible that someone do not

like to answer of these kind of

questions.

Q2

(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 behavior -

P-T-O

of persons, they may give the response

do not according to their own taste or

behaviors.

The only way to overcome this problem to

giving the connection to the whole country

and make sure and punctual to every

person to give the response.

Q2

(F) Ans Census, itself mean the study of

every object under the observation.

And in real it is such a difficult ~~task~~

task to perform. Also it is quite difficult

to Government agencies to go to every

single person and collect the whole a

lot of things ~~that~~ have been done

by these agencies not only to

complete the census.

Q3:

(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	31
30-34	5	32	160
35-39	8	37	296
40-44	5	42	40
45-49	2	47	94
50-54	0	52	0
55-59	1	57	57
	<u>25</u>		<u>920</u>

$$\bar{X} = \frac{920}{25} = \boxed{36.8}$$

P-T-0

→ G.M

G.M = 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
30-34	5	32	7.526
35-39	8	37	12.546
40-44	5	42	8.116
45-49	2	47	3.344
50-54	0	52	0
55-59	1	57	1.756
	<u>25</u>		<u>38.924</u>

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

G.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	<del>0.238</del> 0.119
45-49	2	<del>45</del> 47	0.042
50-54	0	52	0
55-59	1	57	0.175
	<u>25</u>		<u>2.116</u>

P-T-0

$$H.M = \frac{\sum f}{\sum fx} = \frac{25}{1.116}$$

$$= 22.401$$

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	24.5-29.5	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

9 → median class  
 700 Q1  
 17 → median class  
 22 → median class box  
 Q3

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

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

$$\bar{x} = 36.887$$

Quartiles

1st Quartile: Q1

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

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

$$Q_1 = 29.5 + \frac{5}{8} (6.25 - 4)$$

$$Q_1 = 31.75$$

p.T-0

2nd Quartile

$$Q_2 = \tilde{x} = 37.687$$

3rd Quartile  $Q_3$ 

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

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

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

$$Q_3 = 41.25$$

Deciles:-

General formula

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

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

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

By using the median table

$$D_8 = \cancel{40.5} + \frac{5}{5} (20 - 17)$$

$$D_8 = 42.5$$

Percentile

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

Say

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

P-T-0

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

By using median table.

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

$$P_{45} = 35.906$$

mode

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

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 → mode class
40-44	5	<del>39.5</del> <sup>49.5</sup> → 44.5
45-49	2	44.5 - 49.5
50-54	0	49.5 - 54.5
55-59	<u>1</u>	54.5 - 59.5
	<u>25</u>	

$$x' = 34.5 + \frac{8 - 5}{(8 - 5) + (8 - 5)} \times 5$$

$$x' = 37$$

Range

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

$$= 59.5 - 19.5$$

$$\text{Range} = 40$$

P-T-0

Quasile Deviations

$$\begin{aligned}
 Q.D &= \frac{Q_3 - Q_1}{2} \\
 &= \frac{41.25 - 31.75}{2} \\
 &= \boxed{4.75}
 \end{aligned}$$

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	2.6
45-49	2	47	20.4
50-54	0	52	0
55-59	1	57	20.2
			<u>136.4</u>

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

$$\bar{x} = 36.8$$

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

$$= \boxed{5.456}$$

Variance

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

P-T-0



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
			<u>35230</u>

$$s^2 = \frac{35230}{25} - (36.8)^2$$

$$= 1409.2 - 1354.24$$

$$s^2 = 54.96$$

Standard deviation =

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

$$s = \sqrt{\frac{35230}{25} - (36.8)^2}$$

$$s = \sqrt{54.96}$$

$$= \underline{7.413}$$

P-T-0

Skewness

$$Sk = \frac{\text{mean} - \text{mode}}{\text{Standard deviation}}$$

$$Sk = \frac{36.8 - 37}{7.4131}$$

$$Sk = -0.02698$$

ungroup data

A.M

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

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

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

$$= 3.125$$

G.M And H.M

$$G.M = \text{AntiLog} \left[ \frac{1}{n} \sum \log x \right]$$

x	log x
1	0
3	
5	
8	
5	
2	
0	
1	
<hr/>	
25	

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

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

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

P-T-0

↳  $Q_3$  3<sup>rd</sup> quartile

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

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

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

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

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

$$\boxed{Q_3 = 5}$$

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

Decile:

General Formula

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

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

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

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

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

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

$$\boxed{D_4 = 1.6}$$

Percentiles:

General Formula

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

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

$$P_{72} = 0$$

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

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

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

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

↳ mode 2.

most repeated value of data

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

$$\boxed{\bar{x} = 1.5}$$

↳ Range 2.

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

↳ Quartile deviation 2.

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

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

↳ mean deviation 2.

$$m.d = \sum \frac{|x - \bar{x}|}{n} \quad \bar{x} = 3.125$$

x	x - $\bar{x}$
1	2.125
3	0.125
5	1.875
8	4.875
5	1.875
2	1.125
0	3.125

$$\left. \begin{array}{l} 1 \\ 2.125 \end{array} \right\} \frac{2.125}{17.25}$$

P-T = 0

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

$$m.D = 2.156$$

↳ Variance

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

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

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

$$= 16.125 - 9.766$$

$$\Rightarrow S^2 = 6.359$$

↳ Standard deviation

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

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

$$S = \sqrt{6.359}$$

$$\Rightarrow S = 2.521$$

P-T-O

Q. Skewness

$$S_k = 3 \frac{(\text{mean} - \text{median})}{s}$$

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

~~$S_k = 0.745$~~

$SK = 0.745$  Ans

The End