Mid Semester Assignment

Spring 2020

Subject: Probability and Statistics

Q1: Students were asked how long it took them to walk to school on a particular morning. A cumulative frequency distribution was formed

Time taken(in minutes)	<5	<10	<15	<20	<25	<30	<35	<40	<45
Frequency	25	45	81	143	280	349	374	395	400

a) Draw a cumulative frequency curve and estimate how many students took less than 18 minutes.

b) Take equal class intervals of 0-, 5-, 10-, etc., construct frequency distribution and draw a histogram.

Q2: Construct a grouped distribution table for the following data and Calculate Mean, Mode and Quartiles.

423, 369, 387, 411, 393, 394, 371, 377, 389, 409, 392, 408, 431, 401, 363, 391, 405, 382, 400, 381, 399, 415, 428, 422, 396, 372, 410, 419, 386, 390

Q3: By multiplying each of the numbers 3,6,2,1,7,5 by 2 and then adding 5, we obtain 11,17,9,7,19,15. What is the relation between the standard deviation and the means of the two sets.

Q4: For the following grouped distribution table Calculate The Variance and Standard Deviation

Class	64-84	85-104	105-124	125-144	145-164	165-184	185-204
Frequency	15	18	27	10	6	5	13

Q5: Comment on the following sentences

a) The depth of a river at four different points is 2,7,5,6 feet respectively. The average depth is 5 feet. Therefore all the people with heights 5 feet can cross it

b) The average marks of one class of students are 30. Therefore every student is hopeless.

c) The average income of a king and his household servants is £20,000 per month, therefore all the household servants must be fabulously paid.

STUDENT NAME #

KIRAMAT ULLAH

ID NO # 13290

COURSE TITLE #

PROBABILITY AND STATISTICS

TEACHER NAME #

SIR DAUD

DEPARTMENT #

BEE

Question No 1

Part (A)

Answer

Solution :-

Class Interval	Freaquency	Class Boundries	C.F<	C.F>
0 - 4	25	0 - 4.5	25	2092
5 - 9	45	4.5 - 9.5	70	2067
10 - 14	81	9.5 - 14.5	151	2022
15 - 19	143	14.5 - 19.5	294	1941
20 - 24	280	19.5 - 24.5	574	1798
25 - 29	349	24.5 - 29.5	923	1518
30 - 34	374	29.5 - 34.5	1297	1169
35 - 39	395	34.5 - 39.5	1692	795
40 - 44	400	39.5 - 44.5	2092	400

C.B = Δ = LCL with 2nd class - UCL of 1st class

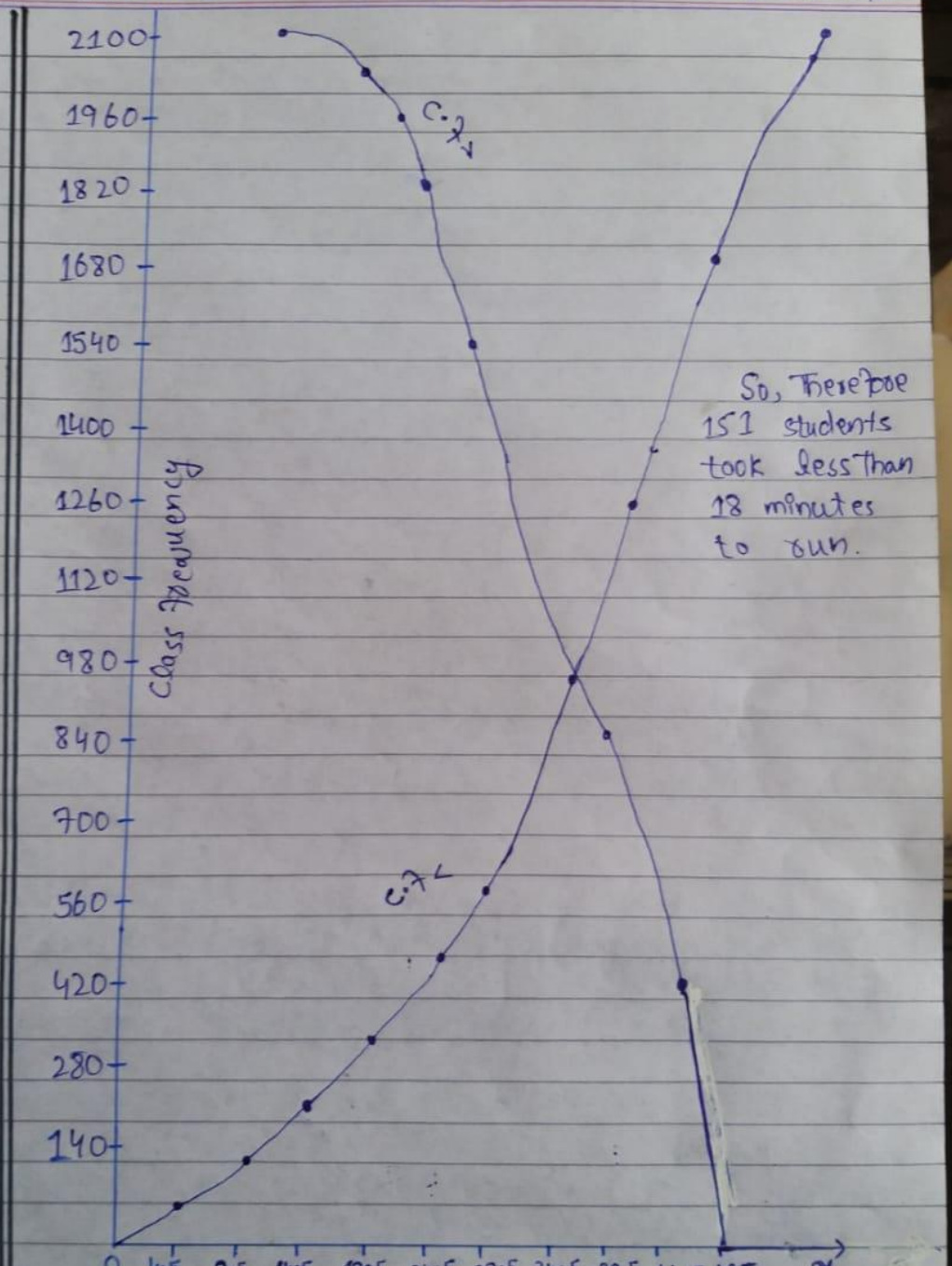
C.B = 5 - 4

C.B = 1

C.B = $\Delta/2$

= $1/2$

C.B = 0.5



So, Therefore 151 students took less than 18 minutes to run.

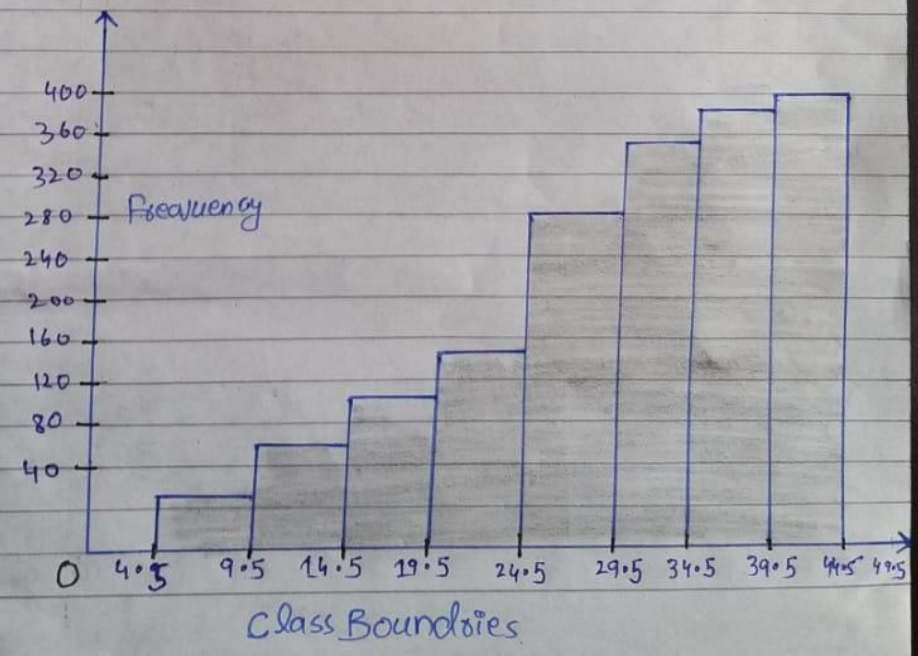
Question No 1

Part (B)

Answer

Solution:-

Class Interval	Frequency	Class - Boundries
0 - 4	25	0.5 - 4.5
5 - 9	45	4.5 - 9.5
10 - 14	81	9.5 - 14.5
15 - 19	143	14.5 - 19.5
20 - 24	280	19.5 - 24.5
25 - 29	349	24.5 - 29.5
30 - 34	374	29.5 - 34.5
35 - 39	395	34.5 - 39.5
40 - 44	400	39.5 - 44.5



Question No 2

Answer

Table of Grouped Distribution:-

⇒ **Step 1:-**

Count the number of observations $N = 30$

⇒ **Step 2:-**

Largest value, $X_m = 431$

Smallest value, $X_0 = 363$

⇒ **Step 3:-**

The Range: $R = X_m - X_0$

$= 431 - 363$

$R = 68.$

⇒ **Step 4:-**

$K = 1 + 3.33 \log N$

$K = 1 + 3.33 \log (30)$

$K = 1 + 3.33 (1.477)$

$K = 1 + 4.92$

$K = 5.92$

$K = 6$ (Rounding off)

⇒ **Step 5:-**

$h = R/K$

$h = 68/6$

$\boxed{h = 11.33}$

$h = 12$ (By Rounding)

Table

Classes	Freequency (7)
363 - 374	4
375 - 386	4
387 - 398	8
399 - 410	7
411 - 422	4
423 - 434	3

⇒ Tally Column :-

Classes	Class-Boundries	Class Mark	Freequency (F)	C.f	Tally
363 - 374	362.5 - 374.5	368.5	4	4	𝍸
375 - 386	374.5 - 386.5	380.5	4	8	𝍸
387 - 398	386.5 - 398.5	392.5	8	16	𝍸 𝍸
399 - 410	398.5 - 410.5	404.5	7	23	𝍸 𝍸
411 - 422	410.5 - 422.5	416.5	4	27	𝍸
423 - 434	422.5 - 434.5	428.5	3	30	𝍸

Mean:-

$$\bar{x} = \frac{\begin{array}{llll} 423 + 369 + 387 + 411 + \\ 393 + 394 + 371 + 377 + \\ 389 + 409 + 392 + 408 + \\ 431 + 401 + 363 + 391 + \\ 405 + 382 + 400 + 381 + \\ 399 + 415 + 428 + 422 + \\ 396 + 372 + 410 + 419 + \\ 386 + 390 \end{array}}{30}$$

$$\bar{x} = \frac{11,914}{30}$$

So,

$$\boxed{\bar{x} = 397}$$ Ans///

Mode:-

$$\Rightarrow \quad \text{Mode} = l + \frac{7m - 7_1}{(7m - 7_1) + (7m - 7_2)} \times h$$

Therefore,

$l = 387$

$7m = 8$

$7_1 = 4$

$7_2 = 7$

$h = 12$

Now,

$$\Rightarrow \quad \text{Mode} = 387 + \frac{8-4}{(8-4)+(8-7)} \times 12$$

$$\Rightarrow \quad \text{Mode} = 387 + \frac{4}{4+1} \times 12$$

$$\Rightarrow \quad \text{Mode} = 387 + \frac{4}{5} \times 12$$

$$\Rightarrow \quad \text{Mode} = 387 + \frac{48}{5} = 9.6$$

$$\Rightarrow \quad \text{Mode} = 387 + 9.6$$

$$\text{Mode} = 396.6$$

$$\boxed{\text{Mode} = 397}$$ Ans

Quartiles :-

As,

$$Q_1 = \frac{n}{4}$$

$$= \frac{30}{4}$$

$$\boxed{Q_1 = 7.5}$$

Then,

which corresponds to value in class.

is 375 - 386.

So,

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

$$Q_1 = 375 + \frac{12}{4}(7.5 - 4)$$

$$Q_1 = 375 + 3(3.5) \qquad \boxed{c = 4}$$

$$Q_1 = 375 + 10.5$$

$$\boxed{Q_1 = 38.5}$$

Therefore,

Now,

$$\Rightarrow \quad Q_3 = \frac{3n}{4}$$

$$= \frac{3 \times 30}{4} = \frac{90}{4} = 22.5$$

$$\boxed{Q_3 = 22.5}$$

Now, which to corresponds value in class 399 - 410

$$\Rightarrow \quad Q_3 \; l + \frac{h}{f}\left(\frac{3n}{4} - c\right)$$

$\Rightarrow$ $Q_3 = 399 + \frac{12}{7}(6.5)$

$Q_3 = 399 + \frac{78}{7} = 11$

$= 399 + 11$

$\boxed{Q_3 = 410}$ Ans

Question NO 3

Answer

Solution:-

Given Data First:-

$\Rightarrow$ 3, 6, 2, 1, 7, 5

$\text{Mean} = \frac{3+6+2+1+7+5}{6}$

$= \frac{24}{6}$

$\boxed{\text{Mean} = 4}$

Now,

x	x^2
3	9
6	36
2	4
1	1
7	49
5	25
$\Sigma = 24$	$\Sigma = 124$

$$\text{Standard. Deviation} = \sqrt{\frac{\Sigma x^2}{N} - \left(\frac{\Sigma x}{N}\right)^2}$$

So,

$$S.D = \sqrt{\frac{124}{6} - \frac{576}{36}}$$

$$S.D = \sqrt{\frac{144 - 576}{36}}$$

$$S.D = \sqrt{\frac{168}{36}}$$

$$S.D = \sqrt{4.7}$$

$$\boxed{S.D = 2.2}$$ Ans

Given Data Seconds:-

Now,

⇒ 11 , 17, 9 , 7 , 19 , 15

Find the Mean =?

$$\text{Mean} \Rightarrow \frac{11 + 17 + 9 + 7 + 19 + 15}{6}$$

$$\text{Mean} = \frac{78}{6}$$

$$\boxed{\text{Mean} = 13}$$ Ans

Formula

$$\text{Standar Deviation} = \sqrt{\frac{\Sigma x^2}{N} - \left(\frac{\Sigma x^2}{N}\right)}$$

x	x^2
11	121
17	289
9	81
7	49
19	361
15	225
$\Sigma = 78$	$\Sigma = 1126$

Now,

$$S.D = \sqrt{\frac{\Sigma x^2}{N} - \left(\frac{\Sigma x}{N}\right)^2}$$

$$S.D = \sqrt{\frac{1126}{6} - \frac{6084}{36}}$$

$$S.D = \sqrt{\frac{6756 - 6084}{36}}$$

$$S.D = \sqrt{\frac{672}{36}}$$

$$S.D = \sqrt{18.7}$$

$$\boxed{S.D = 4.3}$$

⇒ First data mean = 4

⇒ First data Standard Deviation = 2.2

⇒ 2nd Second data mean = 13

⇒ Second data Standard Deviation = 4.3

Ans

Question No 4

Answer

Classes	f_i	x	x^2	$f_i x$	$f_i x^2$
64 - 84	15	74	5476	1110	82140
85 - 104	18	94.5	8930.25	1701	160744.5
105 - 124	27	114.5	13110.25	3091.5	353976.75
125 - 144	10	134.5	18090.25	1345	180902.5
145 - 164	6	154.5	23870.25	927	143221.5
165 - 184	5	174.5	30450.25	872.5	152251.25
185 - 204	13	194.5	37830.25	2528.5	491979325
	$\Sigma = 94$			$\Sigma = 11575.5$	$\Sigma = 1565029.75$

AT Variance :-

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

$$S^2 = \frac{156029.75}{94} - \left(\frac{11575.5}{94}\right)^2$$

$$S^2 = 16649.26 - 15164.35$$

$$S^2 = 1484.9$$

$$\boxed{S^2 = 1484}$$ Ans

AT Standard Deviation:-

Now Taking Square root at eq(1).

So,

$$\sqrt{S^2} = \sqrt{1484}$$

$$\boxed{S = 38.4}$$

Ans

Question No 5

Part (A)

Answer

a) Comment:-

No, it is not obviously that all the people have height 5feet can easily cross it. If he did not know swimming and river is not deep uniformly It is (2)feet at some points while (7)feet on other points, so, he will cross it.

b)

Part (B) Answer

Comment:-

No it does not mean every student is hopeless. Those students whose marks have then 30. Some have 30 marks and some students have greater than 30 marks. There can be few

Students whose marks may be 60 or more.

Question No 5

Part (c)

Answer

c) Comments:-

No it is not true that all the household servants must be paid. Average pay does not mean everyone get paid same. The king income will be much more than servants.

~END~