

(1)

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Probability and Statistics

Q (1) Solution :-

Ans. (a)

Class Interval	Frequency	Class Boundaries	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

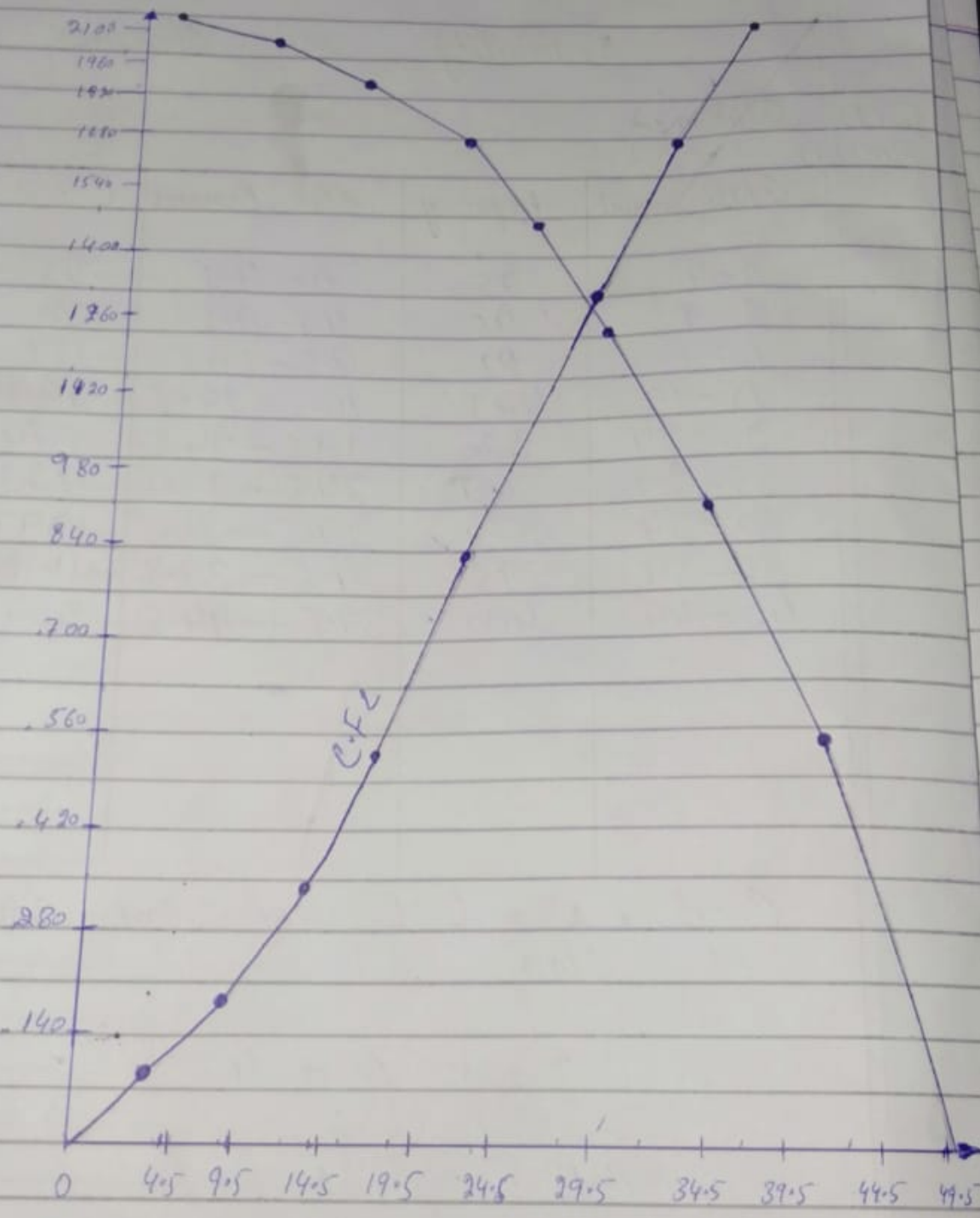
$C.B = \frac{UCL \text{ of } 1^{st} \text{ class} - LCL \text{ of } 2^{nd} \text{ class}}{2}$

$$C.B = \frac{5 - 4}{2}$$

$$C.B = \frac{1}{2}$$

$$C.B = \frac{4}{2} = \frac{1}{2}$$

$$C.B = 0.5$$

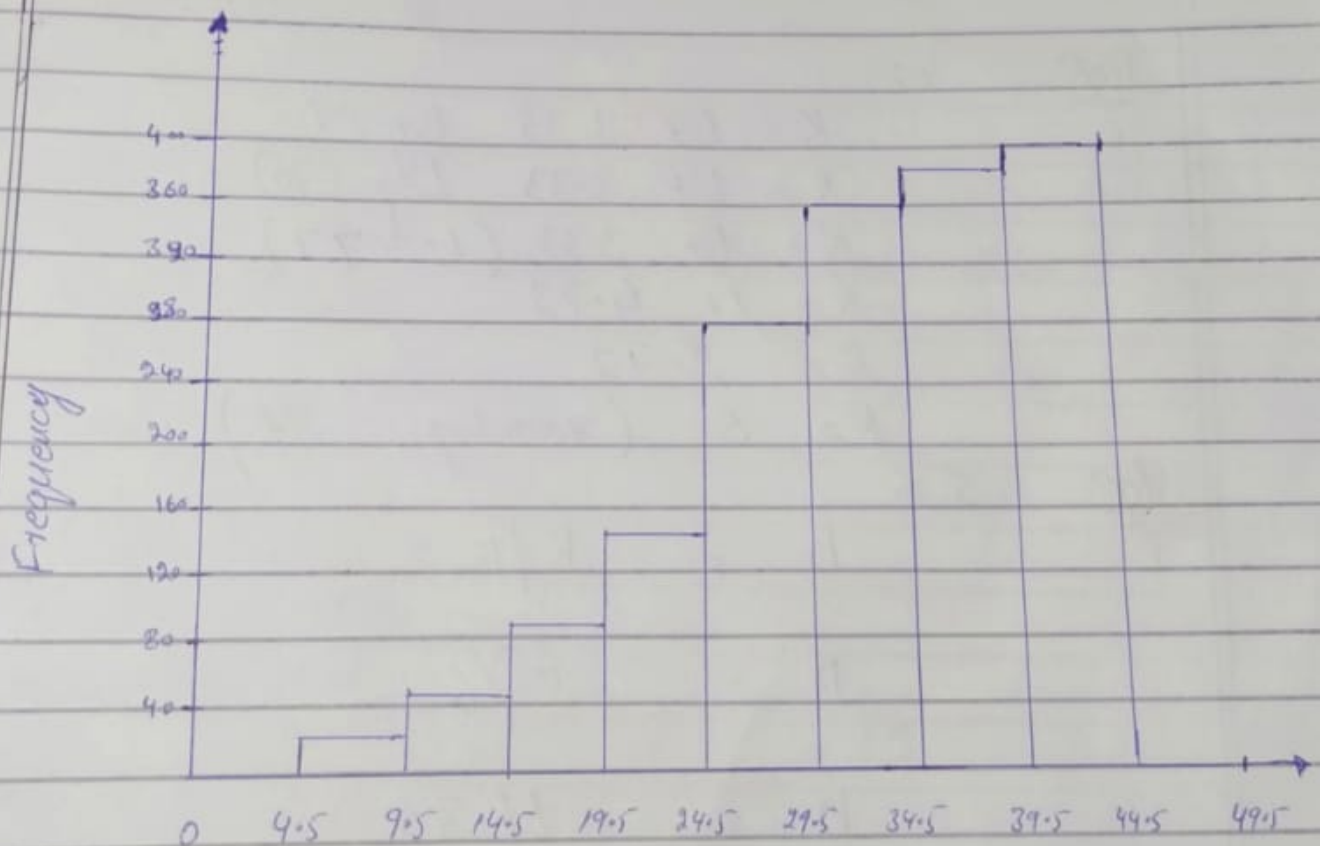


Class Boundaries

Q(1)

Q(2)

Class Interval	Frequency	Class Boundaries
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



Class Boundaries.

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

By Tolly Column

Classes	Class Boundaries	Class Mark	Frequency (f)	Cf	Tolly
363-374	362.5-374.5	368.5	4	4	
375-386	374.5-386.5	380.5	4	8	
387-398	386.5-398.5	392.5	8	16	
399-410	398.5-410.5	404.5	7	23	
411-422	410.5-422.5	416.5	4	27	
423-434	422.5-434.5	428.5	3	30	

Mean :-

3

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

30

$$\bar{x} = \frac{11914}{30}$$

$$\bar{x} = 397$$

Mode

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

$$\text{Here } l = 387, f_m = 8, f_1 = 4$$

$$f_2 = 7, h = 12$$

So

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

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

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

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

$$\text{Mode} = 396.6$$

$$\text{Mode} = 397$$

Quartiles :-

$$Q_1 = \frac{n}{4} = \frac{30}{4}$$

$$Q_1 = 7.5$$

which corresponds to value in class

375 - 386. Therefore

Silva

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ID#14974

BS(CS) 4th Semester

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

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

$$Q_1 = 375 + 3(3.5)$$

$$Q_1 = 375 + 10.5$$

$$Q_1 = 385.5$$

$$Q_1 = 386$$

Now

$$Q_3 = \frac{3n}{4} = \frac{3 \times 30}{4}$$

$$Q_3 = \frac{90}{4} = 22.5$$

Which corresponds to value in class 399 - 410. Therefore

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

$$Q_3 = 399 + \frac{12}{7} (22.5 - 16) \therefore c = 16$$

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

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

$$Q_3 = 399 + 11$$

$$Q_3 = 410$$

Q 3

Ans

Solution:-
7First data

3, 6, 2, 1, 7, 5

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

$$\text{Mean} = \frac{24}{6}$$

$$\text{Mean} = 4$$

x	x ²	S. Deviation = $\sqrt{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}$
3	9	S. D = $\sqrt{\frac{124}{6} - \frac{576}{36}}$
6	36	
2	4	S. D = $\sqrt{\frac{144}{36} - \frac{576}{36}}$
1	1	
7	49	S. D = $\sqrt{\frac{168}{36}}$
5	25	
$\sum = 24$	$\sum = 124$	

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

$$\text{S. D} = 2.2$$

Second data

11, 17, 9, 7, 19, 1

$$\text{Mean} = \frac{11+17+9+7+19+1}{6}$$

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

$$\text{Mean} = 13$$

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

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

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

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

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

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

$$S.D = 4.3$$

1st data Mean = 4

1st data S.D = 2.2

2nd data Mean = 13

2nd data S.D = 4.3

The required relation is that

→ Mean of 2nd data is greater than mean of 1st data and Standard deviation of 2nd data double the standard deviation of 1st data.

Q4:-

Ans

Solution:-

Classes	f_i	x	x^2	fix	fix^2
64-84	15	74	5476	1110	82140
85-104	18	94.5	8930.25	1701	160744.5
105-124	27	114.5	13102.25	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	2598.5	491793.25
	$\Sigma = 94$			$\Sigma = 11575.5$	$\Sigma = 1565029.75$

Variance :-

$$s^2 = \frac{\Sigma fix^2}{n} - \left(\frac{\Sigma fix}{n} \right)^2$$

$$s^2 = \frac{1565029.75}{94} - \left(\frac{11575.5}{94} \right)^2$$

$$s^2 = 16649.26 - 15164.35$$

$$s^2 = 1484.9$$

$$s^2 = 1485$$

Standard Deviation :-

Taking square root of eq (1),
we have

$$s = \sqrt{1485}$$

$$s = 38.5$$

Q 5

ms

(a) Comment :-

$\overline{?}$ No, it is not obviously that all the people have height of 5 feet 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) Comment :-

$\overline{?}$ No, it does not mean every students ~~those~~ in hope-less. Those students whose marks are less than 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.

(c) Comments :-

$\overline{?}$ 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.

The end