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Degree * B.S (software Engr)

PAPER * Probability & statistics

Teacher * Sir M. Daud

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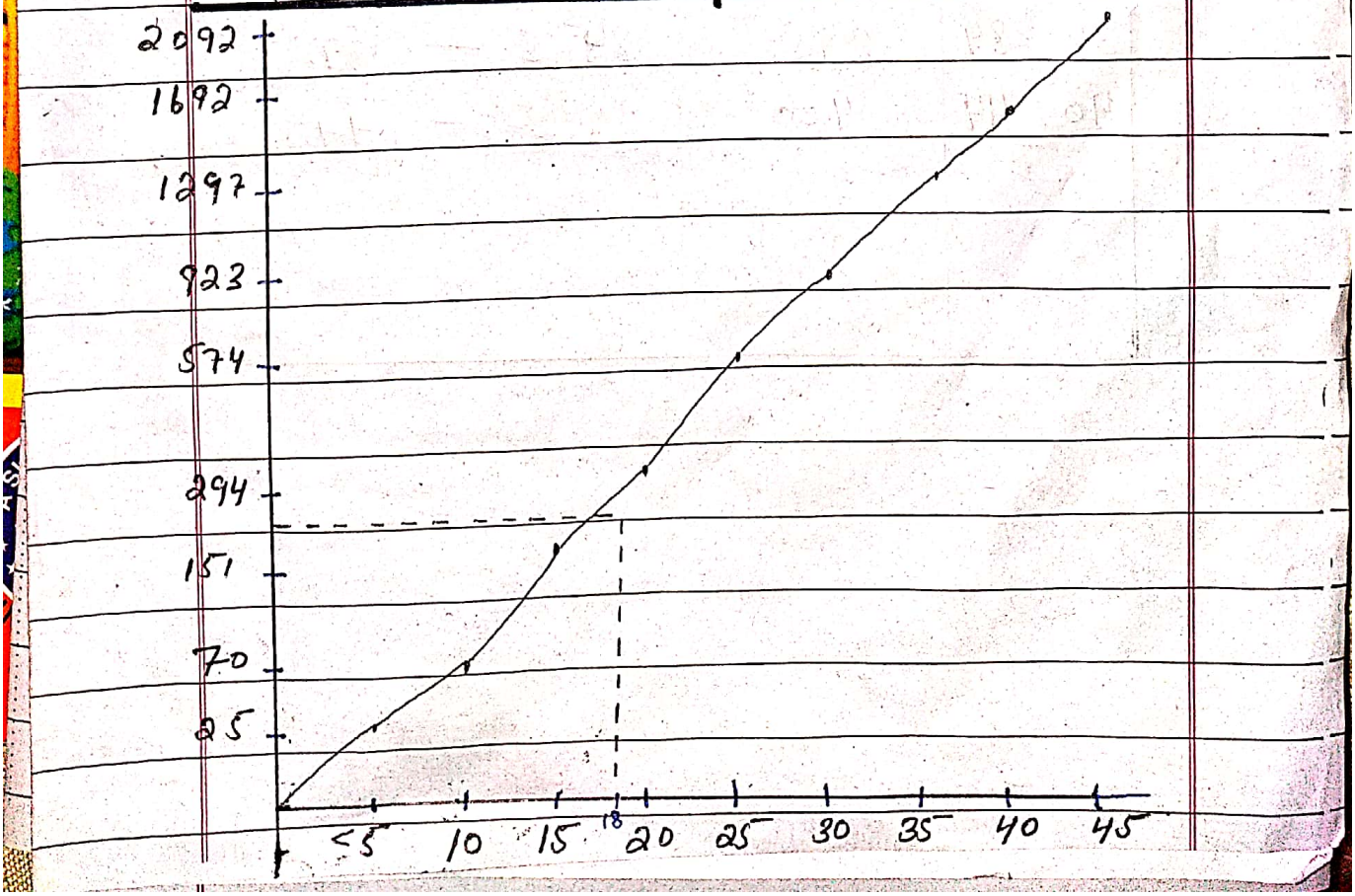
QUESTION - NO - 1

PART - 'A'

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

TIME Taken	5	10	15	20	25	30	35	40	45
Frequen	25	45	81	143	280	349	374	395	400
comulative frequency	25	70	151	294	574	923	1297	1692	2092



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While students go to school approximately 200 Students take less than 18 minutes.

PART 'B'

Class Inter	Frequency	Class boundry
0 - 4	25	0.05 - 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	375	29.5 - 34.5
35 - 39	395	34.5 - 39.5
40 - 44	400	39.5 - 44.5

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Histogram

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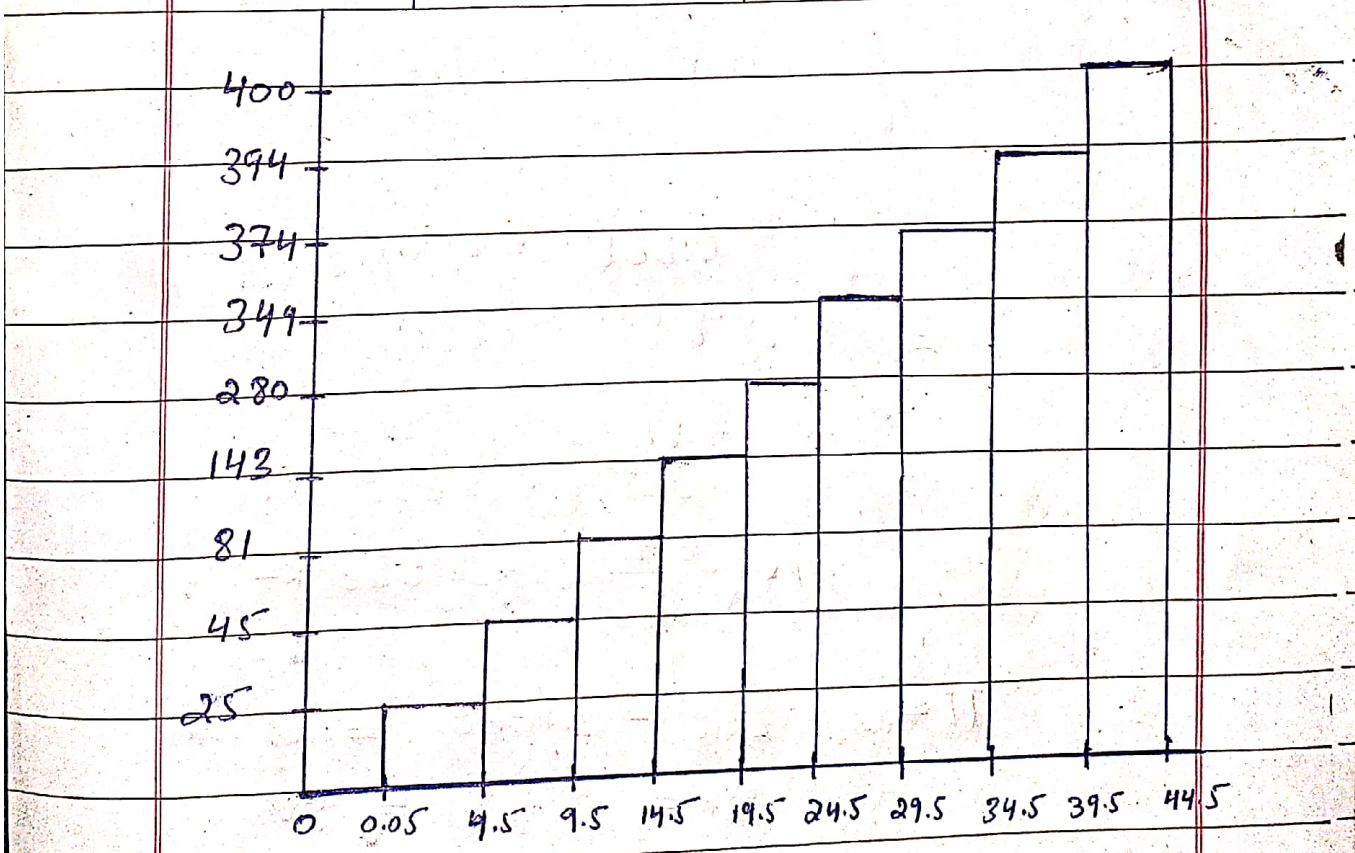
For histogram we need to construct frequency distribution table:

Class	F	
0 – 4	25	0.05 – 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

Construct grouped distrution table

423, 369, 387, 411, 393, 394, 371, 377, 389, 409, 392, 408

431, 401, 363, 391, 405, 382, 400, 381, 399, 415, 428, 422

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Total number = 30

smallest num = 362

largest num = 431

$R = 431 - 362 = 69$

Class interval

$K = 1 + 3.33 \log 30$

$K = 1 + 3.33 (1.47)$

$K = 1 + 4.8951$

$K = 5.8951$

$K = 6$

Class width

$h = R/K$

$= \frac{69}{6} = 11.5$

Class	F	Mid-P(x)	F.x
362 - 372	4	367	1468
373 - 383	3	378	1134
384 - 394	8	389	3112
395 - 405	5	400	2000
406 - 416	5	411	2055
417 - 427	3	422	1266
428 - 431	2	483	866
	$\Sigma f = 30$		11901

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$$\bar{x} = \frac{\Sigma f_i x}{\Sigma f} \Rightarrow \frac{11901}{396.7} \neq$$

Mean $\bar{x} = \frac{11901}{30} \Rightarrow 396.7$

Mode:-

class	F	M.d
362 - 372	4	361.5 - 372.5
373 - 383	3	372.5 - 383.5
384 - 394	8	383.5 - 394.5 ← mode
395 - 405	5	394.5 - 405.5
406 - 416	5	405.5 - 416.5
417 - 427	3	416.5 - 427.5
428 - 439	2	427.5 - 439.5

$$\text{Mode} = l_m + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2}\right) \times h$$

$l_m = \frac{384 + 383}{2} = 383.5$

$\Delta_1 = 8 - 3 = 5$

$\Delta_2 = 8 - 5 = 7$

$h = 394.5 - 383.5 = 11$

$\Rightarrow 383.5 + \left(\frac{5}{5+7}\right) \times 11$

$383.5 + \frac{55}{12}$

$\Rightarrow 4.583 + 383.5$

Mode = 388.0

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Quartiles :-

$$G_r = l + \frac{\frac{rN}{4} - cf_{-1}}{f_q} \times i$$

Class	F	C.F
362 - 372	4	4
373 - 383	3	7
384 - 394	8	15
395 - 405	5	20
406 - 416	5	25
417 - 427	3	28
428 - 439	2	30
	30	

$$G_1 = \frac{r \cdot N}{4} = \frac{1 \times 30}{4} = 7.5$$

$l = 384$, $cf_1 = 7$, $f_q = 8$, $i = 10$

$$G_1 = 384 + \frac{7.5 - 7}{8} \times 10$$

$$G_1 = 389.6$$

G_2 = $l = 384$, $cf_1 = 7$ ~~$\frac{2 \times 30}{4} - 15$~~, $f_q = 8$, $i = 10$

~~$384 + 15 - 16$~~

$$= 384 + \frac{15 - 7}{8} \times 10$$

$$G_2 = 394$$

$G_3 = \frac{rN}{4} = \frac{3 \times 80}{4} = 22.5$

$l = 406, \ cf = 20, \ f_g = 5, \ i = 10$

$406 + \frac{225 - 20}{5} \times 10$

$G_3 = 411$

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QUESTION - No - 4

ANS:-

class	F	x	$(x - \bar{x})$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
64 - 84	15	74 ~~79.14~~	-49.14	2414.7	36220.5
85 - 104	18	94.5	-28.69	820.2	14763.6
105 - 124	27	114.5	-8.64	74.6	2015.2
125 - 144	10	134.5	11.36	129.0	1290
145 - 164	6	154.5	31.36	129	774
165 - 184	5	174.5	51.36	983.4	4917
185 - 204	13	194.5	71.36	5092.2	66198.6

$\Sigma f = 94$ $\qquad \Sigma f(x - \bar{x})^2 = 126,178.9$

$\bar{x} = \frac{\Sigma f x}{\Sigma f}$

$\bar{x} = \frac{(15)(74) + (18)(94.5) + (27)(114.5) + (10)(134.5) + (6)(154.5) + (5)(174.5) + (13)(194.5)}{94}$

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$$\bar{x} = \frac{1110 + 1701 + 3091.5 + 1345 + 927 + 872.5 + 2528.5}{94}$$

$$\bar{x} = \frac{11575.5}{94}$$

$$\bar{x} = 123.14$$

Now

$$S^2 = \frac{\Sigma f (x - \bar{x})^2}{\Sigma f}$$

$$S^2 = \frac{126,178.9}{94}$$

$$S^2 = 1342.3$$

$$\sqrt{S^2} = \sqrt{1342.3}$$

$$S = 36.64$$

Standard deviation

$$v = \frac{\Sigma f (x - \bar{x})^2}{\Sigma f - 1}$$

$$v = \frac{126,178.9}{94 - 1}$$

$$v = \frac{126,178.9}{93}$$

$$v = 1356.762$$

variance.

QUESTION - No - 3

By multiplying each of the number 3, 6, 2, 17, 5 by 2 and then adding 5, we obtain 11, 17, 9, 19, 15. What is the relation between standard devtions and the means of the the two sets.

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ANSWER :-

first Let's find mean

$$\text{Mean} = \frac{\text{Sum of observation}}{\text{Number of obs}}$$

$$\text{Mean} = \frac{24}{6} = 4$$

Let's find median

→ write the set in Ascading form or order

1, 2, 3, 5, 6, 7

$$\text{Median} = \frac{3+5}{2} = 4$$

$\bar{x} = 4$

Range = 7 - 1 = 6

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

x_i	$x - \bar{x}$	$(x - \bar{x})^2$
1	-3	9
2	-2	4
3	-1	1
5	1	1
6	2	4
7	3	6
		25

$$S = \frac{25}{6}$$

standard deviation for the first is

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After multiplying the first set with 2 and adding 5 we get 11, 17, 9, 19, 15, 7

write it an ascending order

7, 9, 11, 15, 17, 19

$$\text{Mean} = \frac{78}{6} = 13$$

$$\text{Median} = \frac{11 + 15}{2} = 13$$

Range = 12

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

x	$x - \bar{x}$	$(x - \bar{x})^2$
7	-6	36
9	-4	16
11	-2	4
15	2	4
17	4	16
19	6	36
		112

$$S = \frac{112}{6} = 18.66$$

Note. When we Both add and multiply a digit to the set. All the statistical values will be change including mean and standard deviation.

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The first set is 3, 6, 2, 1, 7, 5 if we just add 5 lets see what changes write in Ascanding order.

1, 2, 3, 5, 6, 7

Add 5 to each digit of the set

6, 7, 8, 10, 11, 12

$$\text{Mean} = \frac{54}{9} = 9$$

$$\text{Median} = \frac{8+10}{2} = 9$$

Standard deviation $= \frac{\Sigma(x-\bar{x})^2}{\Sigma f}$

x	$x-\bar{x}$	$(x-\bar{x})^2$
6	-3	9
7	-2	4
8	-1	1
10	1	1
11	2	4
12	3	6

$$\text{Standard deviation} = \frac{25}{6} = 4.16$$

Remember: when we add or subtract value from a set it can effect the mean but it can not effect the standard deviation.

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Comparision of three different sets

1, 2, 3, 5, 6, 7 ↓ 1, 2, 3, 5, 6, 7	1, 2, 3, 5, 6, 7 Adding 5 ↓ 6, 7, 8, 10, 11, 12	1, 2, 3, 5, 6, 7 multiplying 2 and adding 5 11, 17, 9, 19, 15, 7
Mean = 4	Mean = 9	Mean = 13
Median = 4	Median = 9	Median = 13
Range = 6	Range = 6	Range = 12
Standard deviation = 4.16	Standard deviation = 4.16	Standard deviation = 18.66

Note :- The relation of mean and standard deviation depends upon the values when we add or subtract their will be no effect on the standard deviation while it will effect the mean When we multiply the set by any scalar so all the statistics value can be change and effected.

As we compare all these two cases above in the table of comparision.

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QUESTION - No - 5

"A" => Point A show that the average depth is 5 Feet therefore all the people with hight 5 Feet can cross it but with a hight less than 5 Feet cannot cross it.

"B" =>

Point B show that all students average marks are 30 which show the poor condition of whole class

"C" =>

Point C show that the direct correlation among average income of king family and payments to their servents.