Hw#1.

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Paper = Probability & Statistics.
Teacher = Sir Daud.

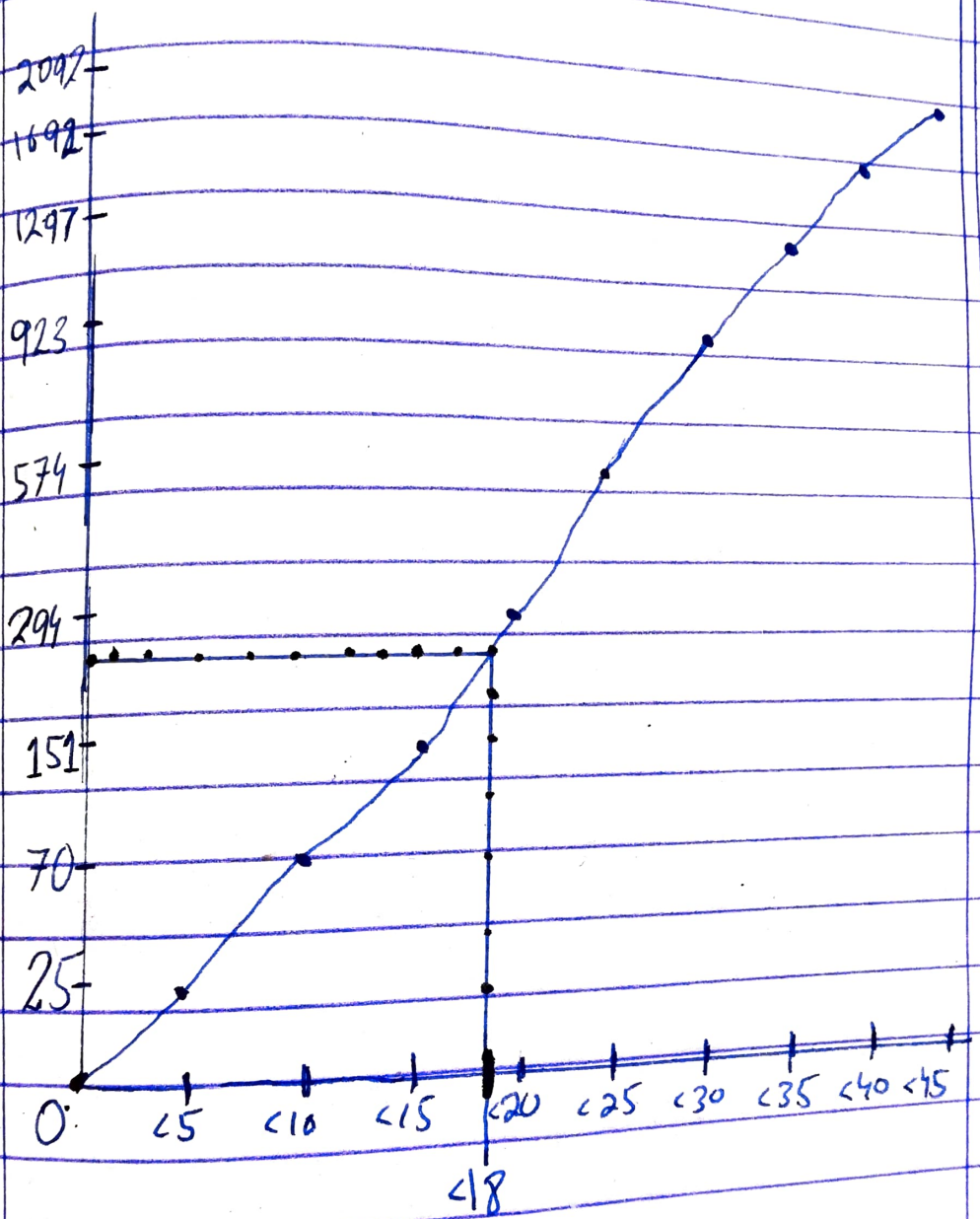
Q1:- Students were asked how long it took them to walk to school on a particular morning. A cumulative frequency distribution was formed.

Time taken in minutes :-	<5	<10	<15	<20
Frequency :-	25	45	81	143

<25	<30	<35	<40	<45
280	349	374	395	400

a):- Draw a comulative frequency curve & estimate how many students took less than 18 minutes.

Ans:- Cumulative frequency = 25, 70, 151, 294, 574, 923, 1297, 1692, 2092.



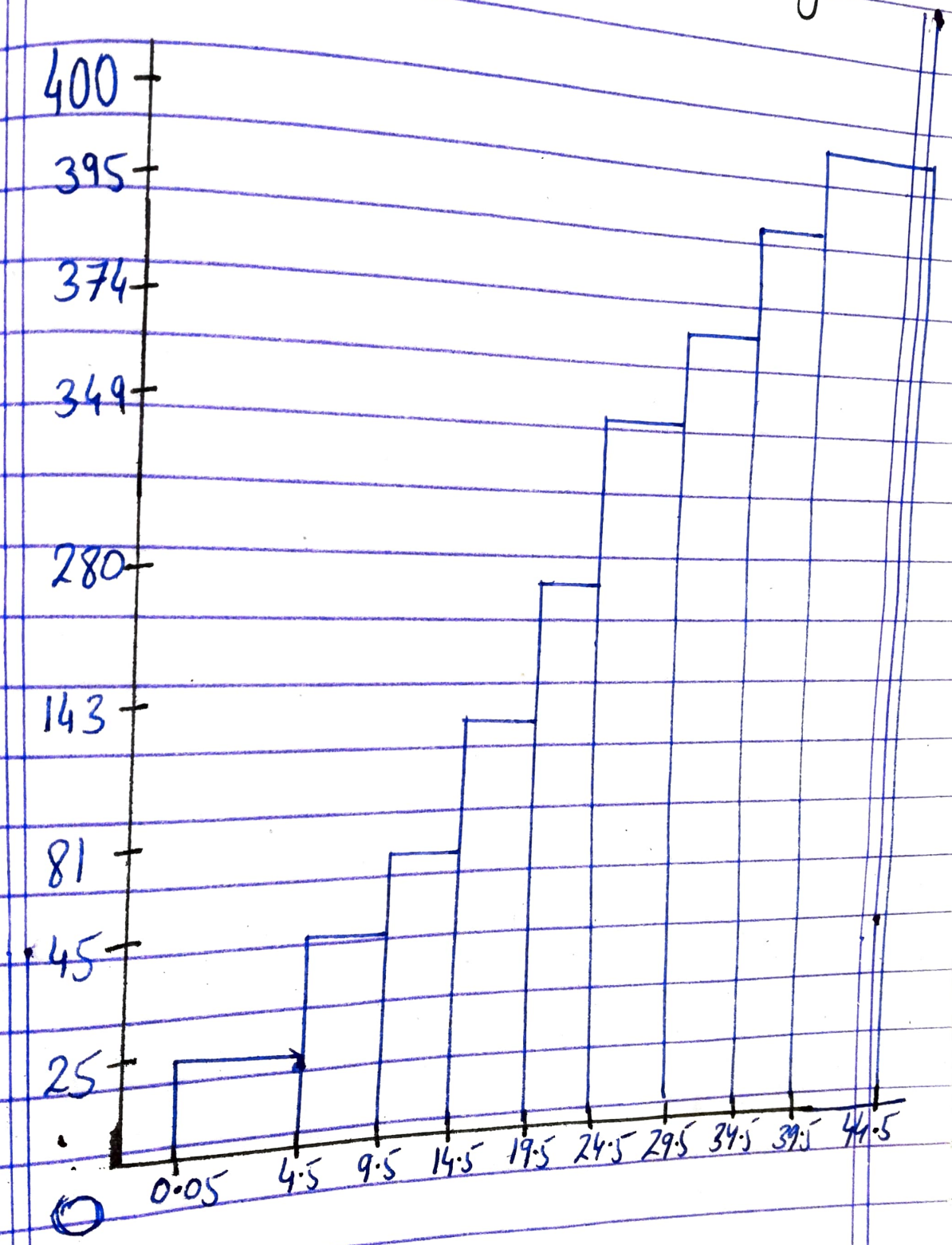
Approximately 235 students took less than 18 minutes.

b):- Take equal class intervals of 0-, 5-, 10- etc,, Construct frequency distribution & draw a histogram.

Ans:- 1st Step:

Construct frequency distribution table.

Class interval	Frequency	C.Boundary.
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


400
395
374
349
280
143
81
45
25
0
0.05
4.5
9.5
14.5
19.5
24.5
29.5
34.5
39.5
44.5

Q2:- Construct a grouped distribution table for the following data & calculate Mean, Mode & 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 -

Ans:-a Total number of data = 30
Smallest data = 362
Largest data = 431
Range = 431 - 362 = 69.
Class interval = $1 + 3.33 \log 30$
" = $1 + 3.33 (1.47)$ = $1 + 4.8951$
Class interval = k = = $5.8951 = 6$

Class width = R/k ∵ Where k = class interval. & ∵ R = Range.

$h = R/k$ ∵ h = class width.
$= \frac{69}{6} = 11.5$.

$= 11.5$

bon table
lculate

371, 377
3, 391,
8, 422,

51

Class	frequency	C.Mark.	Fx
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	433	866.
	$\Sigma f = 30$		11901

b:- $\bar{x}$ = Mean

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{11901}{30} = 396.7.$$

$\bar{x} = 396.7.$

c):- Mode:

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
428-431	2	427.5 - 431.5

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

$= 383.5 + \frac{(8-3)}{(8-3)+(8-5)} \times 11$

$= 383.5 + 6.875$

$= 390.375$.

c= Quartiles:

Class	frequency	Cf.
362-372	4	4
373-383	3	7
384-394	8	15
395-405	5	20
406-416	5	25
417-427	3	28
428-431	2	30
	30	

$Q_r = l + \frac{rN}{4} - Cf - 1 \times i$

f_2

a):- $Q_1 = \frac{r \cdot N}{4} = \frac{1 \times 30}{4} = 7.5$.

$l = 384$, $Cf-1 = 7$, $f_2 = 8$, $i = 10$.

$$Q_1 = 384 + \frac{7.5 - 7}{8} \times 10.$$

$$Q_1 = 389.6.$$

b):- $Q_2 =$ $l = 384$, $Cf = 1 =$, $f_2 = 8$, $i = 10$.

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

$$Q_2 = 394.$$

c):- $Q_3 : \frac{xN}{4} = \frac{3 \times 30}{4}$ 22.5

$l = 406$, $Cf-1 = 20$, $f_2 = 5$, $i = 10$.

$$= 406 + \frac{22.5 - 20}{5} \times 10.$$

$$Q_3 = 411$$

Ans

Q3:- For the following grouped distribution table calculate the variance & 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

Ans:-

Class	F	x	$(x-\bar{x})$	$(x-\bar{x})^2$	$f(x-\bar{x})^2$
64-84	15	74	-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.	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
	$\Sigma f = 94$				$\Sigma f(x-\bar{x})^2 = 126,178.9$

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

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

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

$$\bar{x} = 123.14.$$

Now finding standard deviation.

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

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

$$S^2 = 1342.3$$

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

$$S = 36.64.$$

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

$$V = \frac{126,178.9}{94 - 1} = \frac{126,178.9}{93}$$

$$V = 1356.762.$$

Q4:- By multiplying each of the numbers 3, 6, 2, 1, 7, 5, by 2 & then adding 5, we obtain 11, 17, 9, 7, 19, 15. What is the relation blw the standard deviation & the means of the two sets.

Ans Comparison of three different sets of data.

1, 2, 3, 5, 6, 7	11, 17, 9, 15, 19, 7 & adding 5	~~multiplying 2 & adding 5~~
↓	↓	
1, 2, 3, 5, 6, 7	6, 7, 8, 10, 11, 12	
Range = 6	Range = 6	
Mean = 4	Mean = 9	
Median = 4	Median = 9	
Standard = 4.16.	Standard = 4.16.	

The relation of mean & Standard deviation deviation depend upon the values when we add or sub. There will be no effect on "S.D" while it will effect "mean" -

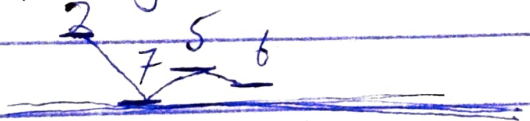
Qs:- Comment the following:

a:- Question written in question paper.

b:- " " " " "

c:- " " " " "

Ans:- a):- Shows high level of dispersion as it can be observed from given data i.e 2, 7, 5, 6 while avg = 5 reflects all these points are different from average value showing dispersion.



b):- Point = 2 shows avg marks of all students i.e 30. Which shows the poor condition & result of whole class.

c):- Point = 3 shows the direct correlation among average income of king's family & payment of their servents. So the servents should be given high salaries.