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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

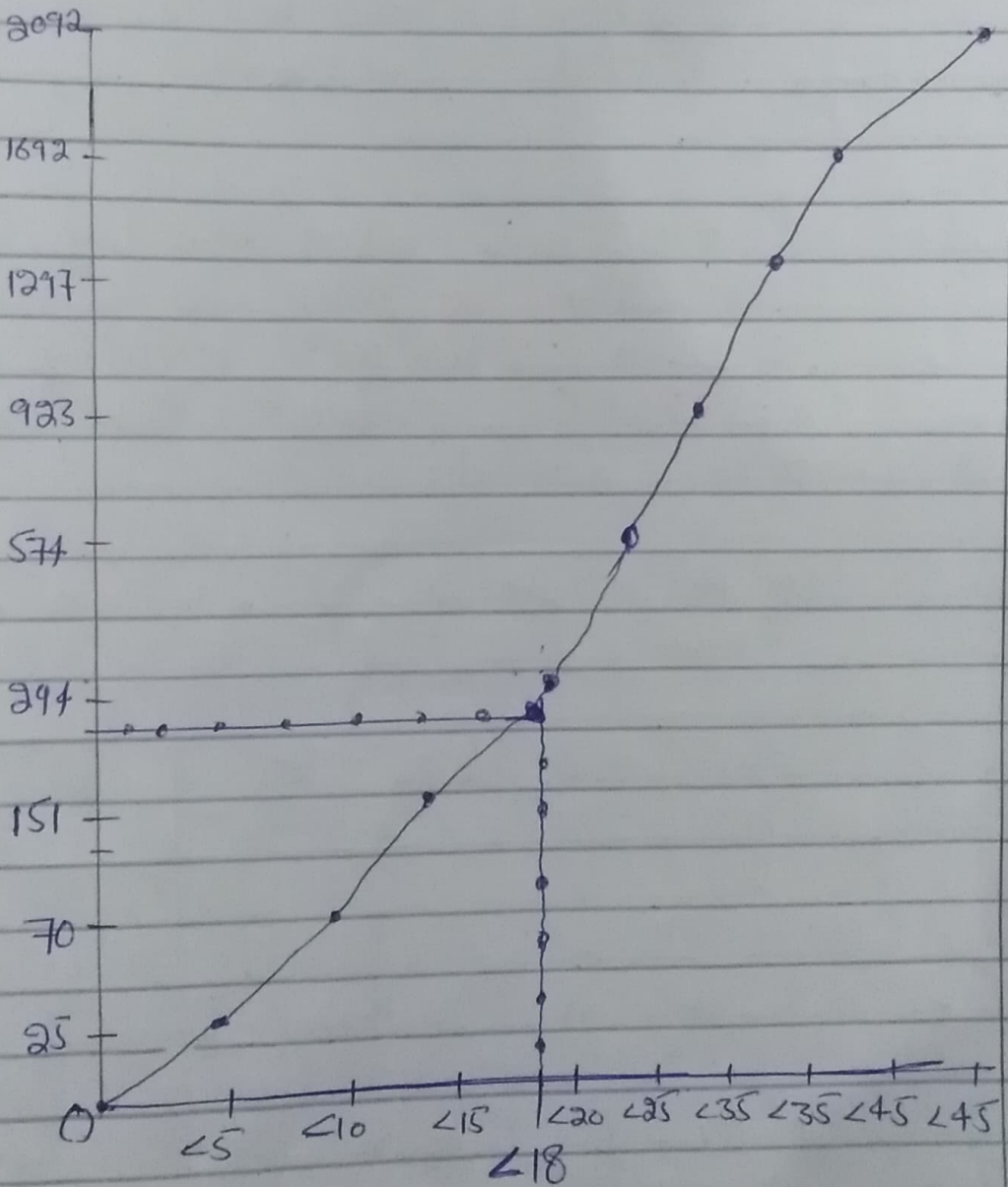
(a)

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

Ans:

Cumulative frequency = 25, 70, 151, ~~219~~ 294, 374, 423, 497, 692, 792.

Page 2 :



⇒ Approximately 239 students took less than 18 minutes.

Page 3 :-

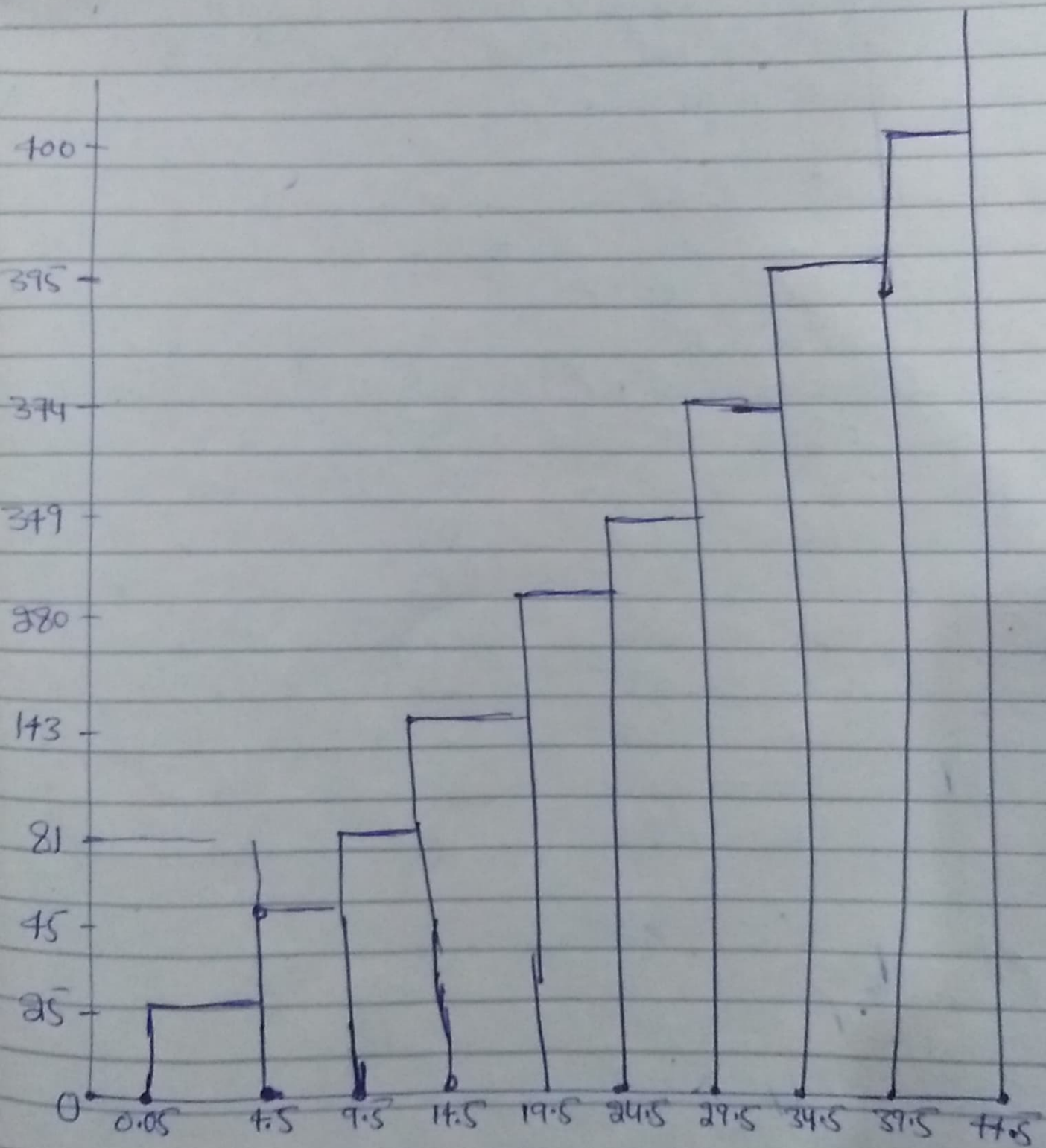
b:-

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

Ans

First 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



Q2:

Construct a grouped distribution table for the following data and calculate mean, mode and Quartile.  
 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~~,  $431 - 362 = 69$ .

class Interval =  $1 + 3.33 \log 30$

" " =  $1 + 3.33 (1.47) = 1 + 4.8951$

class Interval =  $k = 5.8951 = 6$

Class width =  $R/k$

$\therefore$  where  $k$  is equal to class interval

$\therefore R = \text{Range}$

$\therefore h = \text{class width}$

$$h = R/k$$

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

$$= 11.5$$

Class Frequency C. Mark  $\bar{Fx}$  Page # 6

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
$\Sigma f = 30$			<u>11901</u>

$\bar{x}$  = Mean

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

$$\bar{x} = 396.7$$

c)  $\Rightarrow$  Mode :-

362-372	4	361.5 - 372.5	
373-383	3	372.5 - 383.5	
384-394	8	383.5 - 394.5	$\Rightarrow$ 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 =

Page # 7

$$\begin{aligned} & \frac{l + (f_m - f_1) \times h}{(f_m - f_1) + (f_m - f_2)} \\ & = \frac{383.5 + (8 - 3) \times 11}{(8 - 3) + (8 - 5)} \\ & = \frac{383.5 + 6.6875}{6.6875} \\ & = 390.375 \end{aligned}$$

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

$$Q_1 = \frac{l + \frac{8 \cdot N}{4} - cf - 1 \times i}{f_2}$$

$$Q_1 = \frac{8 \cdot N}{4} = \frac{1 \times 30}{4} = 7.5$$

$$Q_1 = \frac{l + \frac{8 \cdot N}{4} - cf - 1 \times i}{f_2} = \frac{384 + 7.5 - 7 \times 10}{8}$$

$$Q1 = 389.6$$

(b)

$$Q2 = l = 384, cf = 1, f_9 = 8, i = 10$$

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

$$Q2 = 394$$

(c)

$$Q3 = \frac{8N}{4} = \frac{3 \times 30}{4} = 22.5$$

$$l = 406, cf-1 = 20, f_9 = 5, i = 10$$

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

$$Q3 = 411$$

Ans



Q4 =

For the following grouped distribution table calculate the variance and standard deviation.

Class	64-84	85-104	105-124	125-144
Frequency	15	18	27	10

145-164	165-184	185-204
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	362020.5
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
<del>165-184</del>	<del>5</del>	<del>174.5</del>	<del>51.36</del>	<del>983.4</del>	<del>4917</del>
185-204	13	194.5	71.36	5092.2	66198.6
$\Sigma f = 94$		$\Sigma f(x - \bar{x})^2 = 126178.9$			

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

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

⇒ Page # 10

$$\bar{x} = \frac{1110 + 1701 + 3091 \cdot 5 + 1345 + 927 + 872 \cdot 5 + 2538 \cdot 5}{94}$$

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

$$\bar{x} = 123.14$$

NOW :

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

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

$$S^2 = 1342.3$$

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

$$S = 36.64$$

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.

Ans:-

Solution:

Suppose :-

$$D_1 = 3, 6, 2, 1, 7, 5$$

$$\text{and } D_2 = 11, 17, 9, 7, 19, 15$$

$x$	$x - \mu$	$(x - \mu)^2$	$x$	$(x - \mu)$	$(x - \mu)^2$
3	-1	1	11	-2	4
6	2	4	17	4	16
2	-2	4	9	-4	16
1	-3	9	7	-6	36
7	3	9	19	6	36
5	1	1	5	2	4
$\Sigma$ 24		28	78		112

$$\mu = \frac{\Sigma x}{n} = \frac{24}{6} = 4$$

$$\mu = 4$$

$$S = \sqrt{\frac{28}{6}} = \sqrt{4.666}$$

$$S = 2.160$$

$$\mu = 78/6 = 13$$

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

$$= \sqrt{18.66}$$

$$= 4.3197$$

⇒ If we multiply 2 with the mean of first data and add 5 we get the mean of the second. This shows that the Relation b/w these two data is as the relation between the mean.  
And Standard deviation is double of first.

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 5 feet can cross it.

Ans:

It shows the high level of dispersion as it can be observed from given data i.e., 2, 7, 5, 6 while the average = 5. reflects all other points are different from average value shows dispersion.

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

Ans: Point b reflects that all students average marks are 30 ~~where~~ which reflects the poor performance of whole class.

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.

Ans Point C reflects the direct Correlation among average income of King family and payments to their Servants i.e.:

King family Income ↑

→

Payment to Servant ↑