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NAME : M. HASSAN ADEEL.

ID : 15437.

DEPARTMENT : SOFTWARE ENGG.

PAPER : PROBABILITY & STATISTICS.

QUESTION: 1:

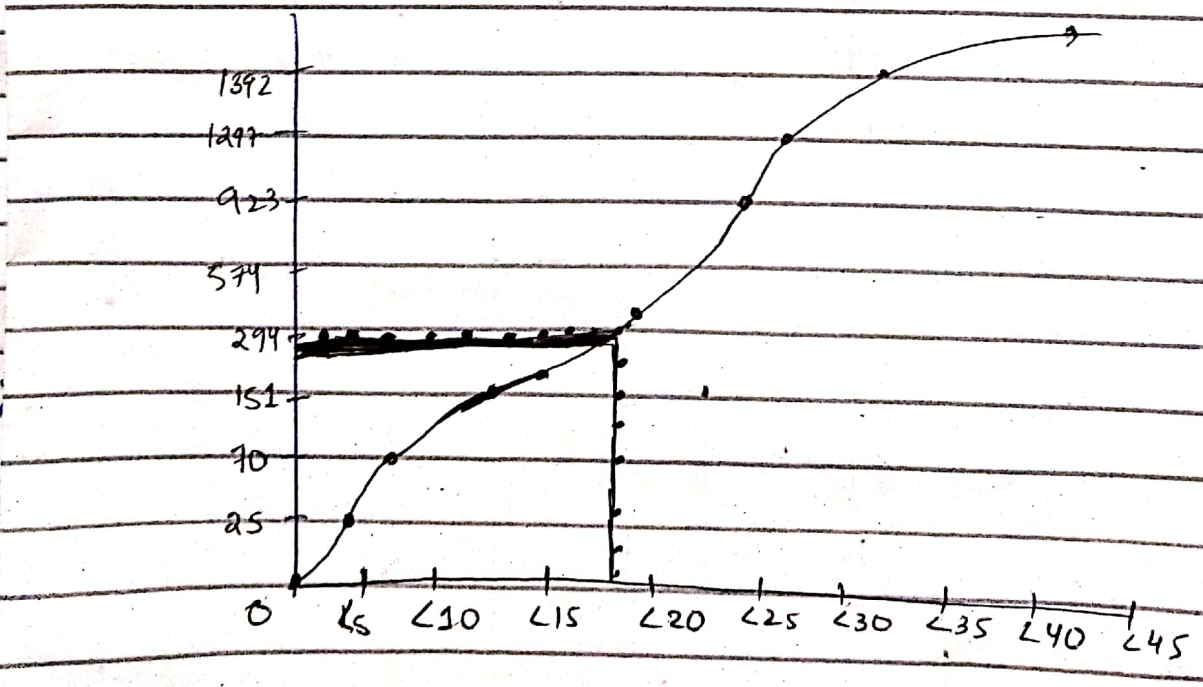
Students were asked how long it took them to walk to school on a particular morning. A cumulative frequency distribution was formed.

*) PART: A:

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

*) ANSWER:-

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



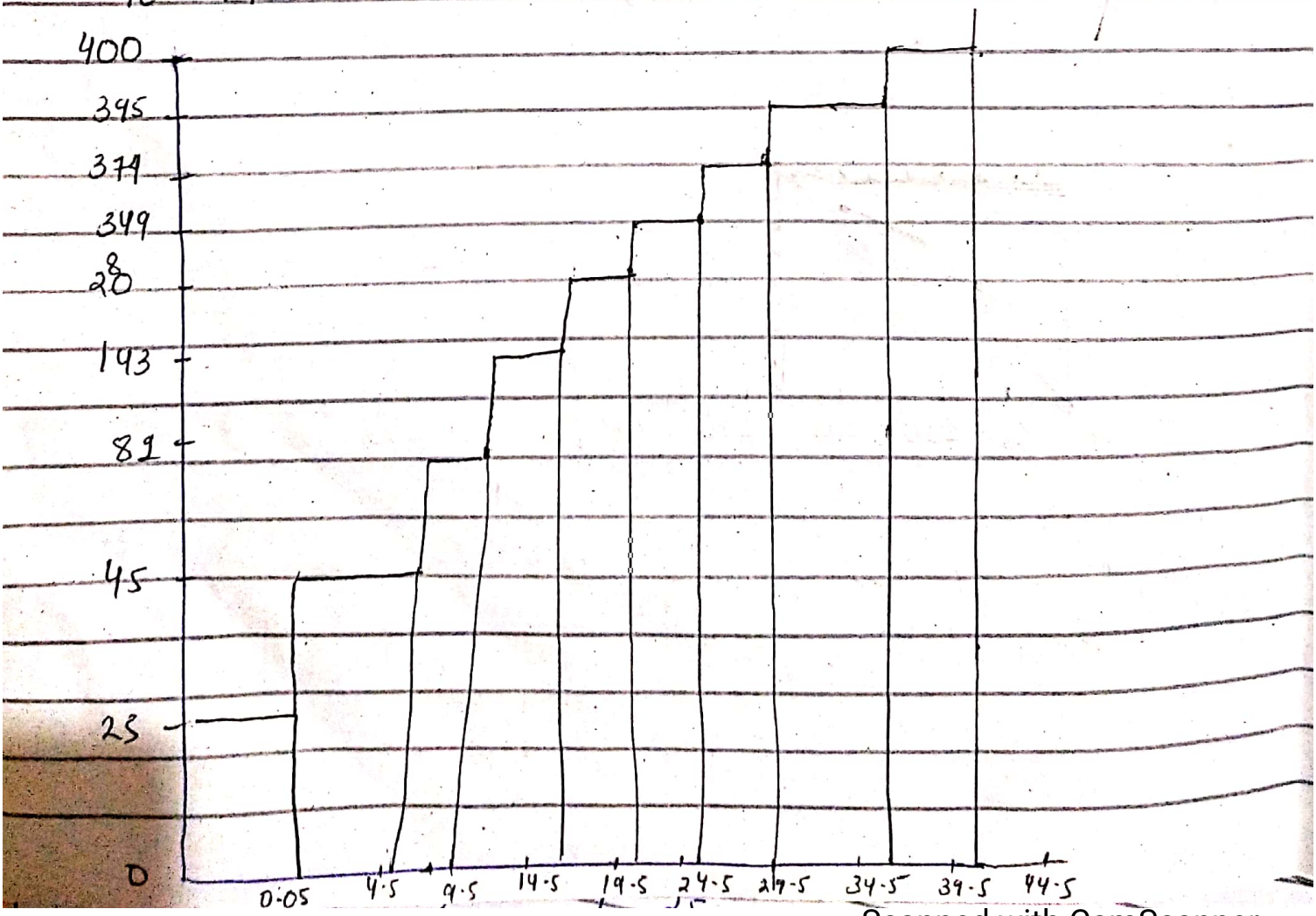
Approximately 235 students took less than 18 minutes.

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

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



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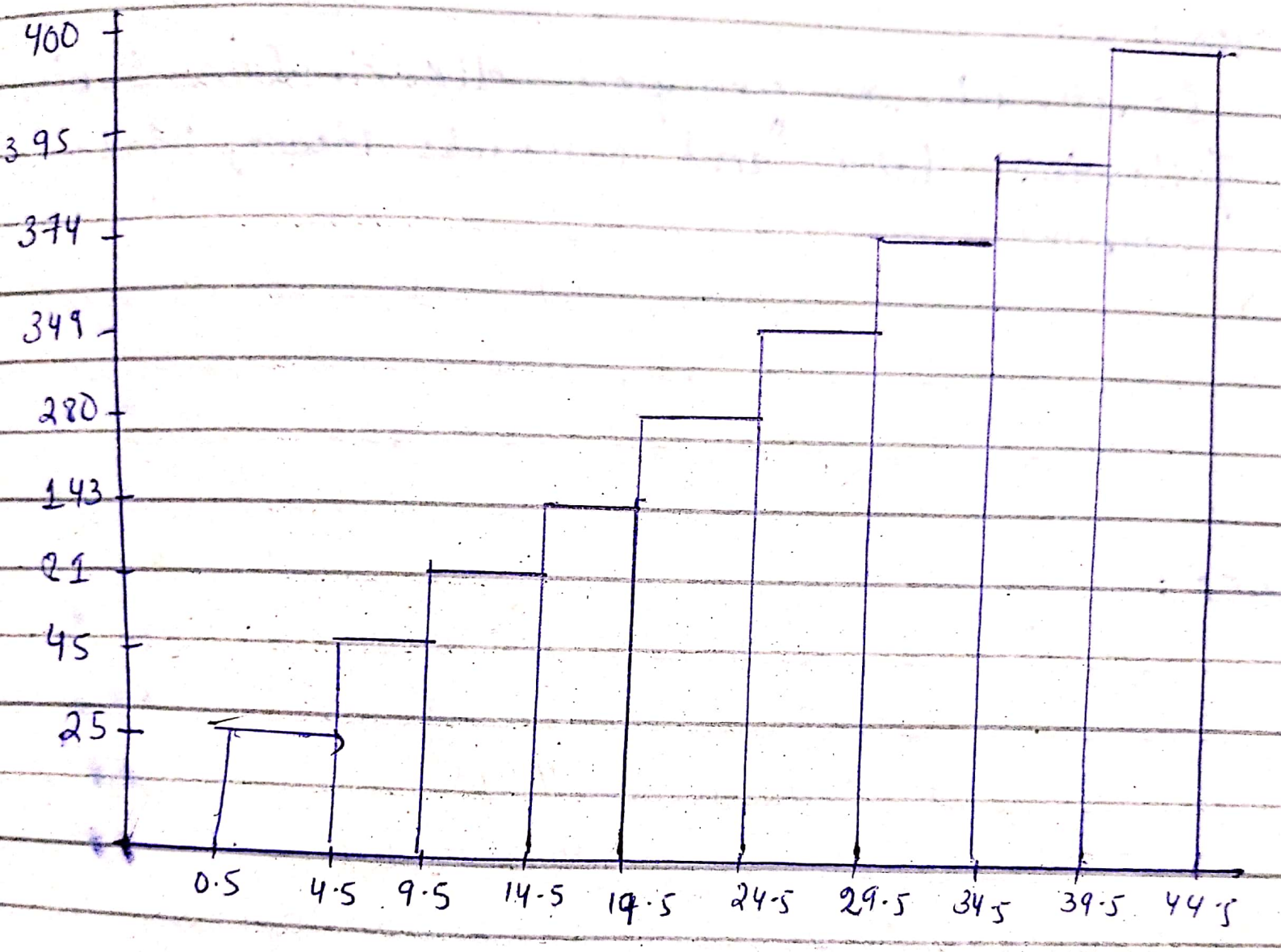

QUESTION: 2:

Construct a grouped distribution table for the following data and calculate Mean, Mode and Quartics.

423, 369, 387, 411, 393, 394, 371, 377, 389, 3409, 392, 408, 431, 401, 363, 391, 405, 382, 400, 381, 349, 415, 428, 422, 396, 372, 410, 419, 386, 390.

ANSWER:-

total number of data = 30

Smallest data = 362

Largest data = 431

Range = 431 - 369 = 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.

$= \frac{69}{6} = 11.5$ R = Range.

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 - 438	2	433	866
	$\Sigma f = 30$		11901

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

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

4) Mode :-

362 - 372	4	361.5 - 372.5
373 - 383	3	372.5 - 383.5
384 - 394	8	383.5 - 394.5
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.

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

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

$$= 383.5 + 6.875$$

$$= 390.375$$

*) QUARTILES :-

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	

$$Q_r = l + \frac{r \cdot N}{4} - 4 - 1 / f_q \times i$$

a) $Q1 = \frac{r \cdot IV}{4} = \frac{1 \times 30}{4} = 7.5$

$l = 384, \ cf = 1 = 7, \ fq = 8, \ i = 10$

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

$Q_1 = 389.6$

b) $Q.2 = l = 384, \ cf = 1, \ fq = 8, \ i = 10$

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

$Q_2 = 394$

) $Q:3 : \frac{r \, IV}{4} = \frac{3 \times 30}{4} = 22.5$

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

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

$Q_3 = 411$.

Answer.

Q3 For the following groupal distribution table calculate the variance by standard deviation.

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

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

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

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

$$S^2 = 1342.3$$

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

$$\boxed{S = 36.64}$$

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

$$V = \frac{126,178.9}{94-1} = \frac{126.178.9}{93}$$

$$V = 1356.762.$$

QUESTION : 5 :

Point 1: shows the high level of dispension as it can be observed from given data i-e 2, 7, 5, 6 whole the average = 5 reflects an other points are different from average value shows disper

Point 2: reflects that all student average masks are 50 which reflects the poor performance of whole class.

Point 3: reflects the direct correlation among average income of king family and payment to their servants i-e

Kings family income ↑ ⟶ Payment to servants ↑