NAME : UMAIR KHAN

I.D : 14596

PAPER : PROBABILITY AND STATISTICS.

SEMISTER : 4th

CLASS-TIMING : Sat' THURSDAY (02 — 05 PM)

Q. No # 01 :

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

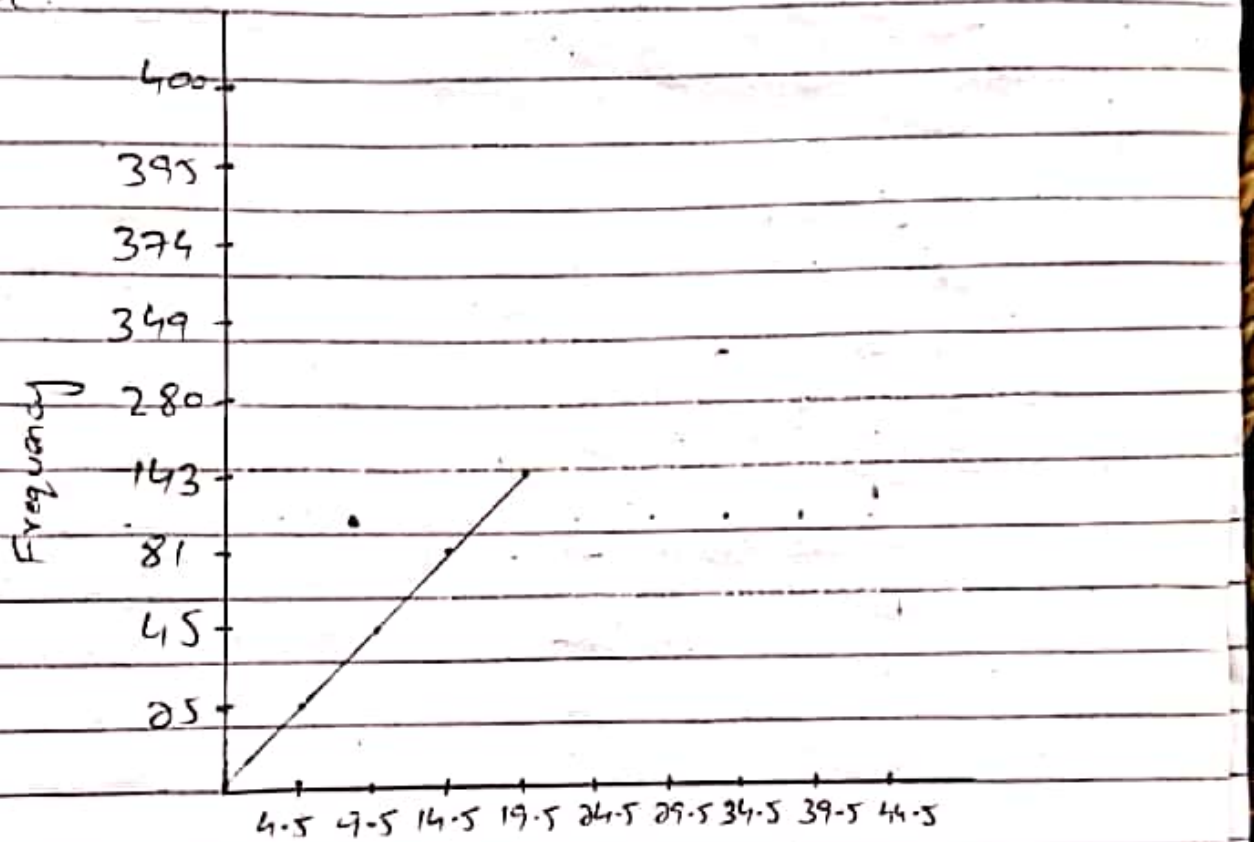
Time taken	Frequency
< 5	25
< 10	45
< 15	81
< 20	143
< 25	280
< 30	349
< 35	374
< 40	395
< 45	400

Sol :

Class Interval	Frequency	class boundaries
05 — 09	25	4.5 — 9.5
10 — 14	45	9.5 — 14.5
15 — 19	81	14.5 — 19.5
20 — 24	143	19.5 — 24.5
25 — 29	280	24.5 — 29.5
30 — 34	349	29.5 — 34.5
34 — 39	374	34.5 — 39.5
40 — 44	395	39.5 — 44.5
45 — 49	400	44.5 — 49.5

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

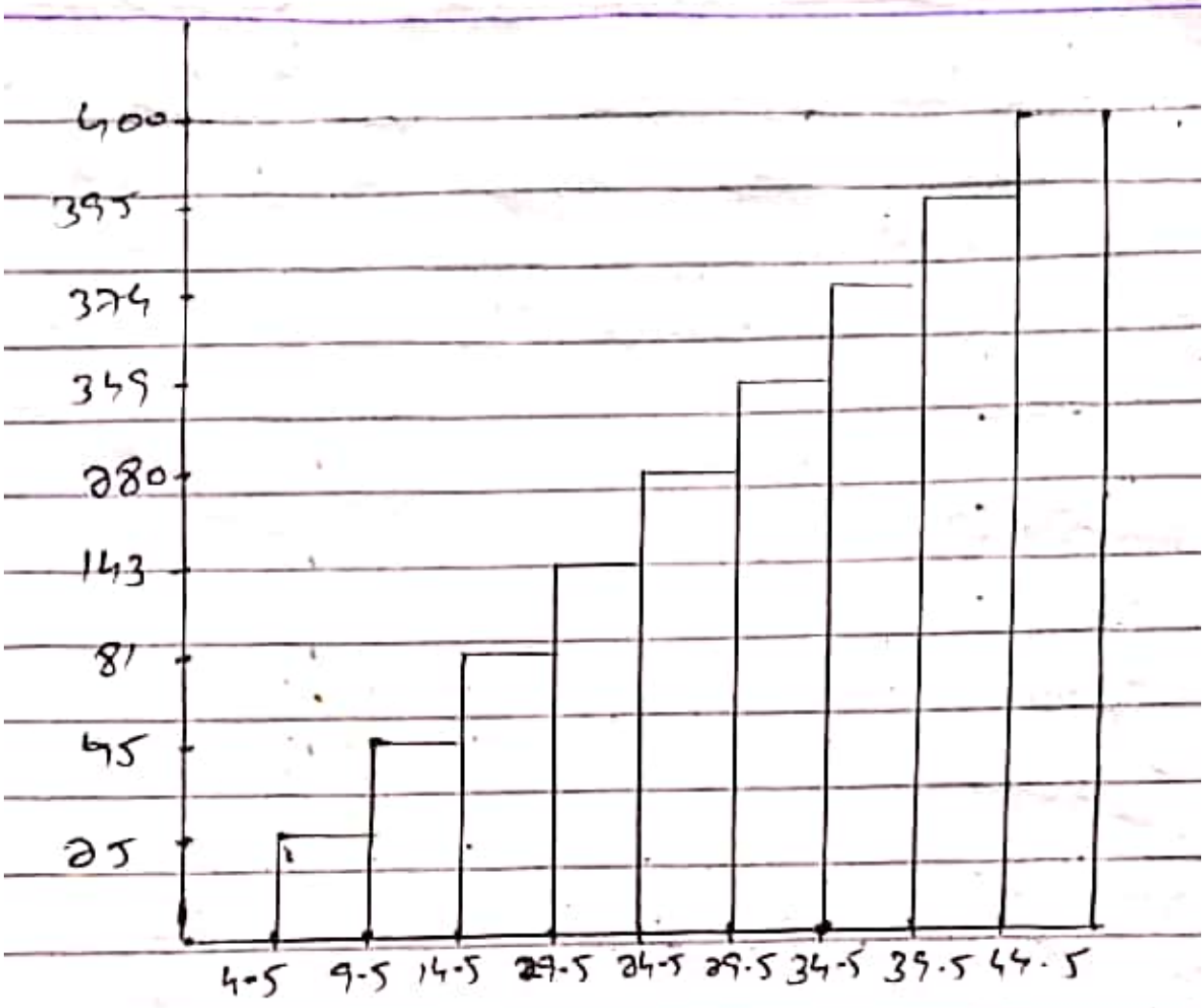
Sol:



=> 143 students completed work in less than 18 minutes.

(b) Take equal class intervals of 0-5, 5-10, 10-15 etc, construct frequency distribution & draw a histogram.

Sol:



Histogram

Q. No # 03

Construct a grouped distribution table for the following data & calculate Mode, Mean & Quartiles.

403, 369, 387, 411, 393, 394,
371, 377, 389, 409, 352, 409,
431, 401, 363, 391, 405, 352,
400, 381, 399, 415, 428, 422,
396, 372, 410, 419, 386, 350.

Sol:

Highest Value = 431
Lowest Value = 363
Class Interval = 10

Class Interval	f	Class - Boundaries	Commulative Frequency
361 - 370	2	360.5 - 370.5	2
371 - 380	3	370.5 - 380.5	2+3 = 5
381 - 390	6	380.5 - 390.5	5+6 = 11
391 - 400	7	390.5 - 400.5	11+7 = 18
401 - 410	5	400.5 - 410.5	18+5 = 23
411 - 420	3	410.5 - 420.5	23+3 = 26
421 - 430	2	420.5 - 430.5	26+2 = 28
431 - 440	1	430.5 - 440.5	28+1 = 29

As $\text{Mode} = l + \left(\frac{f_m - f_0}{2f_m - f_0 - f_1} \right) \times h \rightarrow (1)$

$\because$ l = Lower Class Limit = 370.5

$\because$ f_m = frequency of model group = 3

$\because$ f_0 = frequency of group proceeding the group = 2

f_1 = frequency of group following the model = 7

h = class Interval = 10

Putting the values in (1)

$$\text{Mode} = 370.5 + \left(\frac{3-2}{2(3)-(2-7)} \right) \times 10$$

$$\text{Mode} = 370.5 + \left(\frac{1}{6-(-5)} \right) \times 10$$

$$\text{Mode} = 370.5 + \left(\frac{10}{6+5} \right)$$

$$\text{Mode} = 370.5 + \left(\frac{10}{11} \right)$$

$$\text{Mode} = 370.5 + 0.90$$

$$\boxed{\text{Mode} = 371.409}$$

Now Mean = ?

S. No	x = Values
1	2
2	3
3	6
4	7
5	5
6	3
7	2
8	1

As $\text{Mean} = \frac{x_1 + x_2 + x_3 \ldots + x_8}{n}$

$$\text{Mean} = \frac{2+3+6+7+5+3+2+1}{8}$$

$$\text{Mean} = 29/8$$

$$\boxed{\text{Mean} = 3.625}$$

Now for Quartiles $= \frac{n+1^{th}}{4}$

$$\text{Quartiles} = \frac{8+1^{th}}{4}$$

$$\text{Quartiles} = \frac{9^{th}}{4} = \boxed{2.25}$$

Q No # 03 :

By multiplying each of the numbers 3, 6, 8, 1, 7, 5 by 2 & then adding 5, we obtain 11, 17, 9, 7, 19, 15. What is the relation between the standard deviation & the means of the two sets.

Sol :

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

As $n = 6$.

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6}{n}$$

$$\text{Mean} = \frac{11 + 17 + 9 + 7 + 19 + 15}{6}$$

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

$$\boxed{\text{Mean} = 13}$$

Now Standard Deviation =?

$$\text{Standard Deviation} = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

$$\text{Standard Deviation} = \sqrt{\frac{1126}{6} - \left(\frac{78}{6}\right)^2}$$

$$\text{Standard Deviation} = \sqrt{187.6 - (13)^2}$$

$$\text{Standard Deviation} = \sqrt{187.6 - 169}$$

$$\text{Standard Deviation} = \sqrt{18.6}$$

$$\boxed{\text{Standard Deviation} = 4.31}$$

Q#04:

For the following grouped distribution table calculate the Variance & Standard Deviation.

Sol:

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

Sol:

As

x	x^2
15	225
18	324
27	729
10	100
6	36
5	25
13	169
$\Sigma x = 94$	$\Sigma x^2 = 1608$

As $n = 7$.

We know that

$$\text{Variance} = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2$$

$$\text{Variance} = \frac{1608}{7} - \left(\frac{94}{7}\right)^2$$

$$\text{Variance} = 229.71 - (13.4)^2$$

$$\text{Variance} = 229.7 - 179.56$$

$$\boxed{\text{Variance} = 50.15} \quad \because \text{Variance} = S^2$$

Now for standard deviation

$$\text{Standard Deviation} = \sqrt{S^2}$$

As S^2 = Variance, so putting the value.

$$\text{Standard Deviation} = \sqrt{50.15}$$

$$\boxed{\text{Standard Deviation} = 7.081}$$

Q. No# 05 :

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 with heights 5 feet can cross it.

Sol:

Statement:

The average depth is 5 feet. therefore all the people with heights 5 feet can cross it.

Reason:

Because they people have the height same to river so they can cross it through swimming. If they people wanted to cross it by walking they will sink & have danger of been die.

Conclusion:

From the above discussion we conclude that the only way for crossing the river is swimming.

(b) The average marks of one class of students are 30. Therefore every student is hopeless.

Sol:

Statement:

The average marks of students in class is 30 & they are still hopeless.

Reason:

It is because that they people (students) occupied just passing marks. And we know that every student have wish to get more and more marks. Because everyone wants to get higher position. & these students are hopeful in future because the every door of success are open for these students.

While on the other hand if students occupies minimum marks then those students become hopless & cannot achiere their goal in future.

Conclusion:

From the above discussion we conclude that average marks students are hopeless.

(c) The average income of a king & his household servants is £ 20,000 per month. therefore all the household sewants must be fabolously paid.

Sol:

Statement:

A king have income of £ 20,000 & paid to the servants fabolously.

Reason:

It is due to that the amount which king recieve is all the hardworking of servants because he protect the king's income & all other security. And the amount is also very high which is move for the king. In PKR these amounts is 4154,707.45 which is almost more then the spend of the king.

Conclusion:

So the king paid it to the servant fabolously.