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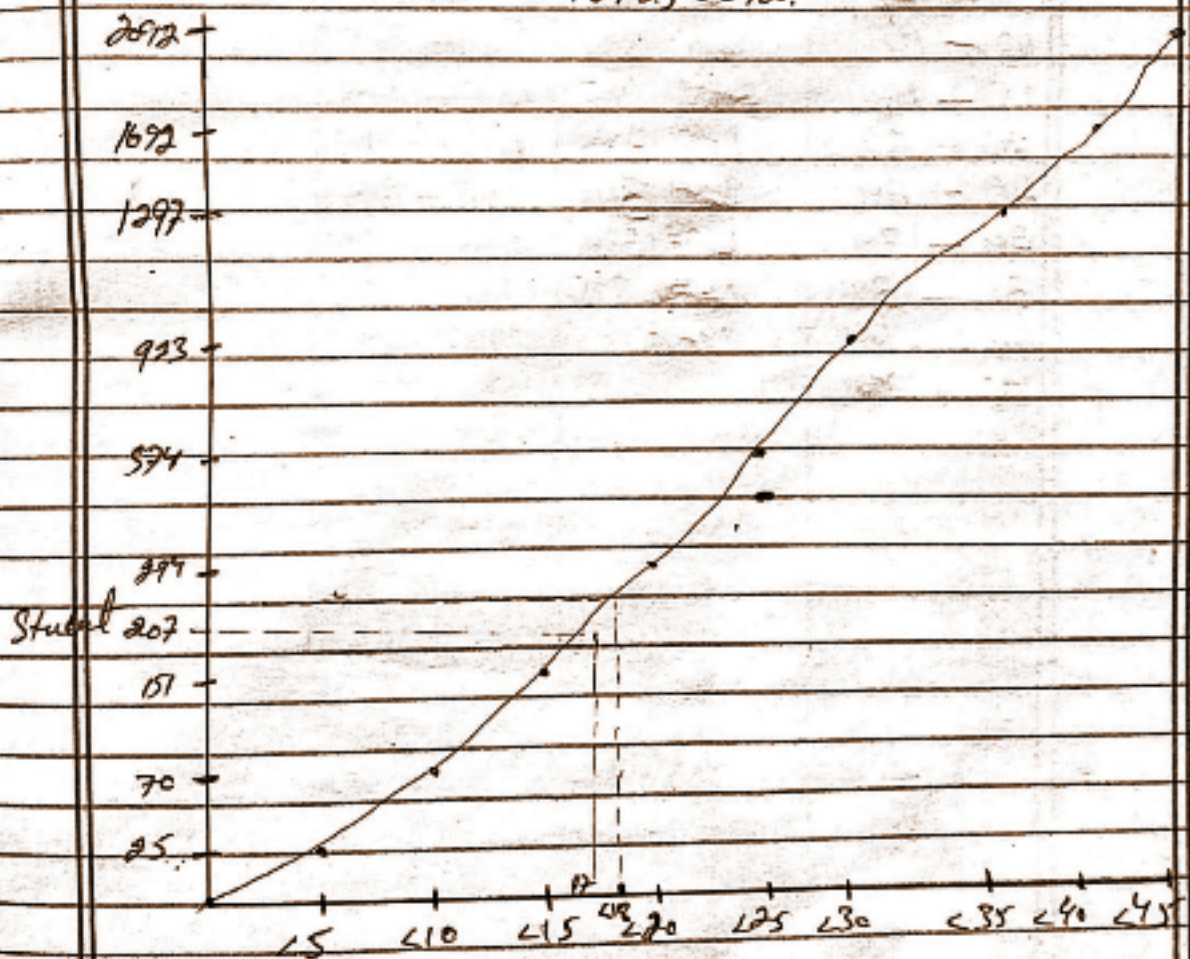
Assignment: Probability & Statistics

(Q1). Part(a)

Time taken $\angle 5, \angle 10, \angle 15, \angle 20, \angle 25, \angle 30, \angle 35, \angle 40$
interval. $\angle 45,$

Frequency:- $25, 45, 81, 143, 280, 349, 374, 395, 400.$

Cummulative frequency:- $25, 70, 151, 294, 574, 923, 1297,$
                         $1692, 2092.$
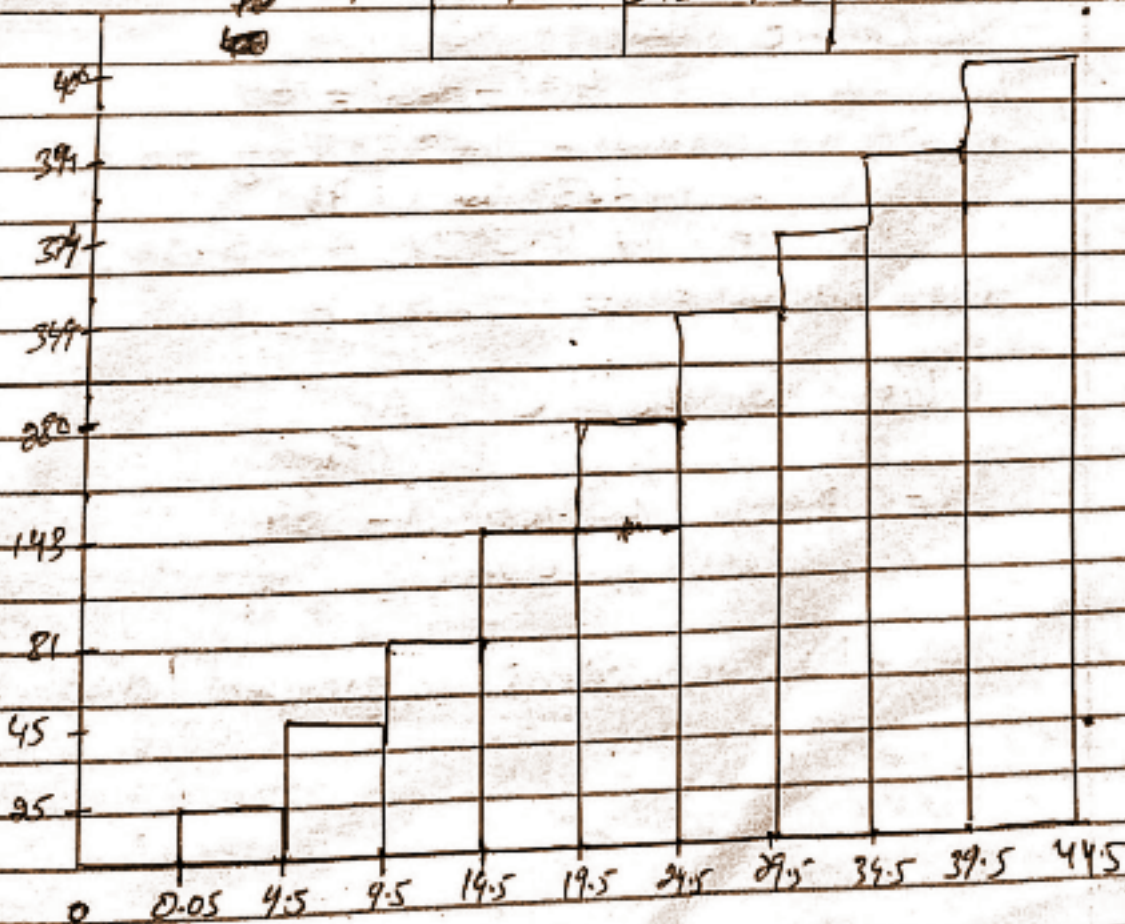

Comment:- The estimate students are 207
students who take less than 18 minutes
to walk to the the school at a
particular morning.

Question ① Pael 6

For writting or drawing histogram we need to consider frequency distribution table and then put the class boundary on x-axis (x = CB) and put the frequency on y-axis (y = frequency).

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	3995	34.5 - 39.5	
40 - 44	400	39.5 - 44.5	

Question #2

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

Total number of data = 30
Smallest data = 362
Largest date = 431
Range = 431 - 362 = 69.
Class Interval = 1 + 3.33 Log 30 =
= 1 + 3.33 log (1.47)
= 1 + 4.8751 = 5.8951
class interval = 6

Class width = R/K

R = Range which is 69
K = class interval

Less Construct grouped distribution table.

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	
	30		11901	

Simple or population mean = $\dfrac{\text{Sum of all observation}}{\text{Total of observation}}$

Simple mean or population mean $= \dfrac{11914}{30}$

$= 397.13$

Now to find grouped arithematic mean

Mean $= \dfrac{\Sigma_0 fx}{\Sigma_0 f} = \dfrac{11901}{30} = 396.7$

$x = 396.7$

Now Lets Find 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		

$$\text{Mode} = l + \frac{(fm - f_1)}{(fm - f_1) + (fm - f_0)} \times h$$

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

$$= 383.5 + 6.875$$

Quartiles

Class	Frequency	Commulative Frequency
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	

$$\text{Quartile} = l + \frac{\frac{rn}{4} - Cf_{-1}}{fq} \times i$$

$$Q_1 = \frac{r \cdot n}{4} = \frac{1 \times 30}{4} = 7.5$$

$$l = 384, \quad Cf_{-1} = 7 \quad fq = 8 \quad i = 10$$

$$Q_2 = 384 + \frac{7.5 - 7}{8} \times 10$$

$$Q_2 = 394.$$

quartile. 3rd. $\dfrac{xn}{4} = \dfrac{3 \times 30}{4} = 22.5$

$l = 406$, $cf-1 = 20$, $f_q = 5$, $c = 10$

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

$QB = 411$

Q4) For the following grouped distribution table calculate the variance and 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

Class	Freg	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	2052
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	4947
185-204	13	194.5	71.36	5092.2	66198.6

$\Sigma f = 94$ $\Sigma f(x-\bar{x})^2$ 126,3178.9

$\bar{x} = \dfrac{\Sigma fx}{\Sigma f} = \dfrac{15(74) + 18(94.5) + 27(114.5) +}{10(134.5) + 6(154.5) + 5(174.5) + 13(194.5)}$
$\overline{\hspace{6cm}}$
$\hspace{3cm} 94$

$\bar{x} = 123.14$.

Now Finding Standard deviation

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

$$S^2 = \frac{126178.9}{94}$$

$$S^2 = 1342.3$$

$$\sqrt{S^2} = \sqrt{1348.3}$$

$$S = 36.64. \quad \text{Standard deviation.}$$

Now Let find variance.

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

$$V = \frac{126178.9}{94-1} = \frac{126178.9}{93}$$

$$V = 1356.762.$$

Q3) By multiplying each of the numbers 3,6,2,17,5 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

3.6, 2,17,5	11,17,9,19,15,7
First Lets find mean	
Mean= $\dfrac{\text{Sum of all obs.}}{\text{Number of obs}}$	
Mean $= \dfrac{24}{6} = 4$	

Let find Median.
→ Write the set in descending form

1, 2, 3, 5, 6, 7

Median $= \dfrac{3+5}{2} = 4$

$\bar{x} = 4$

Range $= 7-1 = 6$

Stand deviation $= \frac{\xi(x-\bar{x})^2}{}$

x_i	$x-\bar{x}$	$(x-x^2)^2$	ξb		
1	-3	9			
2	-2	4	$S = $	$\dfrac{25}{6}$	4.16
3	-1	1			
5	1	1			
6	2	4	Standard deviation for the		
7	3	6	First is 4.16.		

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

11, 17, 9, 19, 15, 7

Write it in ascending order.

7, 9, 11, 15, 17, 19

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

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

$$Range = 12.$$

Standard deviation $= \dfrac{\sum(x-\bar{x})^2}{\sum f}$

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

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

Both

Note:- When we? Add and Multiply
a digit to the set. All the statistical
values will be change including
mean and Standard deviation.

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

Write in Ascending form.

1, 2, 3, 5, 6, 7

Add 5 to each digit of the set.

6, 7, 8, 10, 11, 12

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

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

$$\text{Standard deviation} = \frac{S(x-\bar{x})^2}{S.t}$$

x_i	$x - \bar{x}$	
6	-3	9
7	-2	4
8	-1	1
10	1	1
11	2	4
12	3	6
		25

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

Remember:- When we add or Subtract the value from a set it can effect the mean but it can not effect the standard deviation.

Comparision of three different sets of data.

1,2,3,5,6,7	1,2,3,5,6,7 Adding 5	1,2,3,5,6,7 X 2 and + 5
↓ 1,2,3,5,6,7	↓ 6,7,8,10,11,12	11,17,9,19,15,17
Mean = 4	Mean = 9	Mean = 13
Median 4	Median 9	Median = 13
Range = 6	Range = 6	Range = 12
Standard d = 4.16	S d = 4.16	S·d = 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 scalor so all the Statistics value can be change and effected.
As we compare all these two cases above in the table of comparision.

Q5) Comment on the following Sentences.

(a) The depth of a river at four different points are 8,7,5,6 feet respectively. The average depth is 5 feet. Therefore all the people with height 5 feet can cross it.

→ As we know four different points 8,7,5,6 while the average = 5 reflects all other points are different from the average value so therefore it show dispersion.

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

→ This sentence means that all students get the average marks 30 which really effect the performance of the class and reflect the poor image of the whole class.

(c) The average income of a King and his household servants are £20.000 per month. Therefore all the household servants must be fabolusly paid.

→ It reflect the direct correction among average income of king family and payments to their servant i.e Kings family ↑ → payment to servant ↑