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diamond diamond diamond diamond diamond diamond diamond

CHAPTER 4:-

-: MEASURE OF DISPERSION:-

Dispersion:-

How much our data is dispersed / spread:-

① Range:- Highest - lowest.

② Quartile deviation (Q.D) = $\frac{Q_3 - Q_1}{2}$.

$$= \frac{34.902 - 30.0171}{2} = \boxed{2.4425 = Q.D}$$

Absolute Dispersion

Individual,

Same data comparison

Relative Dispersion:-

Comparison.

Different data

There are 2 types of measure of dispersion. **Absolute** measure of Dispersion is one that measures the dispersion in terms of the same unit or in the square of unit, as the units of the data. **for example:-** If the unit of the data are Rs., meters, kg etc. The unit of the measure of dispersion is Rs, Meters, Kg etc. A **Relative Measure of Dispersion** is the one that express in the form of the ratio, coefficient, % age etc is independent of the unit of measure of dispersion. It is useful for the comparison of data of Different Nature. A measure of Central tendency the main measure of Dispersion are

Range, Quartile Deviation, Mean Varians etc
Standard Deviations:



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Absolute

Range: $N_m - N_o$

Quartile Deviations:

$$\frac{Q_3 - Q_1}{2}$$

Relative

$N_m - N_o$

$N_m + N_o$

Coefficient of

$$Q.D = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$\frac{34.902 - 30.0171}{34.902 + 30.0171}$$

$$\frac{4.8849}{64.9191} = 0.0752$$

Mean Deviation:-

$$\frac{\sum f |n - \bar{n}|}{\sum f} \text{ M.D.}$$

$\sum f$
(Arithmetic Mean)

$$\frac{\sum f |n - \bar{n}|}{\sum f} = \frac{2854.88}{1000}$$

$$(\text{Mean deviation}) \quad 2.85$$

Variance & Standard deviation
are absolute dispersion.

$$S^2 = h \times \sqrt{\frac{\sum f u^2}{\sum f} - \left(\frac{\sum f u}{\sum f} \right)^2}$$

Coefficient of

Mean Deviation: $\frac{\text{Mean Deviation}}{\text{Mean}}$

or

$\frac{\text{Mean Deviation}}{\text{Median}}$

$$\frac{2.85}{32.4909} = 0.0877$$

Coefficient of

Variance: C.V = $\frac{S^2}{\bar{x}} \times 100$

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4.4 : Quartile Deviation:-

Income per week	No. of earners.	cf	class boundaries
41 - 50	30	30	40.5 - 50.5
51 - 60	36	66	50.5 - 60.5
61 - 70	43	109	60.5 - 70.5
71 - 80	104	213	70.5 - 80.5
81 - 90	73	286	80.5 - 90.5
91 - 100	14	300	90.5 - 100.5
Total.	300		

Quartile Deviation: - $\frac{Q_3 - Q_1}{2} = \frac{82.14 - 62.59}{2} = 9.7750$

* $Q_3 = l + \frac{h}{f} \left(\frac{in - c}{4} \right)$ * $Q_1 = l + \frac{h}{f} \left(\frac{in - c}{4} \right)$

$$80.5 + \frac{10}{73} (225 - 213) = 60.5 + \frac{10}{43} (75 - 66)$$

$Q_3 = 82.14$

$Q_1 = 62.59$

4.5 :-

171	160	144	132	154	160	160	158	148	160	151	153
131	165	139	163	149	149	140	149	150	161	136	144
165	174	153	149	159	169	141	156	149	171	149	154
153	149	147	154	158	145	160	152	156	138	167	142
165	155	140	155	147	158	149	169	148	174	150	144

150 149 140 150 150 150 150 150 160 160 170

3/6 131 149 149 147 153 153 153 153 165 165 171
 139 148 149 149 147 152 152 152 165 165 174
 137 147 149 149 147 155 155 155 165 165 171
 138 149 149 146 147 156 156 156 163 163 174
 131 142 149 149 149 157 157 157 169 169 171



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class interval	frequency	f	n	$u = \frac{n-a}{4}$	$\sum f u$	$\sum f u^2$
129.5 - 134.5	3	3	132.0	-3	-9	27 81
134.5 - 139.5	3	6	137.0	-2	-6	12 36
139.5 - 144.5	6	12	142	-1	-6	6 36
144.5 - 149.5	14 = a	26 = b	147 = a	0	0	0 0
149.5 - 154.5	9	35 = med	152	1	9	9 81
154.5 - 159.5	8	43	157	2	16	32 169 286
159.5 - 164.5	7	50 = b	162	3	21	63 441
164.5 - 169.5	6	56	167	4	24	96 576
169.5 - 174.5	4	60	172	5	20	100 720
Total:	<u>60</u>				69	345

$$\text{Median} = l + \frac{h}{f} \left(\frac{n}{2} - c \right)$$

$$= 149.5 + \frac{5}{9} (30 - 26)$$

$$= 151.7 \approx 152 = \text{Median}$$

$$\star \text{Mean} = a + \frac{\sum f u}{\sum f} \times h$$

$$147 + \frac{69}{60} \times 8$$

$$\text{Mean} = 152.75$$

$$\text{Q.D} = \frac{Q_3 - Q_1}{2} = \frac{161 - 146}{2} = 7.5 = \text{Q.D.}$$

$$\star Q_3 = l + \frac{h}{f} \left(\frac{n}{4} - c \right)$$

$$169.5 + \frac{5}{7} (45 - 43)$$

$$160.9 \approx 160 = Q_3$$

$$\star Q_1 = l + \frac{h}{f} \left(\frac{n}{4} - c \right)$$

$$= 144.5 + \frac{5}{14} (18 - 12)$$

$$145.5 \approx 146 = Q_1$$



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4.6: Mean Deviation from Arithmetic Mean.

Marks	No. of Students.	n	fn	n - \bar{n}	n - \bar{n}	f n - \bar{n}
0-9	2	4.5	9	-41.67	41.67	83.34.
10-19	3	14.5	43.5	-31.67	31.67	95.01
20-29	8	24.5	196	-21.67	21.67	173.36
30-39	24	34.5	828	-11.67	11.67	280.08
40-49	27	44.5	1201.5	-1.67	1.67	45.09.
50-59	40	54.5	2180	8.33	8.33	333.2
60-69	11	64.5	709.5	18.33	18.33	201.63
70-79	5	74.5	372.5	28.33	28.33	141.65
	120		5540			1353.36.

$$\bar{n} = \text{Mean} = \frac{\sum f n}{n} = \frac{5540}{120} = 46.17$$

$$\text{Mean Deviation} = \frac{\sum f |n - \bar{n}|}{n}$$

$$= \frac{46.17}{120} \cdot \frac{1353.36}{120}$$

$$11.28 = \text{Mean Deviation}.$$

4.7:

Marks	20-24	25-29	30-39	40-44	45-49	50-54	55-64.
Number of Students	1	2	26	22	20	15	14.



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Age group	n	f	fn	$ n-\bar{n} $	$f n-\bar{n} $
20-24	29	1	22	22.5	22.5
25-29	27	2	54	17.5	35
30-34	32	f_1	$32f_1$	12.5	$12.5f_1$
35-39	37	$26-f_1$	$962-37f_1$	7.5	$195-7.5f_1$
40-44	42	22	924	2.5	1055
45-49	47	20	940	2.5	50
50-54	52	15	780	7.5	112.5
55-59	57	f_2	$57f_2$	12.5	$12.5f_2$
60-64	62	$14-f_2$	$868-62f_2$	17.5	$245-17.5f_2$
			$4550-5(f_1+f_2)$		$715+5(f_1+f_2)$

$$\text{Mean} = \bar{n} = \frac{\sum fn}{n} = \frac{4550-5(f_1+f_2)}{100}$$

$$\bar{n} = 44.5 = \frac{4550-5(f_1+f_2)}{100}$$

$$44.5 = 45.5 - \frac{f_1+f_2}{20}$$

$$\underline{f_1+f_2} = 1$$

$$f_1+f_2=20 \rightarrow \textcircled{1} \Rightarrow f_1+f_1=20 \Rightarrow 2f_1=20 \Rightarrow f_1=10.$$

$$\text{Eq Mean Deviation} = \frac{1}{\sum f} \sum f |n-\bar{n}|$$

$$7.15 = \frac{1}{100} 715 + 5(f_1-f_2)$$

$$7.15 = 7.15 + 5(f_1-f_2)$$

$$0 = f_1 - f_2$$

$$f_1 - f_2 = 10$$

Put in \textcircled{1}

Group H:-

Heights	Class boundaries	No. of Persons	A(c.f)	B(c.f)	n-Med	fm-Med
A	B					
58	57.5-58.5	10	15	10	15	33.50
59	58.5-59.5	18	20	28	35	42.30
60	59.5-60.5	30	32	58.0	67	40.50
61	60.5-61.5	42	35	100	102	44.70
62	61.5-62.5	85	32	135	135	22.75
63	62.5-63.5	28	22	163	157	46.20
64	63.5-64.5	16	20	79	177	42.40
65	64.5-65.5	8	10	87	187	29.20
		187	187			271.55

For Group A:-

* Quartile Deviation:-

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{62.69 - 60.12}{2}, Q.D = Q.D_n$$

$$\rightarrow Q_3 = l + \frac{h}{f} \left(\frac{in - c}{4} \right) \quad (4 = 140.25)$$

$$62.5 + \frac{1}{28} (140.25 - 135)$$

$$62.69 = Q_3$$

$$\rightarrow Q_1 = l + \frac{h}{f} \left(\frac{in - c}{4} \right) \quad (4 = 46.75)$$

$$59.5 + \frac{1}{30} (46.75 - 28)$$

$$60.12 = Q_1$$

Coefficient of Q.D.

$$\frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{62.69 - 60.12}{62.69 + 60.12} = \frac{2.57}{122.81}$$

Coefficient of Q.D. is = 0.0209

For Group B:-

$$Q.D_B = \frac{Q_3 - Q_1}{2} = \frac{62.74 - 59.87}{2} = 1.435$$

$$\rightarrow Q_3 = l + \frac{h}{f} \left(\frac{in - c}{4} \right)$$

$$62.5 + \frac{1}{22} (140.25 - 135)$$

$$Q_3 = 62.74$$



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for Group B

$$Q_1 = l + \frac{h}{f} \left(\frac{n}{4} - c \right)$$

$$59.5 + \frac{1}{32} (46.75 - 3.5)$$

$$Q_1 = 59.87$$

Co-efficient of Q.Ds:-

$$\frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{2.87}{122.61}$$

$$\text{Co-efficient of Q.Ds} = 0.0234$$

Mean Deviation:-

$$\frac{\sum f |m - \bar{m}|}{\sum f}$$

$$\frac{271.55}{187}$$

$$1.4521 = \text{Mean Deviation}$$

Co-efficient of M.D.-

$$\text{Median} = l + \frac{h}{f} \left(\frac{n}{2} - c \right)$$

$$60.5 + \frac{1}{42} (93.5 - 58) = 61.35$$

Mean Deviation
Median:-

$$\frac{61.4521}{61.35} = 0.0237$$

n-Med	f/n-Med
-3.26	48.90
-2.26	45.20
-1.26	40.32
-0.26	9.18
0.74	24.42
1.74	38.28
2.74	54.80
3.74	37.40
	208.12

Mean Deviation:-

$$\frac{\sum f |m - \bar{m}|}{\sum f} = \frac{208.12}{187} = 1.1129$$

$$\text{Median} = l + \frac{h}{f} \left(\frac{n}{2} - c \right) =$$

$$60.5 + \frac{1}{35} (93.5 - 67)$$

$$61.2571 = \text{Median}$$

Co-efficient of Mean Deviation

$$\frac{\text{M.D.}}{\text{Median}} = \frac{61.2571}{61.1129}$$

$$1.01129$$

$$61.2571$$

$$0.0182 = \text{M.D.}$$

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* Variance & standard deviation:-

→ Square root of variance makes standard deviation:-

* Standard deviation:-

$$S = \sqrt{\frac{\sum f u^2}{\sum f} - \left(\frac{\sum f u}{\sum f} \right)^2} \quad \because \text{variance} = S^2.$$

$$S = \sqrt{\frac{646414}{726} - \left(\frac{21092}{726} \right)^2}$$

$$S = \sqrt{890.4 - 844.04}$$

$$S = \sqrt{46.36}$$

$$S = 6.81 \quad \boxed{\text{Variance} = 46.36}$$

* Standard Deviation by Short Method:-

$$S = h \times \sqrt{\frac{\sum f u^2}{\sum f} - \left(\frac{\sum f u}{\sum f} \right)^2}$$

$$S = 20 \times \sqrt{\frac{2715}{815} - \left(\frac{-715}{815} \right)^2}$$
$$= 20 \times \sqrt{3.33 - (-0.8773)^2}$$

$$= 20 \times \sqrt{3.33 - 0.769728} \quad \text{variance} = h^2 \times 2.561$$

$$= 20 \times \sqrt{2.561}$$

$$400 \times 2.561$$

$$1024.4000$$

$$20 \times 1.6005$$

$$\frac{1}{20} \cdot 6005$$

$$32.0100$$



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(Faster/Slower)	No. of Components (n)	$\frac{d\theta}{dt}$ (rad/s)
1000 - 1080	40	-14.
1080 - 1100	96	-288.
1100 - 1120	164	-328.
1120 - 1140	172	-172.
85	83	0.
-75	0	16
275	300.	864.
	110	656
	1130.	1070 = a

Age (years)	No. of Men (R)
15-19	29
20-24	176
25-29	22
30-34	27
35-39	32
40-44	37
45-49	42
50-54	51
55	57
56	61
57	66
58	73
59	79
60	82
61	86
62	90
63	93
64	96
65	98
66	101
67	103
68	106
69	109
70	112
71	115
72	118
73	120
74	123
75	126
76	129
77	132
78	135
79	138
80	141
81	144
82	147
83	150
84	153
85	156
86	159
87	162
88	165
89	168
90	171
91	174
92	177
93	180
94	183
95	186
96	189
97	192
98	195
99	198
100	201
101	204
102	207
103	210
104	213
105	216
106	219
107	222
108	225
109	228
110	231
111	234
112	237
113	240
114	243
115	246
116	249
117	252
118	255
119	258
120	261
121	264
122	267
123	270
124	273
125	276
126	279
127	282
128	285
129	288
130	291
131	294
132	297
133	300
134	303
135	306
136	309
137	312
138	315
139	318
140	321
141	324
142	327
143	330
144	333
145	336
146	339
147	342
148	345
149	348
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151	354
152	357
153	360
154	363
155	366
156	369
157	372
158	375
159	378
160	381
161	384
162	387
163	390
164	393
165	396
166	399
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169	408
170	411
171	414
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217	552
218	555
219	558
220	561
221	564
222	567
223	570
224	573
225	576
226	579
227	582
228	585
229	588
230	591
231	594
232	597
233	600
234	603
235	606
236	609
237	612
238	615
239	618
240	621
241	624
242	627
243	630
244	633
245	636
246	639
247	642
248	645
249	648
250	651
251	654
252	657
253	660
254	663
255	666
256	669
257	672
258	675
259	678
260	681
261	684
262	687
263	690
264	693
265	696
266	699
267	702
268	705
269	708
270	711
271	714
272	717
273	720
274	723
275	726
276	729
277	732
278	735
279	738
280	741
281	744
282	747
283	750
284	753
285	756
286	759
287	762
288	765
289	768
290	771
291	774
292	777
293	780
294	783
295	786
296	789
297	792
298	795
299	798
300	801
301	804
302	807
303	810
304	813
305	816
306	819
307	822
308	825
309	828
310	831
311	834
312	837
313	840
314	843
315	846
316	849
317	852
318	855
319	858
320	861
321	864
322	867
323	870
324	873
325	876
326	879
327	882
328	885
329	888
330	891
331	894
332	897
333	900
334	903
335	906
336	909
337	912
338	915
339	918
340	921
341	924
342	927
343	930
344	933
345	936
346	939
347	942
348	945
349	948
350	951
351	954
352	957
353	960
354	963
355	966
356	969
357	972
358	975
359	978
360	981
361	984
362	987
363	990
364	993
365	996
366	999
367	1002
368	1005
369	1008
370	1011
371	1014
372	1017
373	1020
374	1023
375	1026
376	1029
377	1032
378	1035
379	1038
380	1041
381	1044
382	1047
383	1050
384	1053
385	1056
386	1059
387	1062
388	1065
389	1068
390	1071
391	1074
392	1077
393	1080
394	1083
395	1086
396	1089
397	1092
398	1095
399	1098
400	1101
401	1104
402	1107
403	1110
404	1113
405	1116
406	1119
407	1122
408	1125
409	1128
410	1131
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420	1161
421	1164
422	1167
423	1170
424	1173
425	1176
426	1179
427	1182
428	1185
429	1188
430	1191
431	1194
432	1197
433	1200
434	1203
435	1206
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623	1770
624	1773
625	1776
626	1779
627	1782
628	1785
629	1788
630	1791
631	1794
632	1797
633	1800
634	1803
635	1806
636	1809
637	1812
638	1815
639	1818
640	1821
641	1

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Co-efficient of Variance

$$\bar{x} = \frac{\sum x}{n}$$

* Co-efficient of variance in Reliability of data:-

$$S_x = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$= \sqrt{\frac{1989}{5} - \left(\frac{92}{5}\right)^2}$$

$$= \sqrt{397.8 - (18.5)^2}$$

$$= \sqrt{397.8 - 342.25}$$

$$= \sqrt{54.95}$$

$$= 7.413 = S_x$$

$$C.V = \frac{S_x}{\bar{x}} \times 100$$

$$= \frac{7.413}{18.5} \times 100$$

$$C.V = 40.07$$

$$S_y = \sqrt{\frac{253325}{5} - \left(\frac{1055}{5}\right)^2}$$

$$\bar{y} = 211$$

$$\sqrt{50665 - (211)^2}$$

$$50665 - 44,521$$

$$\sqrt{6144}$$

$$S_y = 78.38$$

$$C.V =$$

$$\frac{78.38}{211} \times 100 =$$

$$37.1469 = C.V.$$

Player A	Player B.
Price (in Rupees) X	Time (in hours) Y
92	130
88	150
1055	169
1055	164
1989	16900
1989	22500
253325	62500
253325	119000



Date: _____

M	T	W	T	F	S	S
◇	◇	◇	◇	◇	◇	◇

Who's C.V answer is low that data is more reliable.

Moments of mean..

$$m_i = \frac{\sum (n_i - \bar{n})^2}{n}, i=1,2,3,4 \cdot \text{ grouped } m_i = \frac{\sum f_i (x_i - \bar{x})^2}{\sum f_i}, i=1,2,3,4$$

N:

32, 36, 36, 37, 39, 41, 45, 46, 48

$$m_1 = \frac{\sum (n - \bar{n})^2}{n}$$

$$m_1 = \frac{\sum (n - \bar{n})^2}{n}$$

$$= \frac{0}{9} = 0 = m_1$$

$$m_2 = \frac{232}{9} = 25.78 = m_2$$

$$m_3 = \frac{186}{9} = 20.67 = m_3$$

$$m_4 = \frac{10708}{9} = 1189.0 = m_4$$

	$\sum n$ = 9	$\sum x$ = 232	$\sum x^2$ = 1828	$\sum (x - \bar{x})$ = 0	$\sum (x - \bar{x})^2$ = 10708
360.	360	360	360	0	0
210.	210	210	210	-1	-1
120.	120	120	120	-1	-1
60.	60	60	60	-1	-1
30.	30	30	30	-1	-1
15.	15	15	15	-1	-1
7.5.	7.5	7.5	7.5	-1	-1
3.75.	3.75	3.75	3.75	-1	-1
1.875.	1.875	1.875	1.875	-1	-1
0.9375.	0.9375	0.9375	0.9375	-1	-1
0.46875.	0.46875	0.46875	0.46875	-1	-1
0.234375.	0.234375	0.234375	0.234375	-1	-1
0.1171875.	0.1171875	0.1171875	0.1171875	-1	-1
0.05859375.	0.05859375	0.05859375	0.05859375	-1	-1
0.029296875.	0.029296875	0.029296875	0.029296875	-1	-1
0.0146484375.	0.0146484375	0.0146484375	0.0146484375	-1	-1
0.00732421875.	0.00732421875	0.00732421875	0.00732421875	-1	-1
0.003662109375.	0.003662109375	0.003662109375	0.003662109375	-1	-1
0.0018310546875.	0.0018310546875	0.0018310546875	0.0018310546875	-1	-1
0.00091552734375.	0.00091552734375	0.00091552734375	0.00091552734375	-1	-1
0.000457763671875.	0.000457763671875	0.000457763671875	0.000457763671875	-1	-1
0.0002288818359375.	0.0002288818359375	0.0002288818359375	0.0002288818359375	-1	-1
0.00011444091796875.	0.00011444091796875	0.00011444091796875	0.00011444091796875	-1	-1
0.000057220458984375.	0.000057220458984375	0.000057220458984375	0.000057220458984375	-1	-1
0.0000286102294921875.	0.0000286102294921875	0.0000286102294921875	0.0000286102294921875	-1	-1
0.00001430511474609375.	0.00001430511474609375	0.00001430511474609375	0.00001430511474609375	-1	-1
0.000007152557373046875.	0.000007152557373046875	0.000007152557373046875	0.000007152557373046875	-1	-1
0.0000035762786865234375.	0.0000035762786865234375	0.0000035762786865234375	0.0000035762786865234375	-1	-1
0.00000178813934326171875.	0.00000178813934326171875	0.00000178813934326171875	0.00000178813934326171875	-1	-1
0.000000894069671630859375.	0.000000894069671630859375	0.000000894069671630859375	0.000000894069671630859375	-1	-1
0.0000004470348358154296875.	0.0000004470348358154296875	0.0000004470348358154296875	0.0000004470348358154296875	-1	-1
0.00000022351741790771484375.	0.00000022351741790771484375	0.00000022351741790771484375	0.00000022351741790771484375	-1	-1
0.000000111758708953857421875.	0.000000111758708953857421875	0.000000111758708953857421875	0.000000111758708953857421875	-1	-1
0.0000000558793544769287109375.	0.0000000558793544769287109375	0.0000000558793544769287109375	0.0000000558793544769287109375	-1	-1
0.00000002793967723846435546875.	0.00000002793967723846435546875	0.00000002793967723846435546875	0.00000002793967723846435546875	-1	-1
0.000000013969838619232177734375.	0.000000013969838619232177734375	0.000000013969838619232177734375	0.000000013969838619232177734375	-1	-1
0.0000000069849193096160888671875.	0.0000000069849193096160888671875	0.0000000069849193096160888671875	0.0000000069849193096160888671875	-1	-1
0.0000000034924596548080444334375.	0.0000000034924596548080444334375	0.0000000034924596548080444334375	0.0000000034924596548080444334375	-1	-1
0.00000000174622982740402221671875.	0.00000000174622982740402221671875	0.00000000174622982740402221671875	0.00000000174622982740402221671875	-1	-1
0.00000000087311491370201110834375.	0.00000000087311491370201110834375	0.00000000087311491370201110834375	0.00000000087311491370201110834375	-1	-1
0.000000000436557456851005554171875.	0.000000000436557456851005554171875	0.000000000436557456851005554171875	0.000000000436557456851005554171875	-1	-1
0.0000000002182787284255027770859375.	0.0000000002182787284255027770859375	0.0000000002182787284255027770859375	0.0000000002182787284255027770859375	-1	-1
0.00000000010913936421275138854375.	0.00000000010913936421275138854375	0.00000000010913936421275138854375	0.00000000010913936421275138854375	-1	-1
0.000000000054569682106375694271875.	0.000000000054569682106375694271875	0.000000000054569682106375694271875	0.000000000054569682106375694271875	-1	-1
0.0000000000272848410531878471359375.	0.0000000000272848410531878471359375	0.0000000000272848410531878471359375	0.0000000000272848410531878471359375	-1	-1
0.0000000000136424205265939235678125.	0.0000000000136424205265939235678125	0.0000000000136424205265939235678125	0.0000000000136424205265939235678125	-1	-1
0.000000000006821210263296961783359375.	0.000000000006821210263296961783359375	0.000000000006821210263296961783359375	0.000000000006821210263296961783359375	-1	-1
0.000000000003410605131648480891678125.	0.000000000003410605131648480891678125	0.000000000003410605131648480891678125	0.000000000003410605131648480891678125	-1	-1
0.000000000001705302565824240445839375.	0.000000000001705302565824240445839375	0.000000000001705302565824240445839375	0.000000000001705302565824240445839375	-1	-1
0.000000000000852651282912120222919375.	0.000000000000852651282912120222919375	0.000000000000852651282912120222919375	0.000000000000852651282912120222919375	-1	-1
0.000000000000426325641456060111459375.	0.000000000000426325641456060111459375	0.000000000000426325641456060111459375	0.000000000000426325641456060111459375	-1	-1
0.000000000000213162820728030055729375.	0.000000000000213162820728030055729375	0.000000000000213162820728030055729375	0.000000000000213162820728030055729375	-1	-1
0.00000000000010658141036401502786453125.	0.00000000000010658141036401502786453125	0.00000000000010658141036401502786453125	0.00000000000010658141036401502786453125	-1	-1
0.000000000000053290705182007513932265625.	0.000000000000053290705182007513932265625	0.000000000000053290705182007513932265625	0.000000000000053290705182007513932265625	-1	-1
0.0000000000000266453525910037569661328125.	0.0000000000000266453525910037569661328125	0.0000000000000266453525910037569661328125	0.0000000000000266453525910037569661328125	-1	-1
0.00000000000001332267629550187848306640625.	0.00000000000001332267629550187848306640625	0.00000000000001332267629550187848306640625	0.00000000000001332267629550187848306640625	-1	-1
0.000000000000006661338147750939241533203125.	0.000000000000006661338147750939241533203125	0.000000000000006661338147750939241533203125	0.000000000000006661338147750939241533203125	-1	-1
0.0000000000000033306690738754696207666015625.	0.0000000000000033306690738754696207666015625	0.0000000000000033306690738754696207666015625	0.0000000000000033306690738754696207666015625	-1	-1
0.00000000000000166533453693773481038330078125.	0.00000000000000166533453693773481038330078125	0.00000000000000166533453693773481038330078125	0.00000000000000166533453693773481038330078125	-1	-1
0.000000000000000832667268468867405191650390625.	0.000000000000000832667268468867405191650390625	0.000000000000000832667268468867405191650390625	0.000000000000000832667268468867405191650390625	-1	-1
0.0000000000000004163336342344337025958251953125.	0.0000000000000004163336342344337025958251953125	0.0000000000000004163336342344337025958251953125	0.0000000000000004163336342344337025958251953125	-1	-1
0.00000000000000020816681711721685129791259765625.	0.00000000000000020816681711721685129791259765625	0.00000000000000020816681711721685129791259765625	0.00000000000000020816681711721685129791259765625	-1	-1
0.0000000000000001040834085586084256489562628125.	0.0000000000000001040834085586084256489562628125	0.0000000000000001040834085586084256489562628125	0.0000000000000001040834085586084256489562628125	-1	-1
0.00000000000000005204170427929221282447813140625.	0.00000000000000005204170427929221282447813140625	0.00000000000000005204170427929221282447813140625	0.00000000000000005204170427929221282447813140625	-1	-1
0.00000000000000002602085213964610641223906571875.	0.00000000000000002602085213964610641223906571875	0.00000000000000002602085213964610641223906571875	0.00000000000000002602085213964610641223906571875	-1	-1
0.000000000000000013010426069823053206119532890625.	0.000000000000000013010426069823053206119532890625	0.000000000000000013010426069823053206119532890625	0.000000000000000013010426069823053206119532890625	-1	-1
0.0000000000000000065052130349115266030597644453125.	0.0000000000000000065052130349115266030597644453125	0.0000000000000000065052130349115266030597644453125	0.0000000000000000065052130349115266030597644453125	-1	-1
0.0000000000000000032526065174557633015298822228125.	0.0000000000000000032526065174557633015298822228125	0.0000000000000000032526065174557633015298822228125	0.0000000000000000032526065174557633015298822228125	-1	-1
0.000000000000000001626303258					

Date:

$$\frac{\sum f_u}{n} = \frac{1318}{131} = 10.1$$

M T W T F S S

weekly earning	No. of men.	$n-\bar{n}$	$(n-\bar{n})^2$	$(n-\bar{n})^3$	$(n-\bar{n})^4$	f_u
5	1	-5.1	26.01	-132.651	676.52010	5
6	2	-4.1	16.81	-68.921	282.5761	12
7	5	-3.1	9.61	-29.791	92.3521	35
8	10	-2.1	4.41	-9.261	19.4481	80
9	20	-1.1	1.21	-1.331	1.4641	180
10	51	-0.1	0.01	-0.001	0.0001	510
11	22	0.9	0.81	0.729	0.6561	242
12	11	1.9	3.61	6.859	13.0321	132
13	5	2.9	8.41	24.389	70.7281	65
14	3	3.9	15.21	59.0319	231.3441	42
15	1	4.9	24.01	117.649	576.4801	15
		131				1318

$\Sigma f(n-\bar{n})$	$f(n-\bar{n})^2$	$f(n-\bar{n})^3$	$f(n-\bar{n})^4$
-5.1	26.01	-132.651	676.5201
-8.2	33.62	-137.842	565.1522
-15.5	48.05	-148.955	461.7605
-2.1	44.01	-92.61	19.4481
-22	24.02	-26.62	29.289
-5.1	0.51	-0.051	0.0051
19.8	17.82	16.038	140.4342
20.9	39.71	75.0449	143.3531
14.5	42.05	121.945	353.6405
11.7	45.63	177.957	694.0323
4.9	24.01	117.649	576.4801
-5.1	345.71	-29.691	3709.1411



Date: _____

M	T	W	T	F	S	S
◇	◇	◇	◇	◇	◇	◇

$$m_1 = \frac{-5.1}{131}$$

$$m_2 = \frac{345.71}{131}$$

$$m_3 = \frac{-29.691}{131}$$

$$m_1 = 0.04$$

$$m_2 = 2.0648$$

$$m_3 = -0.2278$$

$$m_4 = \frac{3709.1411}{131}$$

$$m_4 = 28.33$$

m_2 = variance.

$$S^2 D = \sqrt{m_2} = \sqrt{1.6248} = 1.27$$

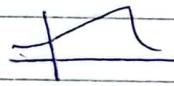
$$\beta_1 = \frac{m_3}{S^3} = \frac{0.5648}{4.2891}$$

$$b_1 = 0.1317$$

Skewness:-

lie b/w $-2 < b_1 < 2$.

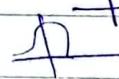
if b_1 is $0 < b_1 \rightarrow$ +vely skewed



if $b_1 < 0 \rightarrow$ -vely skewed



if $b_1 = 0 \rightarrow$ symmetric.



Kurtosis.

$$\beta_2 = \frac{m_4}{m_2^2} = \frac{28.33}{(0.5648)^2} = 4.6689$$

if answer is 3 or nearly 3. than distribution is normal.