1)

x	f_i	x_i	$f_i x_i$	cf
0-10	12	5	60	12
10-20	18	15	270	30
20-30	20	25	570	50 ← $\frac{N}{2} = 49$
30-40	25 ←	35	875	75
40-50	23	45	1035	98
	98		2740	

$$\text{Mean} = \frac{1}{N} \Sigma f_i x_i$$

$$= \frac{1}{98} \times 2740$$

$$= 27.9592$$

$$\text{Median} = L + \frac{\frac{N}{2} - m}{f} \times h$$

$$L = 20, \; m = 30, \; f = 20$$

$$\text{Median} = 20 + \frac{49 - 30}{20} \times 10$$

$$= 20 + \frac{190}{20}$$

$$= 29.5$$

$$\text{Mode} = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$f_1 = 25 \quad f_0 = 20 \quad f_2 = 23$$

$$= 30 + \frac{50}{7}$$

$$= 37.143$$

3)

Wages (x)	No of Persons (fi)	c.f
30-40	1	1
40-50	3	4
50-60	11	15
60-70	21	32 ←
70-80	43	79
80-90	32	111 ←
90-100	9	120
	120	

$\frac{N}{4} = \frac{120}{4} = 30$

$\frac{3N}{4} = \frac{360}{4} = 90$

i) $Q_1 = l + \frac{\frac{N}{4} - m}{f} \times h$

$m = 15, f = 21$

$Q_1 = 60 + \frac{30 - 15}{21} \times 10$

$= 60 + \frac{150}{21}$

$= 67.143$

ii) $Q_3 = l + \frac{\frac{3N}{4} - m}{f} \times h$

$m = 79$

$l = 80$

$f = 32$

$Q_3 = 80 + \frac{90 - 79}{32} \times 10$

$= 80 + \frac{110}{32}$

$= 83.4375$

4)

x_i	f_i	$x_i f_i$	l.c.f
5	1	5	1
10	3	30	4
15	13	195	17
20	17	340	34
25	27	675	61
30	36	1080	97 ←
35	38	1330	135
	135	3655	

i) Mean $= \frac{1}{N} \Sigma f_i x_i$

$= \frac{3655}{135}$

Mean $= 27.074$

ii) Median $= 30$

$\frac{N}{2} = 67.5$

iii) Mode $= 35$

5)

wages (mi)	No of workers (f_i)	x	C.f
0-10	22	5	22 m
10-20	38 → f_0	15	60 ←
20-30	46 → f_1	25	106 ⇐
30-40	35 → f_2	35	141 ←
40-50	20	45	161
	161		

Mode $= l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

~~$\frac{N}{2} = \frac{161}{2} = 80.5$~~

Mode $= 20 + \frac{46 - 38}{92 - 38 - 35} \times 10$

$= 20 + \frac{80}{19}$

$= 24.214$

$\frac{N}{4} = \frac{161}{4} = 40.25$

$l = 10, m = 22, f = 38$

$Q_1 = 10 + \frac{40.25 - 22}{38} \times 10$

$= 10 + \frac{182.5}{38}$

$= 14.803$

$\frac{3N}{4} = 120.75$

$l = 30, m = 106, f = 35$

$Q_3 = 30 + \frac{120.75 - 106}{35} \times 10$

$= 30 + \frac{14.75}{35} \times 10$

~~$= 30 + 142.5$~~

$= 34.214$

Coeff of G.D $= \frac{Q_3 - Q_1}{Q_3 + Q_1}$

~~$= 34.803 - 7$~~

$= \frac{34.214 - 14.803}{34.214 + 14.803} = \frac{19.411}{490.017} = 0.0396$

Median $= l + \frac{\frac{N}{2} - m}{f} \times h$

$\frac{N}{2} = \frac{161}{2} = 80.5, l = 20$

$m = 60 \quad f = 46$

Median $= 20 + \frac{80.5 - 60}{46} \times 10$

$= 20 + \frac{205}{46}$

$= 24.457$

6)

marks (x)	No of students (f_i)	x_i	$f_i x_i$	$x_i - 32.09$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$
0-10	5	5	25	-27.09	733.87	3669.35
10-20	7	15	105	-17.09	292.07	2044.49
20-30	14	25	350	-7.09	50.27	703.78
30-40	12	35	420	2.91	8.47	101.64
40-50	9	45	405	12.91	166.67	1500.03
50-60	6	55	330	22.91	524.87	3149.22
60-70	2	65	180	32.91	1083.07	2166.14
	55		1765	20.37		13334.65

$$\bar{x} = \frac{1}{N} \sum f_i x_i$$

$$= \frac{1765}{55}$$

$$= 32.0909$$

$$\sigma^2 = \frac{1}{N} \sum_{i=1}^{n} f_i (x_i - \bar{x})^2$$

$$= \frac{1}{55} (13334.65)$$

$$\sigma^2 = 242.448$$

$$\sigma = 15.5707$$

7)

x_i	f_i	$x_i f_i$	$x_i - 56.16$	$(x_i - 56.16)^2$	$f_i(x_i - 56.16)^2$
10	15	150	-46.16	2130.75	31961.25
20	30	600	-36.16	1307.55	39226.5
30	53	1590	-26.16	684.35	36270.55
40	75	3000	-16.16	261.15	19586.25
50	100	5000	~~-16.16~~ -6.16	37.95	3795
60	110	6600	3.84	14.75	1622.5
70	115	8050	13.84	191.55	22028.25
80	125	10000	23.84	568.35	71043.75
	623	34990			225534.05

$$\bar{x} = \frac{1}{N} \sum f_i x_i$$

$$= \frac{34990}{623}$$

$$= 56.1684$$

$$\sigma^2 = \frac{225534.05}{623}$$

$$\sigma^2 = 362.0129$$

$$\sigma = 19.0266$$

8)

	f_i	x_i	C.F	$x_i f_i$
0-10	12	5	12	60
10-20	18	15	30	270
20-30	27 ← f_i	25	57 ←	675
30-40	20	35	77	700
40-50	17	45	94	765
50-60	6	55	100	330
	100			2800

Mean $= \frac{1}{N} \sum f_i x_i$

$= \frac{2800}{100}$

$= 28$

Median $= l + \frac{\frac{N}{2} - m}{f} \times h$ $\quad \frac{N}{2} = 50$

$l = 20, \; m = 30, \; f = 27$

Median $= 20 + \frac{50 - 30}{27} \times 10$

$= 20 + \frac{200}{27}$

$= 27.4074$

Mode $= l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

$f_1 = 27$

$f_0 = 18$ $\quad l = 20$

$f_2 = 20$

Mode $= 20 + \frac{9}{54 - 18 - 20} \times 10$

$= 20 + \frac{9}{16} \times 10$

$= 25.625$

a)

C.I	f	x_i	$f_i x_i$	$\lvert x_i - A \rvert$	$f_i \lvert x_i - A \rvert$
20-30	4	25	100	22.4	89.6
30-40	61	35	2135	12.4	756.4
40-50	132	45	5940	2.4	316.8
50-60	153	55	8415	7.6	1162.8
	350		16590		2325.6

$$M.D = \frac{1}{N} \Sigma f_i \lvert x_i - A \rvert$$

$$A = \text{mean} = \frac{1}{N} \Sigma f_i x_i$$

$$A = \frac{16590}{350} = 47.4$$

$$\text{Mean deviation} = \frac{1}{350}(2325.6)$$

$$= 6.645$$

$(x-\bar{x})^2$	$f_i(x-\bar{x})^2$
501.76	2007.04
153.76	9379.36
5.76	760.82
57.76	8857.28
	20984

$$S.D = \sqrt{\frac{1}{N} \cdot \Sigma f_i (x_i - \bar{x})^2}$$

$$= \sqrt{\frac{20984}{350}}$$

$$= 7.74$$

16)

C.I	f	x_i	$f_i x_i$	$\lvert x_i - A \rvert$	$f_i \lvert x_i - A \rvert$
0-8	8	4	32	19.54	156.32
8-16	7	12	84	11.54	80.78
16-24	16	20	320	3.54	56.64
24-32	24	28	672	4.46	107.04
32-40	15	36	540	12.46	186.9
	70		1648		~~619.36~~ 587.68

16.4

$$A = \frac{1648}{70} = 23.542$$

$$M.D = \frac{1}{70}(586.68)$$

$$= 8.395$$

$(x-\bar{x})^2$	$f_i(x_i-\bar{x})^2$
381.81	8054.49
133.17	932.19
12.53	200.48
19.89	477.36
155.25	2328.75
	6993.26

$$SD = \sqrt{\frac{1}{N}\sum f_i(x_i-\bar{x})^2}$$

$$= \sqrt{\frac{6993.26}{70}}$$

$$= 9.99.$$