

Worksheet - 2

Height	No of students
130-134	5
135-139	15
140-144	28
145-149	24
150-154	17
155-159	10
160-164	1

Data is not continuous so to make it continuous add 0.5 in upper limit and subtract 0.5 from lower limit

C.F.	Height	no of students	x	$x-A$	d	fd
5	129.5-134.5	5	132	-15	-3	-15
20	134.5-139.5	15	137	-10	-2	-30
35	139.5-144.5	28	142	-5	-1	-28
72	144.5-149.5	24	147	0	0	0
89	149.5-154.5	17	152	5	1	17
99	154.5-159.5	10	157	10	2	20
110	159.5-164.5	1	162	15	3	3
		100				-23

$$A = 147 ; N = \sum f = 100$$

$$i = 5 ; \sum fd = -23$$

$$\bar{x} = A + \frac{\sum fd}{N} \times i$$

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$$\text{Mean } \bar{x} = \frac{147 \cdot 33 \cdot 100}{100}$$

$$= 147 \cdot 33$$

$$\bar{x} = 147.33$$

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

$$\frac{N}{2} = \frac{100}{2} = 50$$

$$l = 144.5$$

$$c.f = 48$$

$$f = 24$$

$$h = 5$$

$$\text{Median} = 144.5 + \frac{50 - 48}{24} \cdot 5$$

$$= 144.5 + 0.41$$

$$= 144.91$$

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$$

$$= 3 \times 144.91 - 2 \times 147.33$$

$$= 434.73 - 294.66$$

$$= 140.07$$

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Score	No. of students	x	x-A	d	d ²	fx	fx ²
0-10	12	5	-30	-3	36	60	300
10-20	18	15	-20	-2	36	270	4500
20-30	35	25	-10	-1	35	875	21875
30-40	42	35	0	0	0	1470	51450
40-50	50	45	10	1	50	2250	101250
50-60	45	55	20	2	90	2475	136125
60-70	20	65	30	3	60	1300	84500
70-80	8	75	40	4	32	600	45000
	230				125	14455	744550

Standard deviation $\sigma = \sqrt{E(x^2) - [E(x)]^2}$

$$E(x) = \bar{x} = A + \sum f d x_i$$

$$A = 75, \sum f d = 125; N = 230; i = 10$$

$$\bar{x} = 75 + \frac{125}{230} \times 10$$

$$\bar{x} = 75 + 5.43$$

$$\bar{x} = 80.43$$

$$[E(x)]^2 = 6469.05$$

$$E(x^2) = \frac{\sum f x^2}{N}$$

$$= \frac{744550}{230}$$

$$= 3237.17$$

$$\sigma = \sqrt{3237.17 - 6469.05}$$

$$\sigma = \sqrt{2768.12}$$

$$\sigma = 52.61$$

$$s = 17.26$$

$$\text{Coefficient of variation} = 100 \times \frac{s}{\bar{x}}$$

$$= 100 \times \frac{17.26}{70.43}$$

$$= 24.64$$

A3(a)	No. of rejects per operator	No. of operators	c.f.
20.5-25.5	120	120	120
25.5-30.5	125	125	245
30.5-35.5	280	280	525
35.5-40.5	260	260	785
40.5-45.5	155	155	940
45.5-50.5	187	187	1127
50.5-55.5	162	162	1286

$$(i) D_7 = l + \left(\frac{\frac{7 \times 100 - c.f.}{100} - \frac{c.f.}{100} \right) \times h$$

$$7N = \frac{7 \times 1286}{100} = 89.92$$

$$l = 30.5; c.f. = 745; f = 280; h = 5$$

$$D_7 = 30.5 + \frac{89.92 - 745}{280} \times 5$$

$$D_7 = 35.31$$

$$(ii) P_{30} = l + \left(\frac{\frac{30 \times 100}{100} - c.f.}{100} \right) \times h$$

$$\frac{30 \times 1286}{100} = 385.8$$

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$l = 30.5, cf = 245, b = 280, h = 5$
 $P_{30} = 30.5 + \left(\frac{385.7 - 245}{280} \right) \times 5$
 $= 33.10$

(iii) Quartile deviation
 $Q_1 = l + \left(\frac{\frac{N}{4} - cf}{b} \right) \times h$
 $\frac{N}{4} = \frac{1286}{4} = 321.5$
 $Q_1 = 30.5 + \left(\frac{321.5 - 245}{280} \right) \times 5$
 $Q_1 = 31.86$
 $Q_2 = l + \left(\frac{\frac{N}{2} - cf}{b} \right) \times h$
 $\frac{N}{2} = \frac{1286}{2} = 643$
 $Q_2 = 35.5 + \left(\frac{643 - 525}{280} \right) \times 5$
 $Q_2 = 37.76$
 $Q_3 = l + \left(\frac{\frac{3N}{4} - cf}{b} \right) \times h$
 $\frac{3N}{4} = \frac{3 \times 1286}{4} = 964.5$
 $Q_3 = 45.5 + \left(\frac{964.5 - 940}{280} \right) \times 5$
 $Q_3 = 46.16$

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(6)

	Firm A	Firm B
No. of employees	100	200
Average wage monthly	Rs 2700	Rs 1800
S.D.	Rs 60	Rs 80

Coefficient of variation (firm A)
 $= 100 \times \frac{\sigma_1}{\bar{x}_1}$
 $= 100 \times 0.025 = 2.5$

Coefficient of variation (firm B)
 $= 100 \times \frac{\sigma_2}{\bar{x}_2}$
 $= 100 \times 0.044 = 4.44$

\therefore Coefficient of variation of firm B has greater variability

Firm A wages = $100 \times 2.5 = 250$
 Firm B wages = $200 \times 4.44 = 888$
 \therefore Firm B pays larger amount on wages