Statistics

---

1. The following table shows the weekly wages drawn by number of workers in a factory, find the median of the following data.

Weekly wages (in Rs.)	**0-100**	**100-200**	**200-300**	**300-400**	**400-500**
No. of workers	**40**	**39**	**34**	**30**	**45**

Ans. We have

Weekly wages (in Rs.)	No. of workers (f)	C.F
0-100	49	40
100-200	39	79
200-300	34	113
300-400	30	143
400-500	45	188
	$N = \sum f = 188$	

Now $\frac{N}{2} = \frac{188}{2} = 94$ and this is in 200-300 class.

$\therefore$ Median class= 200-300

Here, $l_1 = 200,\ c = 79,\ h = 100,\ f = 34,\ \frac{N}{2} = 94$

We know that $Me = l_1 + \frac{\frac{N}{2} - c}{F} \times h$

$$= 200 + \frac{94 - 79}{34} \times 100$$

$$= 200 + \frac{1500}{34}$$

$$= 200 + \frac{750}{17} \Rightarrow 200 + 14.12$$

$$= 244.12$$

2. Find the median of the following data:

Marks	**Frequency**
Less than 10	**0**

Less than 30	**10**
Less than 50	**25**
Less than 70	**43**
Less than 90	**65**
Less than 110	**87**
Less than 130	**96**
Less than 150	**100**

Ans. First of all we shall change cumulating series into simple series.
We have

X	F	C.F
0-10	0	0
10-30	10	10
30-50	15	25
50-70	18	43
70-90	22	65
90-110	22	87
110-130	9	96
130-150	4	100
	$N = \sum f = 100$	

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

Now , which lies in 70-90 class

$\therefore$ Median class = 70-90

Here, $l_1 = 70, c = 43, h = 20, f = 22, N = 100$

We know that Median, Me = $l_1 + \frac{\frac{N}{2} - C}{f} \times h$

$= 70 + \frac{20}{22}(50 - 43)$

$= 70 + \frac{20 \times 7}{22} = 70 + \frac{70}{11}$

$= 70 + 6.36$

$= 76.36$

3. Find the median of the following data.

Wages (in rupees)	**No. of workers**
More than 150	**Nil**
More than 140	**12**
More than 130	**27**
More than 120	**60**
More than 110	**105**

More than 100	**124**
More than 90	**141**
More than 80	**150**

Ans. First of all we shall find simple frequencies.

Wages (in Rupees) (X)	No. of workers (F)	C.F
80-90	9	9
90-100	17	26
100-110	19	45
110-120	45	90
120-130	33	123
130-140	15	138
140-150	2	150
	$N = \sum f = 150$	

Now $\frac{N}{2} = \frac{150}{2} = 75,$ which lies in 110-120 class

$\therefore$ Median class = 110-120

Here, $l_1 = 110, c, 45, h = 10, f = 45, N = 150$

We know that Me = $l_1 + \frac{\frac{M}{2} - C}{F} \times h$

$$= 110 + \frac{10}{45}(75 - 45)$$

$$= 110 + \frac{10 \times 30}{45} = 110 + \frac{20}{3}$$

$$= 110 + 6.67 = 116.67$$

4. Find the median of the following frequency distribution:

Wages (in Rs.)	**200-300**	**300-400**	**400-500**	**500-600**	**600-700**
No. of Laborers	**3**	**5**	**20**	**10**	**6**

Ans. We have

Wages (in Rs.)	No. of laborers (f)	C.F
200-300	3	3
300-400	5	8
400-500	20	28
500-600	10	38
600-700	6	44

	$N = \sum f = 44$	

Now $\frac{N}{2} = \frac{44}{2} = 22$ and this lies in 400-500 class.

$\therefore$ Median class = 400-500

Here, $l_1 = 400, C = 8, h = 100, f = 20, N = 44$

We know that $Me = l_1 + \frac{\frac{N}{2} - C}{F} \times h$

$= 400 + \frac{22 - 8}{20} \times 100$

$= 400 + \frac{14 \times 100}{20}$

$= 400 + 70$

$= 470$

5. The following tables gives production yield per hectare of wheat of 100 farms of village:

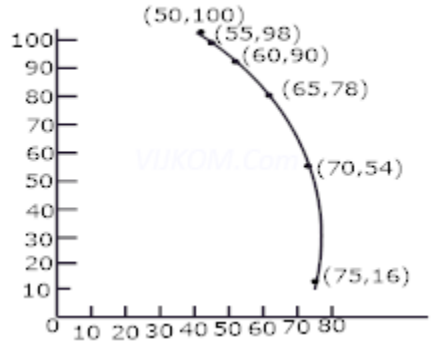
Production yield (in hr)	**50-55**	**55-60**	**60-65**	**65-70**	**70-75**	**75-80**
No. of farms	**2**	**8**	**12**	**24**	**38**	**16**

Change the distribution to a more than type distribution and draw its Ogive.

Ans. More than type Ogive

Production yield (Kg/ha)	C.F
More than or equal to 50	100
More than or equal to 55	98
More than or equal to 60	90
More than or equal to 65	78
More than or equal to 70	54
More than or equal to 75	16

Now, draw the Ogive by plotting the points (50,100), (55,98), (60,90), (65,78), (70,54), (75,16)



6. The A.M of the following distribution is 47. Determine the value of P.

Classes	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**
Frequency	**8**	**15**	**20**	**P**	**5**

Ans. We have

Class Interval	Mid-value (x_i)	Frequency (f_i)	$f_i x_i$
0-20	10	8	80
20-40	30	15	450
40-60	50	20	1000
60-80	70	P	70P
80-100	90	5	450
		$\sum f_i = 48 + P$	$\sum f_i x_i = 1980 + 70P$

Since Mean, $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$

$$\Rightarrow 47 = \frac{1980 + 70P}{48 + P}$$

$$\Rightarrow 2256 + 47P = 1980 + 70P$$

$$\Rightarrow 70P - 47P = 2250 - 1980$$

$$\Rightarrow 23P = 276$$

$$\Rightarrow P = \frac{276}{23} = 12$$

Thus, P = 12

7. Following distribution shows the marks obtained by a class of 100 students:

Marks	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**

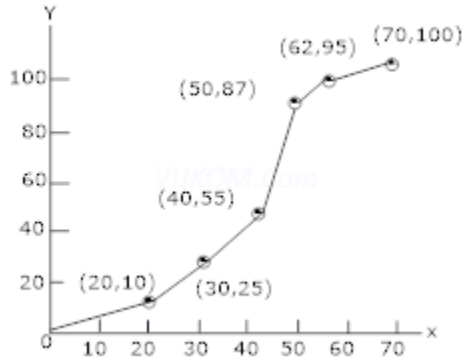
Frequency	**10**	**15**	**30**	**32**	**8**	**5**

Change the distribution to less than type distribution and draw its Ogive.

Ans. Less than type Ogive

Marks	Marks	Frequency	Cumulative Frequency
10-20	Less than 20	10	10
20-30	Less than 30	15	25
30-40	Less than 40	30	55
40-50	Less than50	32	87
50-60	Less than 60	8	95
60-70	Less than 70	5	100

Now, draw the Ogiveby plotting (20,10), (30,25), (40,55), (50,87), (60,95), (70,100)



8. Following table shows the daily pocket allowances given to the children of a multi-story building. The mean of the pocket allowances is Rs. 18. Find out the missing frequency.

Class Interval	**11-13**	**13-15**	**15-17**	**17-19**	**19-21**	**21-23**	**23-25**
Frequency	**3**	**6**	**9**	**13**	**?**	**5**	**4**

Ans. Let the missing frequency = f, we have

Class interval	f_i	Mid-value	$u_i = \frac{x_i - a}{h} = \frac{x_i - 18}{2}$	f_iu_i
11-13	3	12	-3	-9
13-15	6	14	-2	-12
15-17	9	16	-1	-9
17-19	13	18	0	0
19-21	f	20	1	F
21-32	5	22	2	10
23-25	4	24	3	12
	$\sum f_i = 40 + f$			$\sum f_iu_i = f - 8$

Let assumed mean a = 18, Here h = 2

We know that mean $\bar{x} = a + \frac{\sum fixi}{\sum fi} \times h$

$\Rightarrow 18 = 18 + \frac{(f-8)}{40+f} \times 2$

$\Rightarrow 0 = f - 8$

$\Rightarrow f = 8$

Hence, missing frequency = 8

9. A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained. Find the median height.

Height (in cm)	**No. of girls**
Less than 140	**4**
Less than 145	**11**
Less than 150	**29**
Less than 155	**40**
Less than 160	**46**
Less than 165	**51**

Ans. We have,

Class Intervals	Frequency (f)	C.F
Below 140	4	4
140-145	7	11
145-150	18	29
150-155	11	40
155-160	6	46
160-165	5	51
	$N = \sum f = 51$	

Here, $\frac{N}{2} = \frac{51}{2} = 25.5$ which is in the class 145-150

Here, $l_1 = 145, h = 5, N = 51, C = 11, F = 18$

$\therefore$ Median $= l_1 + \frac{\frac{N}{2} - C}{f} \times h$

$= 145 + \frac{25.5 - 11}{18} \times 5$

$= 145 + \frac{72.5}{18} \Rightarrow 149.03$

$\therefore$ Median height of the girls = 149.03

10. Calculate the mean for the following distribution:

Class Interval	**0-4**	**4-8**	**8-12**	**12-16**	**16-20**	**20-24**	**24-28**	**28-32**
Frequency	**2**	**5**	**8**	**16**	**14**	**10**	**8**	**3**

Ans. By stepdeviation Method

Let assumed mean a = 14

Class interval	Mid-value (x_i)	Frequency (f_i)	Deviation $d_i = x_i - a$	Product $(f_i d_i)$
0-4	2	2	-12	-24
4-8	6	5	-8	-40
8-12	10	8	-4	-32
12-16	14	16	0	0
16-20	18	14	4	56
20-24	22	10	8	80
24-28	26	8	12	96
28-32	30	3	16	48
Total		$\sum f_i = 66$		$\sum f_i d_i = 184$

We know that Mean $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$

$= 14 + \frac{184}{66}$

$= 14 + 2.866$

$= 16.866$

11. The percentage of marks obtained by 100 students in an examination are given below:

Marks	**30-35**	**35-40**	**40-45**	**45-50**	**50-55**	**55-60**	**60-65**
Frequency	**14**	**16**	**18**	**23**	**18**	**8**	**3**

Determine the median percentage of marks.

Ans.

Class interval	Mid-value (x_i)	Frequency (f_i)	Deviation $d_i = x_i - a$	Product $(f_i d_i)$
0-4	2	2	-12	-24
4-8	6	5	-8	-40

8-12	10	8	-4	-32
12-16	14	16	0	0
16-20	18	14	4	56
20-24	22	10	8	80
24-28	26	8	12	96
28-32	30	3	16	48
Total		$\sum f_i = 66$		$\sum f_i d_i = 184$

We know that Mean $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$

$= 14 + \frac{184}{66}$

$= 14 + 2.866$

$= 16.866$

Therefore $\frac{n}{2} = 50$, which lies in the class 45-50

l_1(The lower limit of the median class) = 45

c(The cumulative frequency of the class preceding the median class) = 48

f(The frequency of the Median class)= 23

h(The class size) = 5

Median $= l_1 + \left[\frac{\frac{n}{2} - c}{f}\right] h$

$= 45 + \left(\frac{50 - 48}{23}\right) \times 5$

$= 45 + \frac{10}{23} = 45.4$

So, the median percentage of marks is 45.4

12. Draw a less than Ogive for the following frequency distribution:

Marks	**0-4**	**4-8**	**8-12**	**12-16**	**16-20**
No. of students	**4**	**6**	**10**	**8**	**4**

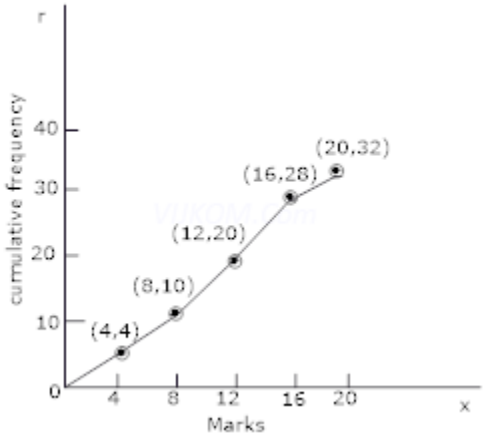
Ans. We have

Marks	Frequency (f)	C.F
0-4	4	4
4-8	6	10
8-12	10	20

12-16	8	28
16-20	4	32
	$\sum f = 32$	

Upper class limits	4	8	12	16	20
Cumulative Frequency	4	10	20	28	32
Plot the points	(4, 4)	(8, 10)	(12, 20)	(16, 28)	(20, 32)

Joint these points by a free hand curve; we get the required Ogive which is as follows:



13. The A.M of the following frequency distribution is 53. Find the value of P.

Classes	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**
Frequency	**12**	**15**	**32**	**P**	**13**

Ans. We have

Class Interval	Mid-value (x_i)	Frequency (f_i)	$f_i x_i$
0-20	10	12	120
20-40	30	15	450
40-60	50	32	1600
60-80	70	P	70P
80-100	90	13	1170
		$\sum f_i i = 72 + P$	$\sum f_i x_i = 3340 + 70P$

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

Since Mean

$$\Rightarrow 53 = \frac{3340 + 70P}{72 + P}$$

$$\Rightarrow 3340 + 70P = 3816 + 53P$$

$$\Rightarrow 17P = 3816 - 3340$$

$$\Rightarrow P = \frac{476}{17}$$

$$\Rightarrow P = 28$$

Thus, P = 28