Statistics: Exercise - 14.4

Q.1 The following distribution gives the daily income of 50 workers if a factory.

Daily income (in Rs)	Number of workers
100 – 120	12
120 – 140	14
140 – 160	8
160 – 180	6
180 – 200	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

Sol. Firstly, convert the given distribution to a less than type cumulative frequency distribution,

Daily income (in Rs)	Cumulative Frequency
Less than 120	12
Less than 140	12 + 14 = 26
Less than 160	26 + 8 = 34
Less than 180	34 + 6 = 40
Less than 200	40 + 10 = 50

Now we plot the points corresponding to the ordered pairs (120, 12), (140, 26), (160, 34), (180, 40) and (200, 50) on graph paper and join them by smooth curve.
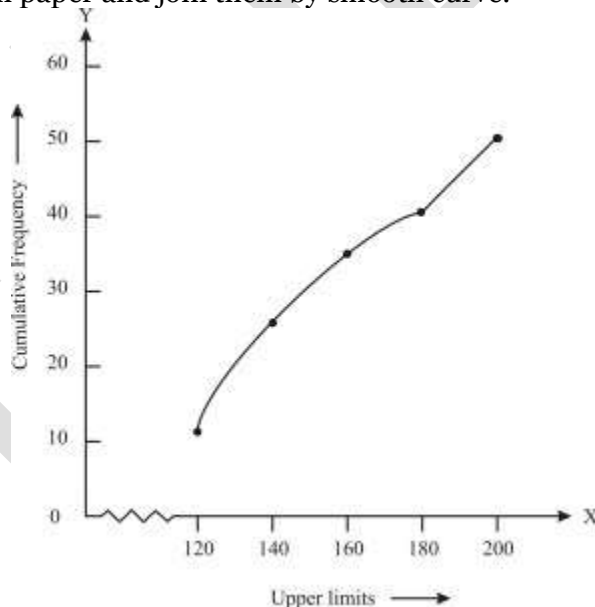
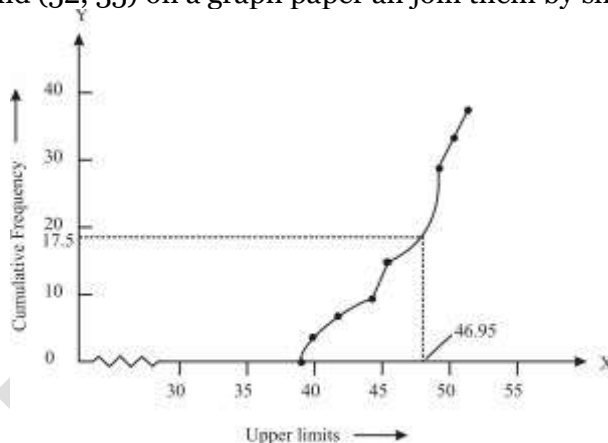Thus, obtained curve is less than type ogive.

Q.2 During the medical check-up of 35 students of a class, their weights were recorded as follows:

Weight (in kg)	Number of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

Draw a less than type ogive for the given data. Hence obtain the median weight from the graph and verify the result by using the formula.

Sol. Given values 38, 40, 42, 44, 46, 48, 50 and 52 are the upper limits of the respective class-intervals. To represent the data in graphically, we need to mark the upper limits of the class intervals on x-axis and their cumulative frequencies on the y-axis.

Now plot the points corresponding to the ordered pairs given by (38, 0), (40, 3), (42, 5), (44, 9),(46, 14), (48, 28), (50, 32) and (52, 35) on a graph paper an join them by smooth curve.

Obtained curve is less than type ogive. Now, locate $\dfrac{n}{2} = \dfrac{35}{2} = 17.5$ on the y-axis. From this point make a line

parallel to the x-axis cutting the curve at a point. And now from this point, draw a perpendicular to the x-axis. The point of intersection of this perpendicular line with the x-axis gives the median of the data.

Point at x-axis is 46.95. Let us make the following table in order to find mode by using the formula:

Weight (in kg)	Number of students Frequency
0 – 38	0
38 – 40	3 – 0 = 3
40 – 42	5 – 3 = 2
42 – 44	9 – 5 = 4
44 – 46	14 – 9 = 5
46 – 48	28 – 14 = 14
48 – 50	32 – 28 = 4
50 – 52	35 – 22 = 3

Since, class 46 – 48 has the maximum frequency. So, this is modal class

From above table, $\ell = 46$, $h = 2$, $f_1 = 14$, $f_0 = 5$ and $f_2 = 4$

$$\text{Mode} = \ell + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

$$= 46 + \left(\frac{14 - 5}{28 - 5 - 4} \right) \times 2$$

$$= 46 + 0.95 = 46.95$$

Hence, mode is verified.

**Q.3 The following table gives production yield per hectare of wheat of 100 farms of a village.**

Production yield (in kg/ha)	Number of farms
50 – 55	2
55 – 60	8
60 – 65	12
65 – 70	24
70 – 75	38
75 – 80	16

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

Sol. Firstly, convert the given distribution to a more than type distribution,

Production yield (in kg/ha)	Number of farms
More than or equal to 50	100
More than or equal to 55	100 – 2 = 98
More than or equal to 60	98 – 8 = 90
More than or equal to 65	90 – 12 = 78
More than or equal to 70	78 – 24 = 54
More than or equal to 75	54 – 38 = 16

Now, we draw the ogive by plotting the points (50, 100), (55, 98), (60, 90), (65, 78), (70, 54) and (75, 16) on the graph paper and join them by a smooth curve.
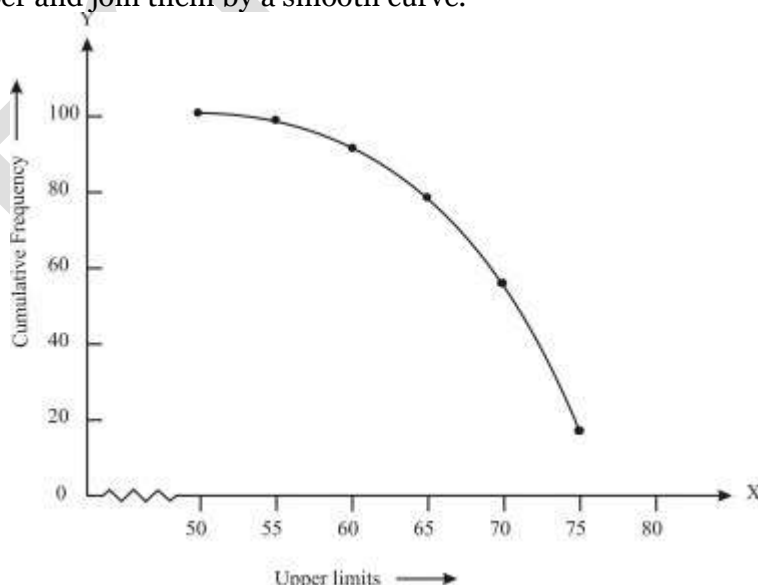
The obtained curve is more than type ogive.