

# Assignment 1

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**Abstract—This PDF contains the solution for Assignment 1 (ICSE Class 10 Maths 2017 Q.3(c))**

## QUESTION:

The marks of 10 students of a class in an examination arranged in ascending order is as follows:

13, 35, 43, 46,  $x$ ,  $x + 4$ , 55, 61, 71, 80.

If the median marks is 48, find the value of  $x$ .

Hence find the mode of the given data.

### **Solution:**

1) Finding the value of  $x$  :

**Median ( $M$ ) :** If  $n$  be the number of entries in given sorted data (ascending or descending) then median of the data is given by ,

(i) if  $n = \text{odd}$

$$M = \left( \frac{n+1}{2} \right)^{\text{th}} \text{ element}$$

(ii) if  $n = \text{even}$

$$M = \frac{\left( \frac{n}{2} \right)^{\text{th}} \text{ element} + \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ element}}{2}$$

As here the value of  $n$  is **even**

From (ii) ,

$$M = \frac{(x) + (x+4)}{2}$$

$$M = \frac{(2x+4)}{2}$$

$$M = x + 2$$

$$x = M - 2 \quad (1)$$

As  $M = 48$  substituting this in equation (1) we get ,

$$x = 48 - 2$$

$$\therefore x = 46 \quad (2)$$

2) Mode of the data :

Using Histogram method to find mode of the data . Converting given set of sorted numbers (here ascending) into Class Intervals ,

$DATA : 13, 35, 43, 46, 46, 50, 55, 61, 71, 80$   
(3)

TABLE :

Class Interval	frequency
0-10	0
10-20	1
20-30	0
30-40	1
40-50	3
50-60	2
60-70	1
70-80	2

TABLE I  
FREQUENCY DISTRIBUTION TABLE

The mode class is first obtained by identifying the interval corresponding to the maximum frequency. The mode point is then obtained as the intersection of the lines  $PQ$  and  $RS$ . The  $x$ -coordinate of the mode point is the desired (approximate) mode. For the given problem,

$$P = \begin{pmatrix} 50 \\ 3 \end{pmatrix}, Q = \begin{pmatrix} 40 \\ 1 \end{pmatrix}, \quad (4)$$

$$R = \begin{pmatrix} 40 \\ 3 \end{pmatrix}, S = \begin{pmatrix} 50 \\ 2 \end{pmatrix} \quad (5)$$

The equations of lines are as follows:

$$PQ \equiv x - 5y = 35 \quad (6)$$

$$RS \equiv x + 10y = 70 \quad (7)$$

From (6) and (7), The point of intersection of  $PQ$  and  $RS$  is obtained through vector approach as follows,

$$\mathbf{PQ} \equiv (1 \quad -5) \begin{pmatrix} x \\ y \end{pmatrix} = 35$$

$$\mathbf{RS} \equiv (1 \quad 10) \begin{pmatrix} x \\ y \end{pmatrix} = 70$$

$$\begin{pmatrix} 1 & -5 \\ 1 & 10 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 35 \\ 70 \end{pmatrix} \quad (8)$$

The Augmented Matrix of the matrix (8) can be written as,

$$\begin{aligned} & \begin{pmatrix} 1 & -5 & | & 35 \\ 1 & 10 & | & 70 \end{pmatrix} \\ \xleftrightarrow{R_1 \leftarrow 2R_1 + R_2} & \begin{pmatrix} 3 & 0 & | & 140 \\ 1 & 10 & | & 70 \end{pmatrix} \\ \xleftrightarrow{R_2 \leftarrow 3R_2 - R_1} & \begin{pmatrix} 3 & 0 & | & 140 \\ 0 & 30 & | & 70 \end{pmatrix} \\ \xleftrightarrow{R_1 \leftarrow R_1/3} & \begin{pmatrix} 1 & 0 & | & 46.667 \\ 0 & 30 & | & 70 \end{pmatrix} \\ \xleftrightarrow{R_2 \leftarrow R_2/30} & \begin{pmatrix} 1 & 0 & | & 46.667 \\ 0 & 1 & | & 2.333 \end{pmatrix} \quad (9) \end{aligned}$$

and from (9) the desired mode is

$$\mathbf{M} = \begin{pmatrix} 46.667 \\ 2.333 \end{pmatrix}$$

Hence, Mode(approx) of given data = 46.66

Thus, 46.66 belong to mode class (40 – 50)

From (3), marks of student that belong to class interval 40 – 50 are:

$$43, 46, 46$$

$\therefore$  Most repeated number = 46

i.e., **mode** = 46 .

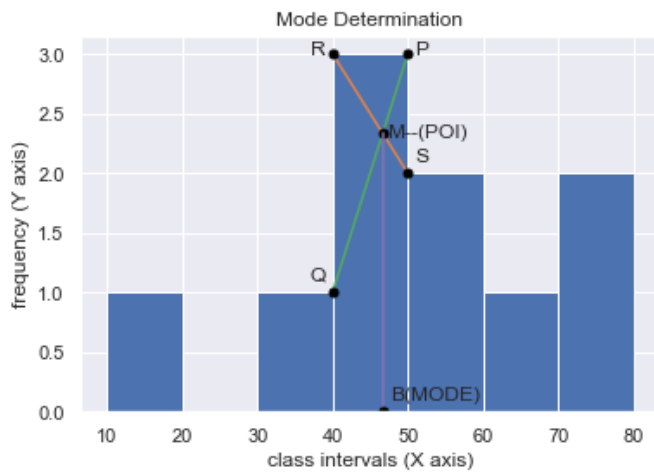


Fig. 1. Histogram of Data