# Assignment 3

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**Question :** Find the mode of

| | | | | | |
|---|---|---|---|---|---|
| 14 | 25 | 14 | 28 | 18 | 17 |
| 18 | 14 | 23 | 22 | 14 | 18 |

SOLUTION: using "HISTOGRAM" method

| class interval | Frequency |
|---|---|
| 0-10 | 0 |
| 10-20 | 8 |
| 20-30 | 4 |

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,

$$\mathbf{P} = \begin{pmatrix} 20 \\ 8 \end{pmatrix}, \mathbf{Q} = \begin{pmatrix} 10 \\ 0 \end{pmatrix}, \tag{1}$$

$$\mathbf{R} = \begin{pmatrix} 10 \\ 8 \end{pmatrix}, \mathbf{S} = \begin{pmatrix} 20 \\ 4 \end{pmatrix} \tag{2}$$

The equations of lines are as follows:

$$\mathbf{PQ} \equiv x - 1.25y = 10 \tag{3}$$

$$\mathbf{RS} \equiv x + 2.5y = 30 \tag{4}$$

From (3) and (4), The point of intersection of $PQ$ and $RS$ is obtained through vector approach as follows,

$$\mathbf{PQ} \equiv \begin{pmatrix} 1 & -1.25 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 10$$

$$\mathbf{RS} \equiv \begin{pmatrix} 1 & 2.5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 30$$

$$\begin{pmatrix} 1 & -1.25 \\ 1 & 2.5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 10 \\ 30 \end{pmatrix} \tag{5}$$

The Augmented Matrix of the matrix (5) can be written as,

$$\left(\begin{array}{cc|c} 1 & -1.25 & 10 \\ 1 & 2.5 & 30 \end{array}\right)$$

$$\xleftrightarrow{R_1 \leftarrow 2R_1 + R_2} \left(\begin{array}{cc|c} 3 & 0 & 50 \\ 1 & 2.5 & 30 \end{array}\right)$$

$$\xleftrightarrow{R_2 \leftarrow 3R_2 - R_1} \left(\begin{array}{cc|c} 3 & 0 & 50 \\ 0 & 7.5 & 40 \end{array}\right)$$

$$\xleftrightarrow{R_1 \leftarrow R_1/3} \left(\begin{array}{cc|c} 1 & 0 & 16.667 \\ 0 & 7.5 & 40 \end{array}\right)$$

$$\xleftrightarrow{R_2 \leftarrow R_2/30} \left(\begin{array}{cc|c} 1 & 0 & 16.667 \\ 0 & 1 & 5.334 \end{array}\right) \tag{6}$$

and from (6) the desired mode is

$$\mathbf{M} = \begin{pmatrix} 16.667 \\ 5.334 \end{pmatrix}$$

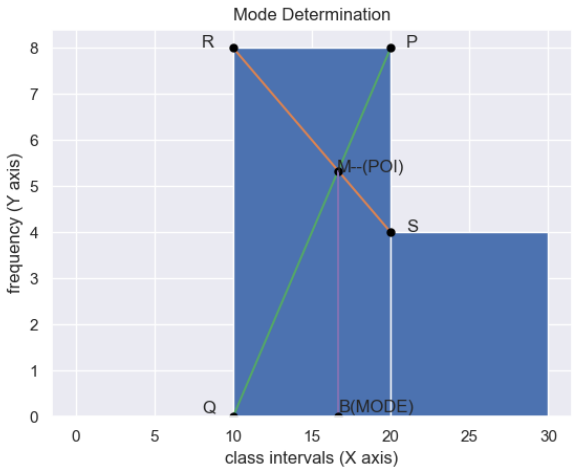


Fig. 1. Histogram of Data

Hence, Mode(approx) of given data = 16.66

Thus, $16.66$ belong to mode class $(10 - 20)$

From (3), marks of student that belong to class interval $10 - 20$ are:

$$14, 17, 18$$

$\therefore$ Most repeated number = $14$

i.e., **mode =** $14$ **.**