ASSIGNMENT 3

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***Abstract*—This assignment contains the solution to the Example 7 from the Chapter STATISTICS, from class 9 CBSE board syllabus.**

1. Question

A teacher wanted to analyse the performance of two sections of students in a mathematics test of 100 marks. Looking at their performances, she found that a few students got under 20 marks and a few got 70 marks or above. So she decided to group them into intervals of varying sizes as follows: 0 - 20, 20 - 30, . . ., 60 - 70, 70 - 100. Then she formed the following table:

MARKS	No. of Students
0 - 20	7
20 - 30	10
30 - 40	10
40 - 50	20
50 - 60	20
60 - 70	15
70 above	8

A histogram for this table was prepared by a student.

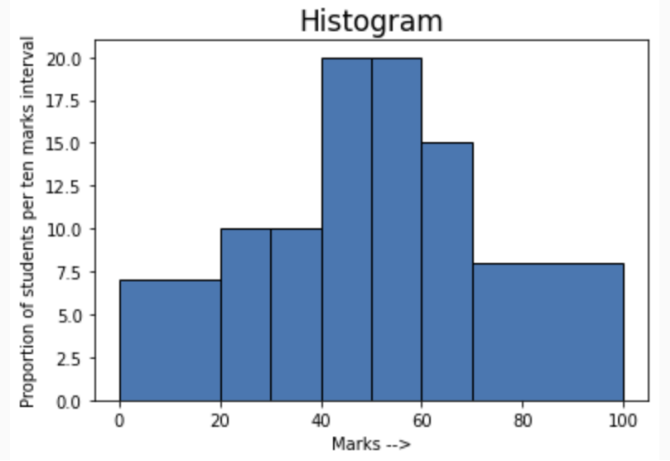

Fig. 1: Given histogram

Carefully examine this graphical representation. Do you think that it correctly represents the data?

2. Solution

No, the given histogram is incorrect.
The area of the rectangles is proportional to the frequencies in histogram. In this histogram,

Area for class 70 - 100:

$$8 \times 30 = 240 \tag{2.0.1}$$

Area for class 60 - 70:

$$15 \times 10 = 150 \tag{2.0.2}$$

Thus we see that the frequency of students who obtained 60 above marks are less than the frequency of students who obtained 70 above marks, which is wrong.
So, make the following modifications in the lengths of the rectangles so that the areas are again proportional to the frequencies.

1) Find the minimum class size. Here it is 10.
2) The lengths of the rectangles are then modified to be proportionate to the class-size 10.

Use the following concept:

$$length\ of\ rectangle = \frac{frequency\ of\ class}{class\ size} \times minimum\ class\ size \tag{2.0.3}$$

Using it, lengths of rectangles will be the as follows.
Calculations:

$$[0, 20] : \frac{7}{20} \times 10 = \frac{7}{2} = 3.5 \tag{2.0.4}$$

$$[20, 30] : \frac{10}{10} \times 10 = 10 \tag{2.0.5}$$

$$[30, 40] : \frac{10}{10} \times 10 = 10 \tag{2.0.6}$$

$$[40, 50] : \frac{20}{10} \times 10 = 20 \tag{2.0.7}$$

$$[50, 60] : \frac{20}{10} \times 10 = 20 \tag{2.0.8}$$

$$[60, 70] : \frac{15}{10} \times 10 = 15 \tag{2.0.9}$$

$$[70 - 100] : \frac{8}{30} \times 10 = \frac{8}{3} = 2.67 \tag{2.0.10}$$

The information when tabulated is as shown below.

Marks	Frequency	Width	Rect length
0 - 20	7	20	3.5
20-30	10	10	10
30-40	10	10	10
40-50	20	10	20
50-60	20	10	20
60-70	15	10	15
70 above	8	30	2.67

TABLE 2: The correct analysis of histogram

So the correct graph would be as follows. This graph has been plotted using `matplotlib`, `python`.

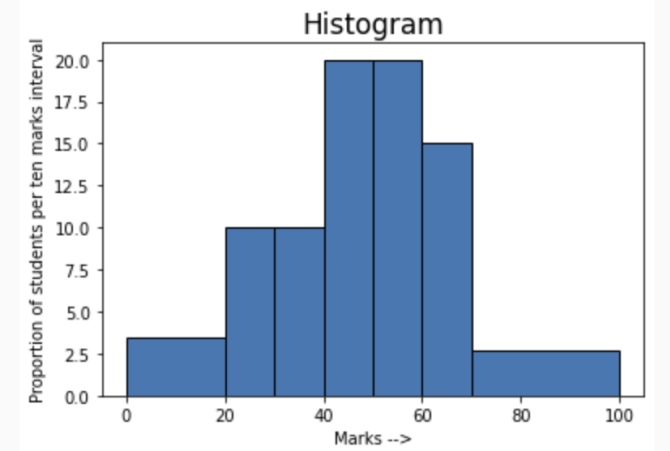

Fig. 3: Given histogram