Answer on Question #58659 – Math – Statistics and Probability

Question

The table below shows discrete frequency distribution data. Use it to answer the questions that follow.

Class	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Frequency	5	8	10	12	7	6	3	2

Compute:

(i) Mode of the distribution (3marks);

(ii) The 7th decile (3marks);

(iii) The third quartile (4marks).

Solution

(i) To find the mode of grouped distribution, the following formula will be used:

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \cdot h,$$

where l is the lower limit of model class, f_0 is the frequency of class preceding, f_1 is the frequency of that class and f_2 is the frequency of class succeeding the model class respectively, h is the class width.

Let's put the numbers into a table:

Class	Frequency	Cumulative Frequency	
0-4	5	5	
5-9	8	13	
10-14	10 (f_0)	23	
15-19	12(f_1)	35	Mode interval
20-24	7 (f_2)	42	7th decile and third quartile interval
25-29	6	48	
30-34	3	51	
35-39	2	53	
$\sum f$	53		

The mode containing class is [15-19] has the biggest frequency 12.

So the mode value is

$$\text{Mode} = 15 + \frac{12-10}{2\cdot 12 - 10 - 7} \cdot 4 = 15 + \frac{2}{24-17} \cdot 4 = 15 + \frac{8}{7} = 16\frac{1}{7} = 16.14.$$

(ii) To find the 7th decile, we need to use the formula:

$$\mathrm{D}_k = l_i + \frac{\frac{k}{10}\cdot\sum f - f'_{D_k-1}}{f_{D_k-1}}\cdot h,$$

where l_i is the lower limit of decile class, $\sum f$ *is* the sum of the absolute frequency; f'_{D_k-1} *is* absolute frequency lies below the decile class; f_{D_k-1} *is* frequency of the decile class; *k* is the decile number; *h* is the class width.

The 7th decile containing class is [20-24], because Cumulative frequency in that interval is $42 > 37.1 = \frac{53}{10}\cdot 7$.

Therefore, $\mathrm{D}_k = 20 + \frac{\frac{7}{10}\cdot 53 - 35}{7}\cdot 4 = 20 + \frac{0.7\cdot 53 - 35}{7}\cdot 4 = 20 + \frac{2.1}{7}\cdot 4 = 20 + 1.2 = 21.2$.

(iii) To find the third quartile, we need to use the formula:

$$\mathrm{Q}_3 = l + \frac{0.75\cdot\sum f - f'_{Q_3-1}}{f_{Q_3-1}}\cdot h,$$

where *l* is the lower limit of the third quartile class, $\sum f$ *is* the sum of the absolute frequency; f'_{Q_3-1} *is* absolute frequency lies below the quartile class; f_{Q_3-1} *is* frequency of the quartile class; *h* is the class width.

The third quartile containing class is [20-24], because Cumulative frequency in that interval is $42 > 39.75 = \frac{53}{4}\cdot 3$.

$$\mathrm{Q}_3 = 20 + \frac{0.75\cdot 53 - 35}{7}\cdot 4 = 20 + \frac{39.75 - 35}{7}\cdot 4 = 20 + \frac{4.75\cdot 4}{7} = 20 + 2.71 = 22.71.$$

Answer: (i) 16.14; **(ii)** 21.2; **(iii)** 22.71.