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## STATICTICS

(i) Assumed Mean method or Shortcut method

Mean $=\bar{X}=\mathrm{a}+\frac{\sum_{i=1}^{n} \text { fidi }}{\sum_{i=1}^{n} f i}$
Where $\mathrm{a}=$ assumed mean
And $\mathrm{d}_{\mathrm{i}}=\mathrm{X}_{\mathrm{i}}-\mathrm{a}$
(ii) Step deviation method.

Mean $=\bar{X}=a+\frac{\sum_{i=1}^{\mathrm{M}} \text { fiui }}{\sum_{i=1}^{\mathrm{M}} \mathrm{i}^{2}} x h$
Where $\mathrm{a}=$ assumed mean
$\mathrm{h}=$ class size
And $u_{i}=\left(X_{i}-a\right) / h$

- Median of a grouped frequency distribution can be calculated by

Median $=1+\left(\frac{n}{x}-a f\right) \times h$
Where
I = lower limit of median class
$\mathrm{n}=$ number of observations
$\mathrm{cf}=$ cumulative frequency of class preceding the median class
$f=$ frequency of median class
$h=$ class size of the median class.

- Mode of grouped data can be calculated by the following formula.

Mode $=1+\left(\frac{f 1-f o}{2 f 1-f o-f 2}\right) \times h$
Where
I = lower limit of modal class
$\mathrm{h}=$ size of class interval
$\mathrm{f} 1=$ Frequency of the modal class
fo $=$ frequency of class preceding the modal class
$\mathrm{f} 2=$ frequency of class succeeding the modal class

- Empirical relationship between the three measures of central tendency.

3 Median $=$ Mode +2 Mean
Or, Mode $=3$ Median -2 Mean

- Ogive

Ogive is the graphical representation of the cumulative frequency distribution. It is of two types:
(i) Less than type ogive.
(ii) More than type ogive

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- Median by graphical method

The $x$-coordinated of the point of intersection of 'less than ogive' and 'more than ogive' gives the median.

## LEVEL-I

| SIno | Question |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | What is the mean of $1^{\text {st }}$ ten prime numbers? |  |  |  |  |  |  |  |
| 2 | What measure of central tendency is represented by the abscissa of the point where less than ogive and more than ogive intersect? |  |  |  |  |  |  |  |
| 3 | If the mode of a data is 45 and mean is 27, then median is |  |  |  |  |  |  |  |
| 4 | Find the mode of the following |  |  |  |  |  |  |  |
|  | $\mathrm{X}_{\mathrm{i}}$ | 35 | 38 |  |  | 42 | 44 |  |
|  | $\mathrm{f}_{\mathrm{i}}$ | 5 | 9 |  |  | 7 | 2 |  |
| 5 | Write the median class of the following distribution. |  |  |  |  |  |  |  |
|  | Class | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|  | Frequency | 4 | 4 | 8 | 10 | 12 | 8 | 4 |
| 6 | The wickets taken by a bowler in 10 cricket matches are as follows: $2,6,4,5,0,2,1,3,2,3$ Find the mode of the data |  |  |  |  |  |  |  |
| 7. | How one can find median of a frequency distribution graphically |  |  |  |  |  |  |  |
| 8. | What important information one can get by the abscissa of the point of intersection of the less than type and the more than type commulative frequency curve of a group data |  |  |  |  |  |  |  |

## LEVEL - II

| Slno | Question |  |  |  |  |  |  |  |  |  |  | Ans |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Find the median of the following frequency distribution |  |  |  |  |  |  |  |  |  |  | 167 |
|  | Height in cm | 160-162 |  | 163-165 |  |  | 166-168 |  | 169-171 |  | 172-174 |  |
|  | Frequency | 15 |  | 117 |  |  | 136 |  | 118 |  | 14 |  |
| 2 | Given below is the distribution of IQ of the 100 students. Find the median IQ |  |  |  |  |  |  |  |  |  |  | 106.1 |
|  | IQ | 75-84 | 85-94 | 95-104 |  |  | $\begin{gathered} \hline 105- \\ 114 \\ \hline \end{gathered}$ |  | 115-124 | 125-134 | 135-144 |  |
|  | Frequency | 8 | 11 |  | 26 |  | 31 | 18 |  | 4 | 2 |  |
| 3 | Find the median of the following distribution |  |  |  |  |  |  |  |  |  |  | 28.5 |
|  | Class interval | 0-10 | 10-20 |  | 20-30 |  |  | 30-40 |  | 40-50 | 50-60 |  |
|  | Frequency | 5 | 8 |  | 20 |  |  | 15 |  | 7 | 5 |  |
| 4 | A class teacher has the following absentee record of 40 students of a class for the whole |  |  |  |  |  |  |  |  |  |  |  |

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## LEVEL - III



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|  | Group B | 54 | 89 | 40 |  | 25 | 17 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 6 | The mean of the following frequency distribution is 57.6 and the sum of the observations is 50 . Find the missing frequencies $f_{1}$ and $f_{2}$. |  |  |  |  |  |  |  | $\begin{aligned} & \hline \mathrm{f}_{1}=8 \\ & \text { and } \\ & \mathrm{f}_{2}=10 \end{aligned}$ |
|  | Class | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 | 100-120 | Total |  |
|  | Frequency | 7 | $\mathrm{f}_{1}$ | 12 | $\mathrm{f}_{2}$ | 8 | 5 | 50 |  |
| 7 | The following distribution give the daily income of 65 workers of a factory |  |  |  |  |  |  |  |  |
|  | Daily <br> income (in <br> Rs) <br> RR | 100-120 | 120-140 | 140-160 | 160-180 | 180-200 |  |  |  |
|  | No. of workers | 14 |  | $10$ | $16$ | $9$ |  |  |  |
|  | Convert the above to a more than type cumulative frequency distribution and draw its ogive. |  |  |  |  |  |  |  |  |
| 8 | Draw a less than type and more than type ogives for the following distribution on the same graph. Also find the median from the graph. |  |  |  |  |  |  |  |  |
|  | Marks | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 |  |
|  | No. of students | 14 | 6 | 10 | 20 | 30 | 8 | 12 |  |

## SELF - EVALUATION

1. What is the value of the median of the data using the graph in figure of less than ogive and more than ogive?

2. If mean $=60$ and median $=50$, then find mode using empirical relationship.
3. Find the value of $p$, if the mean of the following distribution is 18 .

| Variate $\left(\mathrm{x}_{\mathrm{i}}\right)$ | 13 | 15 | 17 | 19 | $20+\mathrm{p}$ | 23 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Frequency <br> $\left(\mathrm{f}_{\mathrm{i}}\right)$ | 8 | 2 | 3 | 4 | 5 p | 6 |

4. Find the mean, mode and median for the following data.

| Classes | $0-10$ | $10-20$ | $20-30$ | $30-40$ | $40-50$ | $50-60$ | $60-70$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| frequency | 5 | 8 | 15 | 20 | 14 | 8 | 5 |

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5. The median of the following data is 52.5. find the value of $x$ and $y$, if the total frequency is 100 .

| Class <br> Interval | $0-10$ | $10-20$ | $20-30$ | $30-40$ | $40-50$ | $50-60$ | $60-70$ | $70-80$ | $80-90$ | $90-$ <br> 100 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| frequency | 2 | 5 | X | 12 | 17 | 20 | Y | 9 | 7 | 4 |

6. Draw 'less than ogive' and 'more than ogive' for the following distribution and hence find its median.

| Classes | $20-30$ | $30-40$ | $40-50$ | $50-60$ | $60-70$ | $70-80$ | $80-90$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| frequency | 10 | 8 | 12 | 24 | 6 | 25 | 15 |

7. Find the mean marks for the following data.

| Marks | Below <br> 10 | Below <br> 20 | Below <br> 30 | Below <br> 40 | Below <br> 50 | Below <br> 60 | Below <br> 70 | Below <br> 80 | Below <br> 90 | Below <br> 100 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of <br> students | 5 | 9 | 17 | 29 | 45 | 60 | 70 | 78 | 83 | 85 |

8. The following table shows age distribution of persons in a particular region. Calculate the median age.

| Age in <br> years | Below <br> 10 | Below <br> 20 | Below <br> 30 | Below <br> 40 | Below <br> 50 | Below <br> 60 | Below <br> 70 | Below <br> 80 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of <br> persons | 200 | 500 | 900 | 1200 | 1400 | 1500 | 1550 | 1560 |

9. If the median of the following data is 32.5 . Find the value of $x$ and $y$.

| Class <br> Interval | $0-10$ | $10-20$ | $20-30$ | $30-40$ | $40-50$ | $50-60$ | $60-70$ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| frequency | x | 5 | 9 | 12 | y | 3 | 2 | 40 |

10. The following are ages of 300 patients getting medical treatment in a hospital on a particular day.

| Age( in <br> years) | $10-20$ | $20-30$ | $30-40$ | $40-50$ | $50-60$ | $60-70$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of <br> patients | 60 | 42 | 55 | 70 | 53 | 20 |

Draw:

1. Less than type cumulative frequency distribution
2. More than type cumulative frequency distribution

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## Value Based Question

Q1. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality.

| Monthly <br> consumption <br> (in units) | $65-85$ | $85-105$ | $105-125$ | $125-145$ | $145-165$ | $165-185$ | $185-205$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Number of <br> consumers | 4 | 5 | 13 | 20 | 14 | 8 | 4 |

Mr. Sharma always saves electricity by switching of all the electrical equipment just immediately after their uses. So , his family belongs to the group 65-85 .
(i) Find the median of the above data
(ii) How many families consumed 125 or more units of electricity during a month?
(iii) What moral values of Mr. Sharma have been depicted in this situation?

Q2. The mileage ( km per litre) of 50 cars of the same models is tested by manufacturers and details are tabulated as given below:-

| Mileage (km per <br> litre) | $10-12$ | $12-14$ | $14-16$ | $16-18$ |
| :---: | :---: | :---: | :---: | :---: |
| No. of cars | 7 | 12 | 18 | 13 |

i. Find the mean mileage.
ii. The manufacturer claims that the mileage of the model is $16 \mathrm{~km} / \mathrm{litre}$. Do you agree with this claim?
iii. Which values do you think the manufacturer should imbibe in his life?

## ANSWER

1. 12.9
2. MEDIAN
3. 33
4. $\mathrm{MODE}=40$
5. MEDIAN $=30-40$
6. 2
7. OGIVE
8. Median

## Level II

Q1 167
Q2 106.1
Q3 28.51
Q4

| No. of days | Less <br> Than 6 | Less <br> Than 10 | Less <br> Than 14 | $\begin{aligned} & \hline \text { Less } \\ & \text { Than } 20 \end{aligned}$ | Less <br> Than 28 | Less <br> Than 38 | Less <br> Than 40 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of students | $\underline{11}$ | $\underline{21}$ | $\underline{28}$ | 32 | 36 | 39 | 40 |

Q5 27.2
Q6 Mean, median, mode

