Question 1: If the heights of 5 persons are $140 \mathrm{~cm}, 150 \mathrm{~cm}, 152 \mathrm{~cm}, 158 \mathrm{~cm}$ and 161 cm , respectively, find the mean height.

## Solution:

The heights of 5 persons are $140 \mathrm{~cm}, 150 \mathrm{~cm}, 152 \mathrm{~cm}, 158 \mathrm{~cm}$ and 161 cm (Given)
Mean height $=($ Sum of heights $) /($ Total number of persons $)$
Sum of heights $=140+150+152+158+161=761$
Total number of persons $=5$
So, Mean height $=761 / 5=152.2$
Question 2: Find the mean of $994,996,998,1002,1000$.

## Solution:

Sum of numbers $=994+996+998+1000+100=4990$
Total counts $=5$
Therefore, Mean $=($ Sum of numbers $) /($ Total Counts $)$
$=4990 / 5$
$=998$
Mean $=998$
Question 3: Find the mean of the first five natural numbers.

## Solution:

The first five natural numbers are $1,2,3,4,5$.
Sum of all the numbers $=1+2+3+4+5=15$
Total Numbers $=5$
Therefore, Mean $=($ Sum of numbers $) /($ Total Numbers $)$
$=15 / 5$
$=3$
Mean $=3$
Question 4: Find the mean of all factors of 10.
Solution:
Factors of 10 are 1, 2, 5, 10 .
Sum of all the factors $=1+2+5+10=18$
Total Numbers $=4$
Therefore, Mean $=($ Sum of factors $) /($ Total Numbers $)$
$=18 / 4$
$=4.5$
Mean $=4.5$
Question 5: Find the mean of the first 10 even natural numbers.

## Solution:

First 10 even natural numbers $=2,4,6,8,10,12,14,16,18,20$
Sum of numbers $=2+4+6+8+10+12+14+16+18+20=110$
Total Numbers $=10$
Now,
Mean $=($ Sum of numbers $) /($ Total Numbers $)$
$=110 / 10$
Mean $=11$
Question 6: Find the mean of $x, x+2, x+4, x+6, x+8$.

## Solution:

Given numbers are $\mathrm{x}, \mathrm{x}+2, \mathrm{x}+4, \mathrm{x}+6, \mathrm{x}+8$.
Sum of numbers $=x+(x+2)+(x+4)+(x+6)+(x+8)=5 x+20$
Total Numbers $=5$
Now,
Mean $=($ Sum of numbers $) /($ Total Numbers $)$
$=(5 \mathrm{x}+20) / 5$
$=5(\mathrm{x}+4) / 5$
$=x+4$
Mean $=x+4$
Question 7: Find the mean of the first five multiples of 3.

## Solution:

the first five multiples of 3 are $3,6,9,12,15$.
Sum of numbers $=3+6+9+12+15=45$
Total Numbers $=5$
Now,
Mean $=($ Sum of numbers $) /($ Total Numbers $)$
$=45 / 5$
$=9$
Mean $=9$

## RD Sharma Solutions for Class 9 Chapter 24 Measures of Central Tendency

Question 8: Following are the weights (in kg) of 10 newborn babies in a hospital on a particular day: 3.4, 3 . 6 , $4.2,4.5,3.9,4.1,3.8,4.5,4.4,3.6$. Find the mean.

## Solution:

The weights of 10 newborn babies (in kg ): $3.4,3.6,4.2,4.5,3.9,4.1,3.8,4.5,4.4,3.6$
Sum of weights $=3 \cdot 4+3 \cdot 6+4 \cdot 2+4 \cdot 5+3 \cdot 9+4 \cdot 1+3 \cdot 8+4 \cdot 5+4 \cdot 4+3 \cdot 6=40$
Total number of babies $=10$
No, Mean $=($ Sum of weights $) /($ Total number of babies $)$
$=40 / 10$
$=4$
Mean weight $=4 \mathrm{~kg}$
Question 9: The percentage marks obtained by students of a class in mathematics are : $64,36,47,23,0,19,81,93,72,35,3,1$. Find their mean.

## Solution:

The percentage marks obtained by students: $64,36,47,23,0,19,81,93,72,35,3,1$
Sum of marks $=64+36+47+23+0+19+81+93+72+35+3+1=474$
Total students $=12$
Now, Mean marks $=($ Sum of marks $) /($ Total students $)$
$=474 / 12$
$=39.5$
Mean Marks $=39.5$
Question 10: The numbers of children in 10 families of a locality are:
$2,4,3,4,2,3,5,1,1,5$. Find the number of children per family.

## Solution:

The numbers of children in 10 families: $2,4,3,4,2,3,5,1,1,5$
Total number of children $=2+4+3+4+2+3+5+1+1+5=30$
Total Families $=10$
Number of children per family $=$ Mean $=($ Total number of children $) /($ Total Families $)=30 / 10$ $=3$

Therefore, the number of children per family is 3.

## EXERCISE 24.2

Question 1: Calculate the mean for the following distribution:
$x: \quad 5$
4
6
7
8
9
f: $\quad 4$
8
14
11
3

Solution:

| $x$ | $f$ | $f x$ |
| :--- | :--- | :--- |
| 5 | 4 | 20 |
| 6 | 8 | 48 |
| 7 | 14 | 98 |
| 8 | 11 | 88 |
| 9 | 3 | 27 |
|  | $N=40$ | $\sum f x=281$ |

Formula to calculate mean:

$$
\operatorname{Mean}(\bar{x})=\frac{\sum f x}{N}
$$

$$
=281 / 40
$$

$$
=7.025
$$

$\Rightarrow$ Mean for the given distribution is 7.025 .
Question 2: Find the mean of the following data:

| $\mathrm{x}:$ | 19 | 21 | 23 | 25 | 27 | 29 | 31 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}:$ | 13 | 15 | 16 | 18 | 16 | 15 | 13 |

## Solution:

| $x$ | $f$ | $f x$ |
| :--- | :--- | :--- |
| 19 | 13 | 247 |
| 21 | 15 | 315 |
| 23 | 16 | 368 |
| 25 | 18 | 450 |
| 27 | 16 | 432 |
| 29 | 15 | 435 |
| 31 | 13 | 403 |
|  | $N=106$ | $\sum f x=2650$ |

Formula to calculate mean:

$$
\begin{aligned}
& \operatorname{Mean}(\bar{x})=\frac{\sum f x}{N} \\
= & 2650 / 106 \\
= & 25 \\
\Rightarrow & \text { Mean for the given data is } 25 .
\end{aligned}
$$

Question 3: The mean of the following data is 20.6. Find the value of $p$.
x : 10
15
p
25
35
f: $\quad 3$
$10 \quad 25$
$25 \quad 7$
5

Solution:

| $x$ | $f$ | $f x$ |
| :--- | :--- | :--- |
|  |  |  |
| 10 | 3 | 30 |
| 15 | 10 | 150 |
| $p$ | 25 | $25 p$ |
| 25 | 7 | 175 |
| 35 | 5 | 175 |
|  |  |  |
|  | $N=50$ |  |
|  |  |  |

Formula to calculate mean:

$$
\begin{aligned}
& \operatorname{Mean}(\bar{x})=\frac{\sum f x}{N} \\
= & (25 \mathrm{p}+530) / 50
\end{aligned}
$$

$$
\text { Mean = } 20.6 \text { (Given) }
$$

So,
$20.6=(25 \mathrm{p}+530) / 50$
$25 p+530=1030$
$25 \mathrm{p}=1030-530=500$
or $\mathrm{p}=20$
$\Rightarrow$ The value of $p$ is 20 .
Question 4: If the mean of the following data is 15 , find $p$.

| $\mathrm{x}:$ | 5 | 10 | 15 | 20 | 25 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}:$ | 6 | p | 6 | 10 | 5 |

Solution:

| $x$ | $f$ | $f x$ |
| :--- | :--- | :--- |
| 5 | 6 | 30 |
| 10 | $p$ | $10 p$ |
| 15 | 6 | 90 |
| 20 | 10 | 200 |
| 25 | 5 | 125 |
|  |  |  |
|  | $N=p+27$ | $\sum f x=10 p+445$ |

Formula to calculate mean:

$$
\begin{aligned}
& \text { Mean }(\bar{x})=\frac{\sum f x}{N} \\
& =(10 \mathrm{p}+445) /(\mathrm{p}+27) \\
& \text { Mean }=15(\text { Given }) \\
& \text { So, }(10 \mathrm{p}+445) /(\mathrm{p}+27)=15 \\
& 10 \mathrm{p}+445=15(\mathrm{p}+27) \\
& 10 \mathrm{p}-15 \mathrm{p}=405-445=-40 \\
& -5 \mathrm{p}=-40 \\
& \text { or } \mathrm{p}=8 \\
& \Rightarrow \text { The value of } \mathrm{p} \text { is } 8 \text {. }
\end{aligned}
$$

Question 5: Find the value of $\mathbf{p}$ for the following distribution whose mean is $\mathbf{1 6 . 6}$.

| $\mathrm{x}:$ | 8 | 12 | 15 | p | 20 | 25 | 30 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}:$ | 12 | 16 | 20 | 24 | 16 | 8 | 4 |

Solution:

| x | f | fx |
| :--- | :--- | :--- |
| 8 | 12 | 96 |
| 12 | 16 | 192 |
| 15 | 20 | 300 |
| p | 24 | 24 p |
| 20 | 16 | 320 |
| 25 | 8 | 200 |
| 30 | 4 | 120 |
|  | $\mathrm{~N}=100$ | $\sum f x=24 p+1228$ |

Formula to calculate mean:

$$
\begin{aligned}
& \text { Mean }(\bar{x})=\frac{\sum f x}{N} \\
& =(24 \mathrm{p}+1228) / 100 \\
& \text { Mean }=16.6 \text { (given }) \\
& \text { So, }(24 \mathrm{p}+1228) / 100=16.6 \\
& 24 \mathrm{p}+1228=1660 \\
& 24 \mathrm{p}=1660-1228=432 \\
& \mathrm{p}=432 / 24=18 \\
& \Rightarrow \text { The value of } \mathrm{p} \text { is } 18 .
\end{aligned}
$$

Question 6: Find the missing value of $\mathbf{p}$ for the following distribution whose mean is $\mathbf{1 2 . 5 8}$.

| $\mathrm{x}:$ | 5 | 8 | 10 | 12 | $p$ | 20 | 25 |
| :--- | ---: | :--- | :--- | :--- | :--- | ---: | ---: |
| $\mathrm{f}:$ | 2 | 5 | 8 | 22 | 7 | 4 | 2 |

Solution:

| x | f | fx |
| :--- | :--- | :--- |
| 5 | 2 | 10 |
| 8 | 5 | 40 |
| 10 | 8 | 80 |
| 12 | 22 | 264 |
| p | 7 | 7 p |
| 20 | 4 | 80 |
| 25 | 2 | 50 |
|  | $\mathrm{~N}=50$ | $\sum f x=7 p+524$ |

Formula to calculate mean:

$$
\begin{aligned}
& \text { Mean }(\bar{x})=\frac{\sum f x}{N} \\
& =(7 \mathrm{p}+524) / 50 \\
& \text { Mean }=12.58 \text { (given) } \\
& \text { So, }(7 \mathrm{p}+524) / 50=12.58 \\
& 7 \mathrm{p}+524=12.58 \times 50 \\
& 7 \mathrm{p}+524=629 \\
& 7 \mathrm{p}=629-524=105 \\
& \mathrm{p}=105 / 7=15 \\
& \Rightarrow \text { The value of } \mathrm{p} \text { is } 15 .
\end{aligned}
$$

Question 7: Find the missing frequency (p) for the following distribution whose mean is 7.68.

| $\mathrm{x}:$ | 3 | 5 | 7 | 9 | 11 | 13 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}:$ | 6 | 8 | 15 | p | 8 | 4 |

Solution:

| $x$ | $f$ | $f x$ |
| :--- | :--- | :--- |
| 3 | 6 | 18 |
| 5 | 8 | 40 |
| 7 | 15 | 105 |
| 9 | $p$ | $9 p$ |
| 11 | 8 | 88 |
| 13 | 4 | 52 |
|  | $N=p+41$ | $\sum f x=9 p+303$ |

Formula to calculate mean:

$$
\begin{aligned}
& \text { Mean }(\bar{x})=\frac{\sum f x}{N} \\
& =(9 \mathrm{p}+303) /(\mathrm{p}+41) \\
& \text { Mean }=7.68 \text { (given) } \\
& \text { So, }(9 \mathrm{p}+303) /(\mathrm{p}+41)=7.68 \\
& 9 \mathrm{p}+303=7.68(\mathrm{p}+41) \\
& 9 \mathrm{p}+303=7.68 \mathrm{p}+314.88 \\
& 9 \mathrm{p}-7.68 \mathrm{p}=314.88-303 \\
& 1.32 \mathrm{p}=11.88 \\
& \text { or } \mathrm{p}=(11.881) /(1.32)=9 \\
& \Rightarrow \text { The value of } p \text { is } 9 .
\end{aligned}
$$

## EXERCISE 24.3

Question 1: Find the median of the following data:
$83,37,70,29,45,63,41,70,34,54$

## Solution:

Arranging given numbers in ascending order:
$29,34,37,41,45,54,63,70,70,83$
Here, Total number of terms $=\mathrm{n}=10$ (even)

$$
\begin{aligned}
& \therefore \text { median }=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2} \\
& =\frac{\frac{10}{2} \text { th value }+\left(\frac{10}{2}+1\right) \text { th value }}{2} \\
& =\frac{5 \text { th value }+6 \text { th value }}{2} \\
& =\frac{45+54}{2} \\
& =\frac{99}{2}=49.5
\end{aligned}
$$

Question 2: Find the median of the following data:
$133,73,89,108,94,104,94,85,100,120$
Solution:
Arranging given numbers in ascending order:
$73,85,89,94,94,100,104,108,120,133$
Here, total number of terms $=\mathrm{n}=10$ (even)

$$
\begin{aligned}
& \therefore \text { median }=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2} \\
& =\frac{\frac{10}{2} \text { th value }+\left(\frac{10}{2}+1\right) \text { th value }}{2} \\
& =\frac{5 \text { th value }+6 \text { th value }}{2} \\
& =\frac{94+100}{2} \\
& =\frac{194}{2}=97
\end{aligned}
$$

Question 3: Find the median of the following data:
$31,38,27,28,36,25,35,40$

## Solution:

Arranging given numbers in ascending order
$25,27,28,31,35,36,38,40$
Here, total number of terms $=\mathrm{n}=8$ (even)

$$
\begin{aligned}
& \therefore \text { median }=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2} \\
& =\frac{\frac{8}{2} \text { th value }+\left(\frac{8}{2}+1\right) \text { th value }}{2} \\
& =\frac{4 \text { th value }+5 \text { th value }}{2} \\
& =\frac{31+35}{2} \\
& =\frac{66}{2}=33
\end{aligned}
$$

Question 4: Find the median of the following data:
$15,6,16,8,22,21,9,18,25$

## Solution:

Arranging given numbers in ascending order
$6,8,9,15,16,18,21,22,25$
Here, total number of terms $=\mathrm{n}=9($ odd $)$
$\therefore$ Median $=\left(\frac{n+1}{2}\right)$ th term
$=\left(\frac{9+1}{2}\right) t h$ term
$=5$ th term $=16$
Question 5: Find the median of the following data:
$41,43,127,99,71,92,71,58,57$

## Solution:

Arranging given numbers in ascending order
$41,43,57,58,71,71,92,99,127$
Here, total number of terms $=\mathrm{n}=9($ odd $)$

$$
\begin{aligned}
& \therefore \text { Median }=\left(\frac{n+1}{2}\right) \text { th term } \\
& =\left(\frac{9+1}{2}\right) \text { th term } \\
& =5 t h \text { term }=71
\end{aligned}
$$

Question 6: Find the median of the following data:
$25,34,31,23,22,26,35,29,20,32$

## Solution:

Arranging given numbers in ascending order
$20,22,23,25,26,29,31,32,34,35$
Here, total number of terms $=\mathrm{n}=10$ (even)

$$
\begin{aligned}
& \therefore \text { median }=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2} \\
& =\frac{\frac{10}{2} \text { th value }+\left(\frac{10}{2}+1\right) \text { th value }}{2} \\
& =\frac{5 \text { th value }+6 \text { th value }}{2} \\
& =\frac{26+29}{2} \\
& =\frac{55}{2}=27.5
\end{aligned}
$$

Question 7: Find the median of the following data:
$12,17,3,14,5,8,7,15$

## Solution:

Arranging given numbers in ascending order

$$
3,5,7,8,12,14,15,17
$$

Here, total number of terms $=\mathrm{n}=8$ (even)

$$
\begin{aligned}
& \therefore \text { median }=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2} \\
& =\frac{\frac{8}{2} \text { th value }+\left(\frac{8}{2}+1\right) \text { th value }}{2} \\
& =\frac{4 \text { th value }+5 \text { th value }}{2} \\
& =\frac{8+12}{2} \\
& =\frac{20}{2}=10
\end{aligned}
$$

Question 8: Find the median of the following data:
$92,35,67,85,72,81,56,51,42,69$

## Solution:

Arranging given numbers in ascending order
$35,42,51,56,67,69,72,81,85,92$
Here, total number of terms $=\mathrm{n}=10$ (even)
$\therefore$ median $=\frac{\frac{n}{2} \text { th value }+\left(\frac{n}{2}+1\right) \text { th value }}{2}$

$$
=\frac{\frac{10}{2} \text { th value }+\left(\frac{10}{2}+1\right) \text { th value }}{2}
$$

$$
=\frac{5 \text { th value }+6 \text { th value }}{2}
$$

$$
=\frac{67+69}{2}
$$

$$
=\frac{136}{2}=68
$$

## EXERCISE 24.4

Question 1: Find out the mode of the following marks obtained by 15 students in a class:
Marks : 4, 6, 5, 7, 9, 8, $10,4,7,6,5,9,8,7,7$.

## Solution:

Mode is the value which occurs most frequently in a set of observations.
The frequency of the given set of observations are as given below:

| Marks | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| No.of Students | 2 | 2 | 2 | 4 | 2 | 2 | 1 |

Here, we can see that 7 occurred most frequently.
So, Mode $=7$
Question 2: Find out the mode from the following data :
$125,175,225,125,225,175,325,125,375,225,125$

## Solution:

Find the frequency of the given set of observations:

| Values | 125 | 175 | 225 | 325 | 375 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Frequency | 4 | 2 | 3 | 1 | 1 |

125 occurred 4 times more than any other values.
So, Mode $=125$
Question 3: Find the mode for the following series:

$$
7.5,7.3,7.2,7.2,7.4,7.7,7.7,7.5,7.3,7.2,7.6,7.2
$$

## Solution:

Find the frequency:

| Values | 7.2 | 7.3 | 7.4 | 7.5 | 7.6 | 7.7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Frequency | 4 | 2 | 1 | 2 | 1 | 2 |

Maximum frequency 4 corresponds to the value 7.2.
So, mode $=7.2$

## EXERCISE VSAQS

Question 1: If the ratio of the mean and median of a certain data is $2: 3$, then find the ratio of its mode and mean.

## Solution:

Empirical formula: $\mathrm{Mode}=3$ median -2 mean
Since the ratio of mean and median of a certain data is $2: 3$, then mean $=2 \mathrm{x}$ and median $=3 \mathrm{x}$
Mode $=3(3 x)-2(2 x)$
$=9 \mathrm{x}-4 \mathrm{x}$
$=5 \mathrm{x}$
Therefore,
Mode: Mean $=5 x: 2 x$ or 5: 2
Question 2: If the ratio of mode and median of a certain data is $\mathbf{6}: 5$, then find the ratio of its mean and median.
Solution: We know, Empirical formula: Mode $=3$ Median -2 Mean
Since the ratio of mode and median of a certain data is 6:5.
$\Rightarrow$ Mode/Median $=6 / 5$
or Mode $=(6$ Median $) / 5$
Now,
( 6 Median) $/ 5=3$ Median -2 Mean
$(6$ Median $) / 5-3$ Median $=-2$ Mean
or 9/10 $($ Median $)=$ Mean
or Mean $/$ Median $=9 / 10$ or 9:10.
Question 3: If the mean of $x+2,2 x+3,3 x+4,4 x+5$ is $x+2$, find $x$.

## Solution:

Given: Mean of $\mathrm{x}+2,2 \mathrm{x}+3,3 \mathrm{x}+4,4 \mathrm{x}+5$ is $\mathrm{x}+2$
We know, Mean $=($ Sum of all the observations) $/$ (Total number of observations)
Sum of all the observations $=x+2+2 x+3+3 x+4+4 x+5=10 x+14$
Total number of observations $=4$
$\Rightarrow$ Mean $=(10 x+14) / 4$
or $(x+2)=(10 x+14) / 4$ (using given)
$4 \mathrm{x}+8=10 \mathrm{x}+14$
$x=-1$
Question 4: The arithmetic mean and mode of the data are 24 and 12 , respectively, then find the median of the data.

## Solution:

Given: The arithmetic mean and mode of the data are 24 and 12 , respectively
We know, Empirical formula: Mode $=3$ Median -2 Mean
or 3 Median $=$ Mode +2 Mean
Using given values, we get
3 Median $=12+2(24)=60$
or Median $=20$
Question 5: If the difference of the mode and median of a data is 24 , then find the difference of the median and mean.

## Solution:

Given: the difference of the mode and median of data is 24 .
That is, Mode - Median $=24$
or Mode $=24+$ Median .
We know, Empirical formula: Mode $=3$ Median -2 Mean
$24+$ Median $=3$ Median -2 Mean
(Using (1))
$24=2$ Median -2 Mean
or $12=$ Median - Mean
Therefore, the difference of the median and mean is 12 .

