Frank Solutions for Class 10 Maths Chapter 24 Measure of Central Tendency



## **1.** Find the mean of first **12** even numbers. Solution:-

We know that, the first 12 even numbers are, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 Then,  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 12  $\overline{x} = (2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20 + 22 + 24)/12$  $\overline{x} = 156/12$  $\overline{x} = 13$ Hence, mean of first 12 even numbers is 13.

#### 2. Find the mean of first 10 prime numbers.

#### Solution:-

We know that, the first 10 prime numbers are, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 Then,  $\bar{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 10  $\bar{x} = (2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29)/10$  $\bar{x} = 129/10$  $\bar{x} = 12.9$ Hence, mean of first 10 prime numbers is 12.9.

#### 3. Find the mean of all numbers from 7 to 17.

#### Solution:-

All numbers from 7 to 17 are, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 Then,  $\bar{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 11  $\bar{x} = (7 + 8 + 9 + 10 + 11 + 12 + 13 + 14 + 15 + 16 + 17)/11$  $\bar{x} = 132/11$  $\bar{x} = 12$ Hence, mean of all numbers from 7 to 17.

4. Find the mean of all odd numbers from 5 to 20. Find the new mean when each

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#### number is multiplied by 4. Solution:-

All odd numbers from 5 to 20 are, 5, 7, 9, 11, 13, 15, 17, 19 Then,  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 8  $\overline{\mathbf{x}} = (5 + 7 + 9 + 11 + 13 + 15 + 17 + 19)/11$  $\overline{x} = 96/8$  $\overline{x} = 12$ Hence, mean of all odd numbers from 5 to 20 is 12. Then, all odd numbers from 5 to 20 multiplied by 4 are, 20, 28, 36, 44, 52, 60, 68, 76 n = 8  $\overline{x} = (20 + 28 + 36 + 44 + 52 + 60 + 68 + 76)/8$  $\bar{x} = 384/8$ <del>x</del> = 48 Hence, mean all odd numbers from 5 to 20 multiplied by 4 is 48.

# 5. Find the mean of all natural numbers from 32 to 46. Find the new mean when each number is diminished by 5.

Solution:-

All natural numbers from 32 to 46 are, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46. Then,  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 15  $\overline{x} = (32 + 33 + 34 + 35 + 36 + 37 + 38 + 39 + 40 + 41 + 42 + 43 + 44 + 45 + 46)/15}$   $\overline{x} = 585/15$   $\overline{x} = 39$ Hence, mean of all natural numbers from 32 to 46 is 39. Then, all natural numbers from 32 to 46 diminished by 5 are, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 n = 15  $\overline{x} = (27 + 28 + 29 + 30 + 31 + 32 + 33 + 34 + 35 + 36 + 37 + 38 + 39 + 40 + 41)/15}$   $\overline{x} = 510/15$  $\overline{x} = 34$ 

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Hence, mean all natural numbers from 32 to 46 diminished by 5 is 34.

## 6. If the mean of 8, 14, 20, x and 12 is 13, find x. Solution:-

Form the question it is given that, 8, 14, 20, x, 12 Mean = 13 We have to find the value of x, Then,  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 5 13 = (8 + 14 + 20 + x + 12)/5 13 × 5 = (54 + x) 65 = 54 + x x = 65 - 54 x = 11 Therefore, the value of x is 11.

#### 7. If the mean of 11, 14, p, 26, 10, 12, 18 and 6 is 15, find p.

**Solution:**-Form the question it is given that, 11, 14, p, 26, 10, 12, 18 and 6. Mean = 15 We have to find the value of p, Then,  $\bar{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$ Where n is the total numbers, n = 8 15 = (11 + 14 + p + 26 + 10 + 12 + 18 + 6)/8 15 × 8 = (97 + p) 120 = 97 + p p = 120 - 97 p = 23 Therefore, the value of p is 23.

# 8. The mean monthly income of 10 persons is Rs 8,670. If a new member with a monthly income of Rs 9,000 jons the group, find the new monthly income. Solution:-

From the question it is given that,

The mean monthly income of 10 persons is ₹ 8,670.

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Number of persons, n = 10 We know that,  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$   $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$   $\overline{x} = 8,670 = \sum x_n/10$   $\sum x_n = 8,670 \times 10$   $\sum x_n = \overline{x} 86,700$ Also it is given that, a new member with a monthly income of  $\overline{x} 9,000$ . So,  $\sum x_n = \overline{x} (86,700 + 9,000)$   $\sum x_n = \overline{x} 95,700$ Then, n = 11  $\overline{x} = (x_1 + x_2 + x_3 + ... + x_n)/n$   $\overline{x} = \overline{x} 95,700/11$   $\overline{x} = \overline{x} 8,700$ Therefore, the new mean monthly income is  $\overline{x} 8,700$ .

# 9. The height of 9 persons are 142 cm, 158 cm, 152 cm, 143 cm, 139 cm, 144 cm, 148 cm and 151 cm. Find the mean height.

#### Solution:-

From the question it is given that,

The height of 9 persons are, 142 cm, 158 cm, 152 cm, 143 cm, 139 cm, 144 cm, 148 cm and 151 cm.

We know that,

 $\overline{\mathbf{x}} = (\mathbf{x}_1 + \mathbf{x}_2 + \mathbf{x}_3 + \dots + \mathbf{x}_n)/n$ 

Where n is the total numbers,

n = 9  $\overline{x}$  = (142 + 158 + 152 + 143 + 139 + 144 + 146 + 148 + 151)/9  $\overline{x}$  = 1323/9  $\overline{x}$  = 147 cm Therefore, the mean height is 147 cm.

#### **10.** Find the mean of the following frequency distribution:

(i)					
Class	0 - 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	4	7	6	3	5

#### Solution:-

So, now we have to prepare the frequency distribution table



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Class Interval	Xi	f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
0-10	5	4	20
10 - 20	15	7	105
20 - 30	25	6	150
30 - 40	35	3	105
40 – 50	45	5	225
Total		25	605

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

 $\overline{x} = 605/25$ 

 $\bar{x} = 24.2$ 

Therefore, the mean is 24.2.

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Class	0 - 10	10 – 20	20 – 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	4	4	7	10	12	8	5

#### Solution:-

So, now we have to prepare the frequency distribution table,

<i>,</i> , , , , , , , , , , , , , , , , , ,			
Class Interval	Xi	<sup>™</sup> o <sup>O</sup> f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
0-10	5	4	20
10 – 20	15	4	60
20 – 30	25	7	175
30 – 40	35	10	350
40 – 50	45	12	540
50 – 60	55	8	440
60 – 70	65	5	325
Total		50	1910

we know that,

 $\overline{\mathbf{x}} = \sum \mathbf{f}_i \mathbf{x}_i / \sum \mathbf{f}_i$ 

 $\bar{x} = 1910/50$ 

<del>x</del> = 38.2

Therefore, the mean is 38.2.

(iii)

Class	0 - 6	6 - 12	12 – 18	18 – 24	24 – 30
Frequency	7	5	10	12	6



#### Solution:-

So, now we have to prepare the frequency distribution table,

-			
Class Interval	Xi	fi	f <sub>i</sub> x <sub>i</sub>
0-6	3	7	21
6 - 12	9	5	45
12 – 18	15	10	150
18 – 24	21	12	252
24 – 30	27	6	162
Total		40	630

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

 $\bar{x} = 630/40$ 

$$\overline{x} = 15.75$$

Therefore, the mean is 15.75.

#### (iv)

Class	25 – 35	35 – 45	45 - 55	55 - 65	65 – 75
Frequency	6	10	8	12	4

#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	🖉 f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
25 – 35	30	6	180
35 – 45	40	10	400
45 – 55	50	8	400
55 – 65	60	12	720
65 - 75	70	4	280
Total		40	1980

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

<del>x</del> = 1980/40

$$\overline{x} = 49.5$$

Therefore, the mean is 49.5.

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Class	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	8	6	12	11	13



#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	fi	f <sub>i</sub> x <sub>i</sub>
50 – 60	55	8	440
60 – 70	65	6	390
70 – 80	75	12	900
80 - 90	85	11	935
90 - 100	95	13	1235
Total		50	3900

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

 $\bar{x} = 3900/50$ 

Therefore, the mean is 78.

#### (vi)

Class	1 – 10	11 – 20	21 - 30	31 - 40	41 – 50
Frequency	9	12	15	10	14

#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	🖉 f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
1 - 10	5.5	9	49.5
11 – 20	15.5	12	186
21 – 30	25.5	15	382.5
31 – 40	35.5	10	355
41 - 50	45.5	14	637
Total		60	1610

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

 $\bar{x} = 1610/60$ 

Therefore, the mean is 26.83.

(vi)

Class	101 – 110	111 – 120	121 – 130	131 – 140	141 – 150	151 - 160
Frequency	9	12	15	10	14	



#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
101 – 110	105.5	11	1160.5
111 – 120	115.5	16	1848
121 – 130	125.5	20	2510
131 – 140	135.5	30	4065
141 - 150	145.5	14	2037
151 - 160	155.5	9	1399.5
Total		100	13020

we know that,

 $\overline{\mathbf{x}} = \sum f_i \mathbf{x}_i / \sum f_i$ 

 $\bar{x} = 13020/100$ 

Therefore, the mean is 130.2.

# 11. The mean of the following frequency distribution is 25.8 and the sum of all the frequencies is 50. Find x and y.

Class	0 - 10	10 - 20	20 - 30	30 – 40	40 – 50
Frequency	7	x	15	У	10

Solution:-

So, now we have to prepare the frequency distribution table,

-			
Class Interval	Xi	f <sub>i</sub>	f <sub>i</sub> x <sub>i</sub>
0-10	5	7	35
10 – 20	15	Х	15x
20 – 30	25	15	375
30 - 40	35	У	35у
40 - 50	45	10	450
Total		50	860 + 15x + 35y

We know that,



25.8 = (860 + 15x + 35y)/50By cross multiplication we get, 15x + 35y + 860 = 129015x + 35y = 1290 - 86015x + 35y = 430... [divide both side by 5] 3x + 7y = 86... (ii) Now multiplying equation (i) by 3 we get, 3x + 3y = 54... (iii) Subtract equation (ii) from equation (iii) we get, 4y = 32 y = 32/4y = 8 Substitute value of y in equation (i) to get the value of x, x + y = 18x + 8 = 18x = 18 - 8x = 10

Hence the value of x = 10 and y = 8.

#### **11.** Find the mean of the following frequency distribution by the short cut method.

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 – 50
Frequency	9	12	15	10	14

#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	f <sub>i</sub>	A = 25	f <sub>i</sub> d
			d = x - A	
0-10	5	9	- 20	-180
10 - 20	15	12	- 10	-120
20 – 30	A = 25	15	0	0
30 - 40	35	10	10	100
40 - 50	45	14	20	280
Total		60		80

we know that,

 $\overline{\mathbf{x}} = \mathbf{A} + \sum \mathbf{f}_i \mathbf{d} / \sum \mathbf{f}_i$ 

 $\overline{x} = 25 + 80/60$ 

 $\overline{x} = 25 + 1.33$ 

<del>x</del> = 26.33



Therefore, the value of mean is 26.33.

#### 13. Find the mean of the following frequency distribution by the short cut method:

Class	1 - 10	11 – 20	21 – 30	31 – 40	41 – 50	51 - 60	61 – 70
Frequency	7	10	14	17	15	11	6

#### Solution:-

So, now we have to prepare the frequency distribution table,

Class Interval	Xi	fi	A = 25	f <sub>i</sub> d
			d = x - A	
1-10	5.5	7	- 30	-210
11 – 20	15.5	10	20	-200
21 – 30	25.5	14	-10	-140
31 - 40	35.5	17	0	0
41 - 50	45.5	15	10	150
51 - 60	55.5	11	20	220
61 - 70	65.5	6	30	180
Total		80	10-	0

we know that,

 $\overline{\mathbf{x}} = \mathbf{A} + \sum \mathbf{f}_i \mathbf{d} / \sum \mathbf{f}_i$ 

 $\overline{x} = 35.5 + 0/80$ 

 $\overline{x} = 35.5 + 0$ 

 $\overline{x} = 35.5$ 

Therefore, the value of mean is 35.5.

# 14. Find the mean of the following frequency distribution by the step deviation method:

Class	1 -	10	11 – 20	21 – 30	31 – 4	10	41 – 50	51 - 60	61 - 70
Frequency		7	10	14	17		15	11	6
Solution:-	Solution:-								
Class Interv	/al		Xi	fi		A = 125			f <sub>i</sub> u
						u	$= (x - A)/h_i$		
100 - 110	)		105	15	15 - 2			-30	
110 - 120	)		115	18		-1			-18
120 - 130	)	A	A = 125	32	32 0		0		
130 - 140	)		315	25			1		25
140 - 150			145	10			2		20

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Total		100	-3
C a fue we the table	A 125	<u> </u>	

So, from the table A = 125 and  $h_i = 10$ we know that,  $\overline{x} = A + h \times \sum f_i u / \sum f_i$  $\overline{x} = 125 + 10 \times (-3/100)$  $\overline{x} = 125 - 0.3$  $\overline{x} = 124.70$ 

Therefore, the mean is 124.70.

### 15. Find the mean of the following frequency distribution by the step deviation method:

Class	0 - 1	20	20 – 40	40 - 60	) 60 –	80	80 - 100	100 - 120	120 - 140	
Frequency 1		2 24		52	52 88		66	42	16	
Solution:-										
Class Interval		Xi			fi	A = 125		f <sub>i</sub>	f <sub>i</sub> u	
						u	= (x – A)/h	i		
0 - 20		10		12			- 3	-3	-36	
20-40		30		24		2	-2	-48		
40 - 60		50		52			-1	-52		
60 - 80		A = 70		88			0	0	)	

66

42

16

300

1

2

3

66

84

48 62

TotalSo, from the table A = 70 and h<sub>i</sub> = 20

90

110

130

we know that,

 $\overline{\mathbf{x}} = \mathbf{A} + \mathbf{h} \times \sum \mathbf{f}_i \mathbf{u} / \sum \mathbf{f}_i$ 

80 - 100

100 - 120

120 - 140

 $\overline{x} = 70 + 20 \times (62/300)$ 

- $\overline{x} = 70 + 4.13$
- <del>x</del> = 74.13

Therefore, the mean is 74.13.