RS Aggarwal Solutions for Class 9 Maths Chapter 18 – Mean, Median and Mode of Ungrouped Data

EXERCISE 18(A) PAGE: 669

1. Find the mean of:
(i) the first eight natural numbers
(ii) the first ten odd numbers
(iii) the first seven multiples of 5
(iv) all the factors of 20
(v) all prime numbers between 50 and 80.
Solution:

(i) We know that
First eight natural numbers = 1, 2, 3, 4, 5, 6, 7 and 8
So we get
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8)/8
On further calculation
Mean = 36/8
By division
Mean = 4.5

Therefore, the mean of the first eight natural numbers is 4.5.

(ii) We know that
First ten odd numbers = 1, 3, 5, 7, 9, 11, 13, 15, 17 and 19
So we get
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19)/10
On further calculation
Mean = 100/10
By division
Mean = 10

Therefore, the mean of first ten odd numbers is 10.

(iii) We know that
First seven multiples of five = 5, 10, 15, 20, 25, 30 and 35
So we get
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (5 + 10 + 15 + 20 + 25 + 30 + 35)/7
On further calculation
Mean = 140/7
By division
Mean = 20

Therefore, the mean of first seven multiples of five is 20.

(iv) We know that

All the factors of 20 = 1, 2, 4, 5, 10 and 20
So we get
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (1 + 2 + 4 + 5 + 10 + 20)/6
On further calculation
Mean = 42/6
By division
Mean = 7

Therefore, the mean of all the factors of 20 is 7.

(v) We know that
All prime numbers between 50 and 80 = 53, 59, 61, 67, 71, 73 and 79
So we get
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (53 + 59 + 61 + 67 + 71 + 73 + 79)/7
On further calculation
Mean = 463/7
So we get
Mean = 66 1/7

Therefore, the mean of all prime numbers between 50 and 80 is 66 1/7.

2. The number of children in 10 families of a locality are 2, 4, 3, 4, 2, 0, 3, 5, 1 and 6.
Find the mean number of children per family.
Solution:

It is given that number of children in 10 families of a locality are 2, 4, 3, 4, 2, 0, 3, 5, 1 and 6.
We know that
Mean = sum of numbers/ total numbers
By substituting the values
Mean = (2 + 4 + 3 + 4 + 2 + 0 + 3 + 5 + 1 + 6)/ 10
On further calculation
Mean = 30/10
By division
Mean = 3

Therefore, the mean number of children per family is 3.

3. The following are the numbers of books issued in a school library during a week:
105, 216, 322, 167, 273, 405 and 346.
Find the average number of books issued per day.
Solution:

It is given that the number of books issued are 105, 216, 322, 167, 273, 405 and 346.
We know that
Mean = sum of numbers/ total numbers
By substituting the values

Mean = (105 + 216 + 322 + 167 + 273 + 405 + 346)/ 7
On further calculation
Mean = 1834/7
By division
Mean = 262

Therefore, the average number of books issued per day is 262.

4. The daily minimum temperature recorded (in °F) at a place during six days of a week was as under:

Monday	**35.5**
Tuesday	**30.8**
Wednesday	**27.3**
Thursday	**32.1**
Friday	**23.8**
Saturday	**29.9**

Find the mean temperature.
Solution:

We know that
Mean temperature = Sum of temperatures/ Number of days
By substituting the values
Mean temperature = (35.5 + 30.8 + 27.3 + 32.1 + 23.8 + 29.9)/6
On further calculation
Mean = 179.4/6
By division
Mean = 29.9 °F

Therefore, the mean temperature is 29.9 °F.

5. If the mean of five observations x, x + 2, x + 4, x + 6, x + 8 is 13, find the value of x and hence find the mean of the last three observations.
Solution:

We know that
Number of observations = 5
It is given that mean = 13
We can write it as
[x + (x + 2) + (x + 4) + (x + 6) + (x + 8)]/5 = 13
On further calculation
5x + 20 = 13 (5)
So we get
5x + 20 = 65
By subtraction
5x = 45
By division
x = 9

By substituting the value of x
We know that the last three observations are
9 + 4 = 13
9 + 6 = 15
9 + 8 = 17

We know that
Mean of last three observations = (13 + 15 + 17)/3
On further calculation
Mean of last three observations = 45/3
By division
Mean of last three observations = 15

Therefore, the mean of last three observations is 15.

6. The mean weight of 6 boys in a group is 48kg. The individual weights of five of them are 51kg, 45kg, 49kg, 46kg and 44kg. Find the weight of the sixth boy.
Solution:

It is given that
Mean weight of 6 boys = 48kg
So we get
Mean weight = sum of the weight of 6 boys/6 = 48
We know that
Sum of weight of six boys = 48 (6) = 288kg
So the sum of weight of 5 boys = (51 + 45 + 49 + 46 + 44) = 235kg

We get
Weight of sixth boy = sum of weight of six boys – sum of weight of 5 boys
By substituting the values
Weight of sixth boy = 288 – 235
By subtraction
Weight of sixth boy = 53kg

Therefore, the weight of sixth boy is 53 kg.

7. The mean of the marks scored by 50 students was found to be 39. Later on it was discovered that a score of 43 was misread as 23. Find the correct mean.
Solution:

It is given that
Mean of the marks of 50 students = 39
So we get
Sum of these marks = 39 (50) = 1950

We can write it as
Corrected sum of the marks = 1950 – wrong number + correct number
By substituting the values
Corrected sum of the marks = 1950 – 23 + 43
So we get

Corrected sum of the marks = 1970

So the correct mean = 1970/50
By division
Correct mean = 39.4

Therefore, the correct mean is 39.4.

8. The mean of 24 numbers is 35. If 3 is added to each number, what will be the new mean?
Solution:

Consider $x_1, x_2, \ldots\ldots x_{24}$ as the given numbers
So we get
Mean = $(x_1 + x_2, \ldots\ldots + x_{24})/24$
It is given that mean = 35
$(x_1 + x_2, \ldots\ldots + x_{24})/24 = 35$
By cross multiplication
$x_1 + x_2, \ldots\ldots + x_{24} = 840$ ……. (1)

Take $(x_1 + 3), (x_2 + 3), \ldots\ldots\ldots (x_{24} + 3)$ as new numbers
So the mean of new numbers = $[(x_1 + 3) + (x_2 + 3) + \ldots\ldots\ldots + (x_{24} + 3)]/24$
From equation (1) we get
$[(x_1 + 3) + (x_2 + 3) + \ldots\ldots\ldots + (x_{24} + 3)]/24 = (840 + 72)/24$
On further calculation
$[(x_1 + 3) + (x_2 + 3) + \ldots\ldots\ldots + (x_{24} + 3)]/24 = 912/24$
By division
Mean of new numbers = 38

Therefore, the mean of the new numbers is 38.

9. The mean of 20 numbers is 43. If 6 is subtracted from each of the numbers, what will be the new mean?
Solution:

Consider $x_1, x_2, \ldots\ldots x_{20}$ as the given numbers
So we get
Mean = $(x_1 + x_2 + \ldots\ldots + x_{20})/20$
It is given that mean = 43
$(x_1 + x_2 + \ldots\ldots + x_{20})/20 = 43$
By cross multiplication
$x_1 + x_2 + \ldots\ldots + x_{20} = 860$ …… (1)

Take $(x_1 – 6), (x_2 – 6) \ldots\ldots (x_{20} – 6)$ as the new numbers
So the mean of new numbers = $[(x_1 – 6) + (x_2 – 6) + \ldots\ldots + (x_{20} – 6)]/20$
From equation (1) we get
$[(x_1 – 6) + (x_2 – 6) + \ldots\ldots + (x_{20} – 6)]/20 = (860 – 120)/20$
On further calculation
$[(x_1 – 6) + (x_2 – 6) + \ldots\ldots + (x_{20} – 6)]/20 = 740/20$
By division
Mean of new numbers = 37

Therefore, the new mean of numbers is 37.

10. The mean of 15 numbers is 27. If each number is multiplied by 4, what will be the mean of the new numbers?
Solution:

Consider $x_1, x_2, \ldots\ldots x_{15}$ as the given numbers
So we get
Mean = $(x_1 + x_2 + \ldots\ldots + x_{15})/15$
It is given that mean = 27
$(x_1 + x_2 + \ldots\ldots + x_{15})/15 = 27$
By cross multiplication
$x_1 + x_2 + \ldots\ldots + x_{15} = 405$ …… (1)

Take $(x_1 \times 4), (x_2 \times 4), \ldots\ldots\ldots (x_{15} \times 4)$ as new numbers
So the mean of new numbers = $[(x_1 \times 4) + (x_2 \times 4) + \ldots\ldots\ldots + (x_{15} \times 4)]/15$
From equation (1) we get
$[(x_1 \times 4) + (x_2 \times 4) + \ldots\ldots\ldots + (x_{15} \times 4)]/15 = (405 \times 4)/ 15$
On further calculation
Mean of new numbers = $1620/15 = 108$

Therefore, the mean of new numbers is 108.

11. The mean of 12 numbers is 40. If each number is divided by 8, what will be the mean of the new numbers?
Solution:

Consider $x_1, x_2, \ldots\ldots x_{12}$ as the given numbers
So we get
Mean = $[x_1 + x_2 + \ldots\ldots + x_{12}]/12$
It is given that mean = 40
$(x_1 + x_2 + \ldots\ldots + x_{12})/12 = 40$
By cross multiplication
$x_1 + x_2 + \ldots\ldots + x_{12} = 480$ …… (1)

Take $(x_1 \div 8), (x_2 \div 8), \ldots\ldots\ldots (x_{12} \div 8)$ as new numbers
So the mean of new numbers = $[(x_1 \div 8) + (x_2 \div 8) + \ldots\ldots\ldots + (x_{12} \div 8)]/12$
From equation (1) we get
$[(x_1 \div 8) + (x_2 \div 8) + \ldots\ldots\ldots + (x_{12} \div 8)]/12 = (480 \div 8)/12$
On further calculation
Mean of new numbers = $60/12 = 5$

Therefore, the mean of the new numbers is 5.

12. The mean of 20 numbers is 18. If 3 is added to each of the first ten numbers, find the mean of the new set of 20 numbers.
Solution:

Consider $x_1, x_2, \ldots\ldots x_{20}$ as the given numbers
So we get

Mean = $(x_1 + x_2 + \ldots\ldots + x_{20})/20$
It is given that mean = 18
$(x_1 + x_2, \ldots\ldots + x_{20})/20 = 18$
By cross multiplication
$x_1 + x_2 + \ldots\ldots + x_{20} = 360$ …… (1)

Take $(x_1 + 3)$, $(x_2 + 3)$, …… $(x_{10} + 3)$ as first ten new numbers
So the mean of new set of 20 numbers = $[(x_1 + 3) + (x_2 + 3) + \ldots\ldots + (x_{10} + 3) + x_{11} + \ldots\ldots + x_{20}]/ 20$
We get
Mean of new set of 20 numbers = $[(x_1 + x_2 + \ldots\ldots + x_{20}) + 3 \times 10]/ 20$
From equation (1) we get
Mean of new set of 20 numbers = $(360 + 30)/ 20 = 19.5$

Therefore, the mean of new set of 20 numbers is 19.5.

13. The mean of six numbers is 23. If one of the numbers is excluded, the mean of the remaining numbers is 20. Find the excluded number.
Solution:

It is given that
Mean of six numbers = 23
So we get the sum of six numbers = 23 (6) = 138

It is given that
Mean of five numbers = 20
So we get the sum of five numbers = 20 (5) = 100

We know that
Excluded number = sum of six numbers – sum of five numbers
By substituting the values
Excluded number = 138 – 100 = 38

Therefore, the excluded number is 38.

14. The average height of 30 boys was calculated to be 150cm. It was detected later that one value of 165cm was wrongly copied as 135cm for the computation of the mean. Find the correct mean.
Solution:

It is given that
Mean height of 30 boys = 150cm
So the total height = 150 (30) = 4500cm

We know that
Correct sum = 4500 – incorrect value + correct value
By substituting the values
Correct sum = 4500 – 135 + 165 = 4350

So we get
Correct mean = Correct sum/30
By substituting the values

Correct mean = 4530/30 = 151 cm

Therefore, the correct mean is 151 cm.

15. The mean weight of a class of 34 students is 46.5kg. If the weight of the teacher is included, the mean rises by 500g. Find the weight of the teacher.
Solution:

It is given that
Mean weight of 34 students = 46.5kg
So the total weight = 34 (46.5) = 1581kg

We know that
Mean weight of 34 students and teacher = 46.5 + 0.5 = 47kg

So the total weight of 34 students and teacher = 47 (35) = 1645kg
The weight of teacher = Weight of 34 students and teacher – total weight
By substituting the values
Weight of the teacher = 1645 – 1581 = 64kg

Therefore, the weight of the teacher is 64kg.

16. The mean weight of a class of 36 students is 41kg. If one of the students leaves the class then the mean is decreased by 200g. Find the weight of the student who left.
Solution:

It is given that
Mean weight of 36 students = 41kg
So the total weight = 41 (36) = 1476kg

It is given that if one of the students leaves the class then the mean is decreased by 200g
So the new mean = 41 – 0.2 = 40.8kg

We get the total weight of 35 students = 40.8 (35) = 1428kg
So the weight of student who left = total weight of 36 students – weight of 35 students
By substituting the values
Weight of the student who left the class = 1476 – 1428 = 48kg

Therefore, the weight of the student who left is 48kg.

17. The average weight of a class of 39 students is 40kg. When a new student is admitted to the class, the average decreases by 200g. Find the weight of the new student.
Solution:

It is given that
Mean weight of 39 students = 40kg
So the total weight = 40 (39) = 1560kg

It is given that when a new student is admitted to the class, the average decreases by 200g
So the new mean = 40 – 0.2 = 39.8kg

We know that
Total weight of 40 students = 39.8 (40) = 1592kg

So the weight of new student = total weight of 40 students – total weight of 39 students
By substituting the values
Weight of new student = 1592 – 1560 = 32kg

Therefore, the weight of the new student is 32kg.

18. The average weight of 10 oarsmen in a boat is increased by 1.5kg when one of the crew who weighs 58kg is replaced by a new man. Find the weight of the new man.
Solution:

It is given that
Weight of 10 oarsmen is increased by 1.5kg
So the total weight increased = 1.5 (10) = 15kg

It is given that one of the crew who weights 58kg is replaced by a new man
So we get the weight of new man = weight of man replaced + total weight increased
By substituting the values
Weight of the new man = 58 + 15 = 73kg

Therefore, the weight of a new man is 73kg.

19. The mean of 8 numbers is 35. If a number is excluded then the mean is reduced by 3. Find the excluded number.
Solution:

It is given that
Mean of 8 numbers = 35
So the total sum = 35 (8) = 280

It is given that if a number is excluded then the mean is reduced by 3
So the new mean = 35 – 3 = 32

We know that total sum of 7 numbers = 32 (7) = 224

So we get
Excluded number = sum of 8 numbers – sum of 7 numbers
By substituting the values
Excluded number = 280 – 224 = 56

Therefore, the excluded number is 56.

20. The mean of 150 items was found to be 60. Later on, it was discovered that the values of two items were misread are 52 and 8 instead of 152 and 88 respectively. Find the correct mean.
Solution:

It is given that
Mean of 150 items = 60

So the total sum = 150 (60) = 9000

We know that
Correct sum of items = sum of 150 items – sum of wrong items + sum of right items
By substituting the values
Correct sum of items = 90000 – (52 + 8) + (152 + 88)
On further calculation
Correct sum of items = 9000 – 60 + 240
So we get
Correct sum of items = 9180

So the correct mean = correct sum of items/ total number of items
By substituting the values
Correct mean = 9180/150 = 61.2

Therefore, the correct mean is 61.2.

21. The mean of 31 results is 60. If the mean of the first 16 results is 58 and that of the last 16 results is 62, find the 16^{th} result.
Solution:

It is given that
Mean of 31 results = 60
So the total sum = 31 (60) = 1860

We know that
Mean of first 16 results = 58
So the total sum = 16 (58) = 928

Mean of last 16 results = 62
So the total sum = 16 (62) = 992

We get the 16^{th} result = total sum of first 16 results + total sum of last 16 results – total sum of 31 results
By substituting the values
16^{th} result = 928 + 992 – 1860
On further calculation
16^{th} result = 1920 – 1860 = 60

Therefore, the 16^{th} result is 60.

22. The mean of 11 numbers is 42. If the mean of the first 6 numbers is 37 and that of the last 6 numbers is 46, find the 6^{th} number.
Solution:

It is given that
Mean of 11 numbers = 42
So the total sum = 42 (11) = 462

Mean of first 6 numbers = 37
So the total sum = 37 (6) = 222

Mean of last 6 numbers = 46
So the total sum = 6 (46) = 276

We know that
6^{th} number = total sum of last 6 numbers + total sum of first 6 numbers – total sum of 11 numbers
By substituting the values
6^{th} number = 276 + 222 – 462
So we get
6^{th} number = 498 – 462 = 36

Therefore, the 6^{th} number is 36.

23. The mean weight of 25 students of a class is 52kg. If the mean weight of the first 13 students of the class is 48kg and that of the last 13 students is 55kg, find the weight of the 13^{th} student.
Solution:

It is given that
Mean weight of 25 students = 52kg
So the total weight = 25 (52) = 1300kg

Mean weight of first 13 students = 48kg
So the total weight = 13 (48) = 624kg

Mean weight of last 13 students = 55kg
So the total weight = 13 (55) = 715kg

We know that
Weight of 13^{th} student = total weight of the first 13 students + total weight of last 13 students – total weight of 25 students
By substituting the values
Weight of 13^{th} student = 624 + 715 – 1300
On further calculation
Weight of 13^{th} student = 39kg

Therefore, the weight of the 13^{th} student is 39kg.

24. The mean score of 25 observations is 80 and the mean score of another 55 observations is 60. Determine the mean score of the whole set of observations.
Solution:

It is given that
Mean score of 25 observations = 80
So the total score = 25 (80) = 2000

Mean score of 55 observations = 60
So the total score = 55 (60) = 3300

We know that
Total number of observations = 25 + 55 = 80
So the total score = 2000 + 3300 = 5300

Mean score = total score/total number of observations
By substituting the values
Mean score = 5300/80
So we get
Mean score = 66.25

Therefore, the mean score of the whole set of observations is 66.25.

25. Arun scored 36 marks in English, 44 marks in Hindi, 74 marks in mathematics and x marks in science. If he has secured an average of 50 marks, find the value of x.
Solution:

It is given that
Average marks in 4 subjects = 50
So the total marks = 50 (4) = 200

We know that
36 + 44 + 75 + x = 200
On further calculation
155 + x = 200
So we get
x = 200 – 155
By subtraction
x = 45

Therefore, the value of x is 45.

26. A ship sails out to an island at the rate of 15 km/hr and sails back to the starting point at 10 km/hr. Find the average sailing speed for the whole journey.
Solution:

Consider x km as the distance of mark from the starting point
So the time taken by the ship to reach the mark = x/15 hours

We know that
The time taken by the ship to reach the starting point from the mark = x/10 hours

So we get
Total time taken = x/15 + x/10
By taking LCM
Total time taken = x/6 hours
We know that total distance covered = x + x = 2x km

So the average sailing speed for the whole journey = 2x ÷ x/6
It can be written as
Average sailing speed for the whole journey = (2x × 6)/ x
So we get
Average sailing speed for the whole journey = 12 km/hr

Therefore, the average sailing speed for the whole journey is 12 km/hr.

27. There are 50 students in a class, of which 40 are boys. The average weight of the class is 44kg and that of the girls is 40kg. Find the average weight of the boys.
Solution:

It is given that
Total number of students = 50
So total number of girls = 50 – 40 = 10
Average weight of the class = 44kg
So the total weight = 44 (50) = 2200kg

Average weight of 10 girls = 40kg
So total weight = 40 (10) = 400kg

We know that total weight of 40 boys = total weight of 50 students – total weight of 10 girls
By substituting the values
Total weight of 40 boys = 2200 – 400 = 1800kg

So we get
Average weight of boys = total weight of 40 boys/ number of boys
By substituting the values
Average weight of boys = 1800/40 = 45kg

Therefore, the average weight of boys = 45kg.

28. The aggregate monthly expenditure of a family was ₹ 18720 during the first 3 months, ₹ 20340 during the next 4 months and ₹ 21708 during the last 5 months of a year. If the total savings during the year be ₹ 35340 find the average monthly income of the family.
Solution:

We know that
Total earnings of the year = ₹ (3 × 18720 + 4 × 20340 + 5 × 21708 + 35340)
On further calculation
Total earnings of the year = ₹ (56160 + 81360 + 108540 + 35340)
So we get
Total earnings of the year = ₹ 281400

We know that
Average monthly income of the family = Total earning of the year/ Number of months
By substituting the values
Average monthly income of the family = 281400/ 12
So we get
Average monthly income of the family = ₹ 23450

Therefore, the average monthly income of the family is ₹ 23450.

29. The average weekly payment to 75 workers in a factory is ₹ 5680. The mean weekly payment to 25 of them is ₹ 5400 and that of 30 others is ₹ 5700. Find the mean weekly payment of the remaining workers.
Solution:

It is given that

Average weekly payment of 75 workers = ₹ 5680
So the total payment = ₹ (75 × 5680) = ₹ 426000

Mean weekly payment of 25 workers = ₹ 5400
So the total payment = ₹ (25 × 5400) = ₹ 135000

Mean weekly payment of 30 workers = ₹ 5700
So the total payment = ₹ (30 × 5700) = ₹ 171000

We know that number of remaining workers = 75 – 25 – 30 = 20

So the total weekly payment of remaining 20 workers = Total weekly payment of 75 workers – total weekly payment of 25 workers – total weekly payment of 30 workers
By substituting the values
Total weekly payment of remaining 2 workers = 426000 – 135000 – 171000 = ₹ 120000

So the mean weekly payment of remaining 20 workers = 120000/20 = ₹ 6000

Therefore, the mean weekly payment of the remaining workers is ₹ 6000.

30. The mean marks (out of 100) of boys and girls in an examination are 70 and 73 respectively. If the mean marks of all the students in that examination is 71, find the ratio of the number of boys to the number of girls.
Solution:

Consider x: 1 as the ratio of number of boys to the number of girls
So we get
Sum of marks of boys = 70x
Sum of marks of girls = 73 (1) = 73
We know that
Sum of marks of boys and girls = 71 (x + 1)

It can be written as
70x + 73 = 71 (x + 1)
On further calculation
7x + 73 = 71x + 71
So we get
x = 2

Therefore, the ratio of the number of boys to the number of girls is 2: 1.

31. The average monthly salary of 20 workers in an office is ₹ 45900. If the manager's salary is added, the average salary becomes ₹ 49200 per month. What's manager's monthly salary?
Solution:

It is given that
Mean monthly salary of 20 workers = ₹ 45900
So the total monthly salary = ₹ (20 × 49500) = ₹ 918000

Mean monthly salary of 20 workers and manager = ₹ 49200

So the total monthly salary = ₹ (21 × 49200) = ₹ 1033200

We know that
Manager's monthly salary = Total monthly salary of 20 workers and manager – Total monthly salary of 20 workers
By substituting the values
Manager's monthly salary = 1033200 – 918000 = ₹ 115200

Therefore, the manager's monthly salary is ₹ 115200.

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1. Obtain the mean of the following distribution:

Variable (x_i)	4	6	8	10	12
Frequency (f_i)	4	8	14	11	3

Solution:

Variable (x_i)	Frequency (f_i)	$f_i x_i$
4	4	16
6	8	48
8	14	112
10	11	110
12	3	36
	$\Sigma f_i = 40$	$\Sigma f_i x_i = 322$

We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean = 322/40 = 8.05

2. The following table shows the weights of 12 workers in a factory:

Weight (in kg)	60	63	66	69	72
No. of workers	4	3	2	2	1

Find the mean weight of the workers.
Solution:

Weight (in kg) (x_i)	No. of workers (f_i)	$f_i x_i$
60	4	240
63	3	189
66	2	132
69	2	138
72	1	72
	$\Sigma f_i = 12$	$\Sigma f_i x_i = 771$

We know that
Mean weight of the workers = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean weight of the workers = 771/12 = 64.250kg

Therefore, the mean weight of the workers is 64.250kg.

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3. The measurements (in mm) of the diameters of the heads of 50 screws are given below:

Diameter (in mm) (x_i)	34	37	40	43	46
Number of screws (f_i)	5	10	17	12	6

Calculate the mean diameter of the heads of the screws.
Solution:

Diameter (in mm) (x_i)	Number of screws (f_i)	$f_i x_i$
34	5	170
37	10	370
40	17	680
43	12	516
46	6	276
	$\Sigma f_i = 50$	$\Sigma f_i x_i = 2012$

We know that
Mean diameter of the heads of the screws = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean diameter of the heads of the screws = 2012/50 = 40.24mm

Therefore, the mean diameter of the heads of the screws is 40.24mm.

4. The following data give the number of boys of a particular age in a class of 40 students.

Age (in years)	15	16	17	18	19	20
Frequency (f_i)	3	8	9	11	6	3

Calculate the mean age of the students.
Solution:

Age (in years) (x_i)	Frequency (f_i)	$f_i x_i$
15	3	45
16	8	128
17	9	153
18	11	198
19	6	114
20	3	60
	$\Sigma f_i = 40$	$\Sigma f_i x_i = 698$

We know that
Mean age of the students = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean age of the students = 698/40 = 17.45 years

Therefore, the mean age of the students is 17.45 years.

5. Find the mean of the following frequency distribution:

Variables (x_i)	**10**	**30**	**50**	**70**	**89**
Frequency (f_i)	**7**	**8**	**10**	**15**	**10**

Solution:

Variables (x_i)	Frequency (f_i)	$f_i x_i$
10	7	70
30	8	240
50	10	500
70	15	1050
89	10	890
	$\Sigma f_i = 50$	$\Sigma f_i x_i = 2750$

We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean = 2750/50 = 55

6. Find the mean of daily wages of 40 workers in a factory as per data given below:

Daily wages (in ₹) (x_i)	**250**	**300**	**350**	**400**	**450**
Number of workers (f_i)	**8**	**11**	**6**	**10**	**5**

Solution:

Daily wages (in ₹) (x_i)	Number of workers (f_i)	$f_i x_i$
250	8	2000
300	11	3300
350	6	2100
400	10	4000
450	5	2250
	$\Sigma f_i = 40$	$\Sigma f_i x_i = 13650$

We know that
Mean of daily wages of 40 workers in a factory = $\Sigma f_i x_i / \Sigma f_i$
By substituting the values
Mean of daily wages of 40 workers in a factory = 13650/40 = ₹ 341.25

Therefore, the mean of daily wages of 40 workers in a factory is ₹ 341.25.

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7. If the mean of the following data is 20.2, find the value of p.

Variable (x_i)	10	15	20	25	30
Frequency (f_i)	6	8	p	10	6

Solution:

Variable (x_i)	Frequency (f_i)	$f_i x_i$
10	6	60
15	8	120
20	p	20p
25	10	250
30	6	180
	$\Sigma f_i = 30 + p$	$\Sigma f_i x_i = 610 + 20p$

It is given that
Mean = 20.2
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(610 + 20p)/ (30 + p) = 20.2$
On further calculation
$610 + 20p = 606 + 20.2p$
So we get
$0.2p = 4$
By division
$p = 20$

Therefore, the value of p is 20.

8. If the mean of the following data is 8, find the value of p.

x	3	5	7	9	11	13
f	6	8	15	p	8	4

Solution:

x	f	$f_i x_i$
3	6	18
5	8	40
7	15	105
9	p	9p
11	8	88
13	4	52

	$\Sigma f_i = 41 + p$	$\Sigma f_i x_i = 303 + 9p$

It is given that
Mean = 8
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(303 + 9p)/ (41 + p) = 8$
On further calculation
$303 + 9p = 8 (41 + p)$
So we get
$303 + 9p = 328 + 8p$
It can be written as
$9p – 8p = 328 – 303$
We get
$p = 25$

Therefore, the value of p is 25.

9. Find the missing frequency p for the following frequency distribution whose mean is 28.25.

x	15	20	25	30	35	40
f	8	7	p	14	15	6

Solution:

x	f	$f_i x_i$
15	8	120
20	7	140
25	p	25p
30	14	420
35	15	525
40	6	240
	$\Sigma f_i = 50 + p$	$\Sigma f_i x_i = 1445 + 25p$

It is given that
Mean = 28.25
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(1445 + 25p)/ (50 + p) = 28.25$
On further calculation
$1445 + 25p = 1412.50 + 28.25p$
So we get
$-28.25p + 25p = -1445 + 1412.50$
It can be written as
$-3.25p = -32.5$

By division
p = 10

Therefore, the value of p is 10.

10. Find the value of p for the following frequency distribution whose mean is 16.6.

x	8	12	15	p	20	25	30
f	12	16	20	24	16	8	4

Solution:

x	f	$f_i x_i$
8	12	96
12	16	192
15	20	300
p	24	24p
20	16	320
25	8	200
30	4	120
	$\Sigma f_i = 100$	$\Sigma f_i x_i = 1228 + 24p$

It is given that
Mean = 16.6
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(1228 + 24p)/ 100 = 16.6$
On further calculation
$1228 + 24p = 1660$
So we get
$24p = 1660 – 1228$
By subtraction
$24p = 432$
We get
$p = 18$

Therefore, the value of p is 18.

11. Find the missing frequencies in the following frequency distribution whose mean is 34.

x	10	20	30	40	50	6	Total
f	4	f_1	8	f_2	3	4	35

Solution:

x	f	$f_i x_i$
10	4	40
20	f_1	$20f_1$
30	8	240
40	f_2	$40f_2$
50	3	150
6	4	240
Total	$35 = \Sigma f_i = 19 + f_1 + f_2$	$\Sigma f_i x_i = 670 + 20f_1 + 40f_2$

We know that
$\Sigma f_i = 19 + f_1 + f_2$
It can be written as
$35 = 19 + f_1 + f_2$
So we get
$f_1 + f_2 = 16$ …… (1)

It is given that
Mean = 34
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(670 + 20f_1 + 40f_2)/ 35 = 34$
On further calculation
$(335 + 10f_1 + 20f_2)/ 35 = 17$
So we get
$335 + 10f_1 + 20f_2 = 595$
It can be written as
$10f_1 + 20f_2 = 260$
Dividing the equation by 10
$f_1 + 2f_2 = 26$ ..... (2)

By subtracting equation (1) from (2)
$f_2 = 10$
Substituting in equation (1)
$f_1 + 10 = 16$
So we get
$f_1 = 6$

Therefore, the missing frequencies are 6 and 10.

12. Find the missing frequencies in the following frequency distribution whose mean is 50.

x	10	30	50	70	90	Total
f	17	f_1	32	f_2	19	120

Solution:

x	f	$f_i x_i$
10	17	170
30	f_1	$30f_1$
50	32	1600
70	f_2	$70f_2$
90	19	1710
Total	$120 = \Sigma f_i = 68 + f_1 + f_2$	$\Sigma f_i x_i = 3480 + 30f_1 + 70f_2$

We know that
$\Sigma f_i = 68 + f_1 + f_2$
It can be written as
$120 = 68 + f_1 + f_2$
So we get
$f_1 + f_2 = 52$
$f_2 = 52 - f_1$ ……. (1)

It is given that
Mean = 50
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(3480 + 30f_1 + 70f_2)/ 120 = 50$
Substituting equation (1)
$3480 + 30f_1 + 70(52 - f_1) / 120 = 50$
On further calculation
$(3480 + 30f_1 + 3640 – 70f_1)/ 120 = 50$
So we get
$(7120 - 40f_1)/ 120 = 50$
It can be written as
$6000 = 7120 - 40f_1$
By subtraction
$40f_1 = 1120$
By division
$f_1 = 28$

By substituting it in equation (1)
$f_2 = 52 – 28 = 24$

Therefore, the missing frequencies are 28 and 24.

13. Find the value of p, when the mean of the following distribution is 20.

x	15	17	19	20 + p	23
f	2	3	4	5p	6

Solution:

x	f	$f_i x_i$
15	2	30
17	3	51
19	4	76
20 + p	5p	$100p + 5p^2$
23	6	138
	$\Sigma f_i = 15 + 5p$	$\Sigma f_i x_i = 5p^2 + 100p + 295$

It is given that
Mean = 20
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get
$(5p^2 + 100p + 295)/ (15 + 5p) = 20$
On further calculation
$5p^2 + 100p + 295 = 300 + 100p$
So we get
$5p^2 = 5$
By division
$p^2 = 1$
By taking square root
$p = 1$

Therefore, the value of p is 1.

14. The mean of the following distribution is 50.

x	**10**	**30**	**50**	**70**	**90**
f	**17**	**5a + 3**	**32**	**7a - 11**	**19**

Find the value of a and hence the frequencies of 30 and 70.
Solution:

x	f	$f_i x_i$
10	17	170
30	5a + 3	150a + 90
50	32	1600
70	7a - 11	490a - 770
90	19	171
	$\Sigma f_i = 60 + 12a$	$\Sigma f_i x_i = 2800 + 640a$

It is given that
Mean = 50
We know that
Mean = $\Sigma f_i x_i / \Sigma f_i$
So we get

$(2800 + 640a)/ (60 + 12a) = 50$
On further calculation
$2800 + 640a = 3000 + 600a$
So we get
$40a = 200$
By division
$a = 5$

We know that
Frequency of $30 = 5a + 3$
By substituting the values
Frequency of $30 = 5 (5) + 3$
So we get
Frequency of $30 = 28$

We know that
Frequency of $70 = 7a - 11$
By substituting the values
Frequency of $70 = 7 (5) - 11$
So we get
Frequency of $70 = 24$

Therefore, the value of a is 5 and the frequencies of 30 and 70 is 28 and 24.

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EXERCISE 18(C)

1. Find the median of:
(i) 2, 10, 9, 9, 5, 2, 3, 7, 11
(ii) 15, 6, 16, 8, 22, 21, 9, 18, 25
(iii) 20, 13, 18, 25, 6, 15, 21, 9, 16, 8, 22
(iv) 7, 4, 2, 5, 1, 4, 0, 10, 3, 8, 5, 9, 2
Solution:

(i) By arranging the numbers in ascending order
We get
2, 2, 3, 5, 7, 9, 9, 10, 11
We know that n = 9 is odd

So we get
Median = ½ (n + 1) th term
By substituting the values
Median = ½ (9 + 1) th term
It can be written as
Median = value of the 5^{th} term = 7
We get
Median = 7

(ii) By arranging the numbers in ascending order
We get
6, 8, 9, 15, 16, 18, 21, 22, 25
We know that n = 9 is odd

So we get
Median = ½ (n + 1) th term
By substituting the values
Median = ½ (9 + 1) th term
It can be written as
Median = value of the 5^{th} term = 16
We get
Median = 16

(iii) By arranging the numbers in ascending order
We get
6, 8, 9, 13, 15, 16, 18, 20, 21, 22, 25
We know that n = 11 is odd

So we get
Median = ½ (n + 1) th term
By substituting the values
Median = ½ (11 + 1) th term
It can be written as
Median = value of the 6^{th} term = 16
We get
Median = 16

(iv) By arranging the numbers in ascending order
We get
0, 1, 2, 2, 3, 4, 4, 5, 5, 7, 8, 9, 10
We know that n = 13 is odd

So we get
Median = ½ (n + 1) th term
By substituting the values
Median = ½ (13 + 1) th term
It can be written as
Median = value of the 7^{th} term = 4
We get
Median = 4

2. Find the median of:
(i) 17, 19, 32, 10, 22, 21, 9, 35
(ii) 72, 63, 29, 51, 35, 60, 55, 91, 85, 82
(iii) 10, 75, 3, 15, 9, 47, 12, 48, 4, 81, 17, 27
Solution:

(i) By arranging the numbers in ascending order
We get
9, 10, 17, 19, 21, 22, 32, 35
We know that n = 8 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {4^{th} term + 5^{th} term)
By substituting the values
Median = ½ (19 + 21)
On further calculation
Median = ½ (40)
We get
Median = 20

(ii) By arranging the numbers in ascending order
We get
29, 35, 51, 55, 6, 63, 72, 82, 85, 91
We know that n = 10 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {5^{th} term + 6^{th} term)
By substituting the values
Median = ½ (60 + 63)
On further calculation
Median = ½ (123)
We get

Median = 61.5

(iii) By arranging the numbers in ascending order
We get
3, 4, 9, 10, 12, 15, 17, 27, 47, 48, 75, 81
We know that n = 12 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {6^{th} term + 7^{th} term)
By substituting the values
Median = ½ (15 + 17)
On further calculation
Median = ½ (32)
We get
Median = 16

3. The marks of 15 students in an examination are 25, 19, 17, 24, 23, 29, 31, 4, 19, 20, 22, 26, 17, 25, 21. Find the median score.
Solution:

By arranging the numbers in ascending order
We get
17, 17, 19, 19, 20, 21, 22, 23, 24, 25, 26, 29, 31, 35, 40
We know that n = 15 which is odd

So we get
Median = ½ (n + 1) th term
By substituting the values
Median = ½ (15 + 1) th term
It can be written as
Median = value of the 8^{th} term = 23

Therefore, the median score is 23.

4. The heights (in cm) of 9 students of a class are 148, 144, 152, 155, 160, 147, 150, 149, 145. Find the median height.
Solution:

By arranging the numbers in ascending order
We get
144, 145, 147, 148, 149, 150, 152, 155, 160
We know that n = 9 which is odd

So we get
Median = [(n + 1)/2]th value
By substituting the values

Median = [(9 + 1)/2]th value
We get
Median = 5^{th} value = 149cm

Therefore, the median height is 149cm.

5. The weights (in kg) of 8 children are 13.4, 10.6, 12.7, 17.2, 14.3, 15, 16.5, 9.8.
Find the median weight.
Solution:

By arranging the numbers in ascending order
We get
9.8, 1.6, 12.7, 13.4, 14.3, 15, 16.5, 17.2
We know that n = 8 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {4^{th} term + 5^{th} term)
By substituting the values
Median = ½ (13.4 + 14.3)
On further calculation
Median = ½ (27.7)
We get
Median = 13.85kg

Therefore, the median weight is 13.85kg.

6. The ages (in years) of 10 teachers in a school are 32, 44, 53, 47, 37, 54, 34, 36, 40, 50.
Find the median age.
Solution:

By arranging the numbers in ascending order
We get
32, 34, 36, 37, 4, 44, 47, 50, 53, 54
We know that n = 10 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {5^{th} term + 6^{th} term)
By substituting the values
Median = ½ (40 + 44)
On further calculation
Median = ½ (84)
We get
Median = 42

Therefore, the median age is 42 years.

7. If 10, 13, 15, 18, x + 1, x + 3, 30, 32, 35, 41 are ten observations in an ascending order with median 24, find the value of x.
Solution:

By arranging the numbers in ascending order
We get
10, 13, 15, 18, x + 1, x + 3, 30, 32, 35, 41
We know that n = 10 which is even

So we get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
It can be written as
Median = ½ {5^{th} term + 6^{th} term)
By substituting the values
Median = ½ (x + 1 + x + 3)
On further calculation
Median = ½ (2x + 4)
We get
Median = x + 2

It is given that median = 24
So we get
x + 2 = 24
On further calculation
x = 24 – 2 = 22

Therefore, the value of x is 22.

8. The following observations are arranged in ascending order:
26, 29, 42, 53, x, x + 2, 70, 75, 82, 93.
If the median is 65, find the value of x.
Solution:

We know that n = 10 which is even
It is given that median = 65

We can write it as
½ {(n/2)th term + (n/2 + 1)th term} = 65
By substituting the values
½ {(10/2)th term + (10/2 + 1)th term} = 65
So we get
½ {5^{th} value + 6^{th} value} = 65
It can be written as
(x + x + 2)/2 = 65
On further calculation
2x + 2 = 130
By subtraction
2x = 128

By division
x = 64

Therefore, the value of x is 64.

9. The numbers 50, 42, 35, (2x + 10), (2x – 8), 12, 11, 8 have been written in a descending order. If their median is 25, find the value of x.
Solution:

We know that n = 8 which is even
It is given that median = 25

We can write it as
½ {(n/2)th term + (n/2 + 1)th term} = 25
By substituting the values
½ {(8/2)th term + (8/2 + 1)th term} = 25
So we get
½ {4^{th} value + 5^{th} value} = 25
It can be written as
(2x + 10 + 2x - 8)/2 = 25
On further calculation
4x + 2 = 50
By subtraction
4x = 48
By division
x = 12

Therefore, the value of x is 12.

10. Find the median of the data
46, 41, 77, 58, 35, 64, 87, 92, 33, 55, 90.
In the above data, if 41 and 55 are replaced by 61 and 75 respectively, what will be the new median?
Solution:

We know that n = 11 which is odd
By arranging the numbers in ascending order
We get
33, 35, 41, 46, 55, 58, 64, 77, 87, 90, 92

So we get
Median = [(n + 1)/2]th value
By substituting the values
Median = [(11 + 1)/2]th value
We get
Median = 6^{th} value = 58

By replacing 41 and 55 by 61 and 75
By arranging the numbers in ascending order
We get
33, 35, 46, 58, 61, 64, 75, 77, 87, 90, 92

So we get
Median = [(n + 1)/2]th value
By substituting the values
Median = [(11 + 1)/2]th value
We get
Median = 6^{th} value = 64

Therefore, the new median is 64.

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1. Find the mode of the following items.
0, 6, 5, 1, 6, 4, 3, 0, 2, 6, 5, 6
Solution:

By arranging the numbers in ascending order
We get
0, 0, 1, 2, 3, 4, 5, 5, 6, 6, 6, 6

Observations (x)	0	1	2	3	4	5	6
Frequency	2	1	1	1	1	2	4

From the table we know that 6 occurs maximum number of times so the mode is 6.

2. Determine the mode of the following values of a variable.
23, 15, 25, 40, 27, 25, 22, 25, 20
Solution:

By arranging the numbers in ascending order
We get
15, 20, 22, 23, 25, 25, 25, 27, 40

Observations (x)	15	20	22	23	25	27	40
Frequency	1	1	1	1	3	1	1

From the table we know that 25 occurs maximum number of times so the mode is 25.

3. Calculate the mode of the following sizes of shoes sold by a shop on a particular day.
5, 9, 8, 6, 9, 4, 3, 9, 1, 6, 3, 9, 7, 1, 2, 5, 9
Solution:

By arranging the numbers in ascending order
We get
1, 1, 2, 3, 3, 4, 5, 5, 6, 6, 7, 8, 9, 9, 9, 9, 9

Observations (x)	1	2	3	4	5	6	7	8	9
Frequency	2	1	2	1	2	2	1	1	5

From the table we know that 9 occurs maximum number of times so the mode is 9.

4. A cricket player scored the following runs in 12 one-day matches:
50, 30, 9, 32, 60, 50, 28, 50, 19, 50, 27, 35.
Find his modal score.
Solution:

By arranging the numbers in ascending order
We get
9, 19, 27, 28, 30, 32, 35, 50, 50, 50, 50, 60

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Observations (x)	9	19	27	28	30	32	35	50	60
Frequency	1	1	1	1	1	1	1	4	1

From the table we know that 50 occurs maximum number of times so the mode is 50.

5. If the mean of the data 3, 21, 25, 17, (x + 3), 19, (x – 4) is 18, find the value of x. Using this value of x, find the mode of the data.
Solution:

We know that
Number of observations = 7
It is given that mean = 18

It can be written as
$(3 + 21 + 25 + 17 + x + 3 + 19 + x – 4)/7 = 18$
On further calculation
$2x + 84 = 126$
By subtraction
$2x = 42$
By division
$x = 21$

By substituting the value of x
$(x + 3) = 21 + 3 = 24$
$(x – 4) = 21 – 4 = 17$
So we get
3, 21, 25, 17, 24, 19, 17

We know that 17 occurs maximum number of times so the mode is 17.

6. The numbers 52, 53, 54, 54, (2x + 1), 55, 55, 56, 57 have been arranged in an ascending order and their median is 55. Find the value of x and hence find the mode of the given data.
Solution:

We know that
Number of observations = 9
By arranging the numbers in ascending order
We get
52, 53, 54, 54, (2x + 1), 55, 55, 56, 57

So we get
Median = [(n + 1)/2]th value
By substituting the values
Median = [(9 + 1)/2]th value
We get
Median = 5^{th} value = 2x + 1

It is given that median = 55
We can write it as
$2x + 1 = 55$

On further calculation
2x = 54
By division
x = 27

By substituting the value of x
2x + 1 = 2(27) + 1 = 55
So we get
52, 53, 54, 54, 55, 55, 55, 56, 57
We know that 55 occurs the maximum number of times so the mode is 55.

7. For what value of x is the mode of the data 24, 15, 40, 23, 27, 26, 22, 25, 20, x + 3 found 25? Using this value of x, find the median.
Solution:

It is given that
Mode = 25
So we know that 25 occurs maximum number of times

Take x + 3 = 25
On further calculation
x = 22

We get
24, 15, 40, 23, 27, 26, 22, 25, 20, 25
By arranging the numbers in ascending order
We get
15, 20, 22, 23, 24, 25, 25, 26, 27, 40
So the number of observations = 10

We get
Median = ½ {(n/2)th term + (n/2 + 1)th term}
By substituting the values
Median = ½ {(10/2)th term + (10/2 + 1)th term}
So we get
Median = (5^{th} term + 6^{th} term)/2
On further calculation
Median = (24 + 25)/2
We get
Median = 49/2 = 24.5

8. The numbers 42, 43, 44, 44, (2x + 3), 45, 45, 46, 47 have been arranged in an ascending order and their median is 45. Find the value of x. Hence, find the mode of the above data.
Solution:

We know that
Number of observations = 9
It is given that median = 45

So we get

Median = [(n + 1)/2]th value
By substituting the values
Median = [(9 + 1)/2]th value
We get
Median = 5^{th} value = 2x + 3

It is given that median = 45
We get
2x + 3 = 45
On further calculation
2x = 42
By division
x = 21

By substituting the value of x
2x + 3 = 2(21) + 3 = 45
We get
42, 43, 44, 44, 45, 45, 46, 47
We know that 45 occurs maximum number of times so the mode is 45.