

NCERT SOLUTIONS

CLASS - 11th



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Class : 11th
Subject : Statistics
Chapter : 5

Chapter Name : Measures of Central Tendency

Q1 Which average would be suitable in the following cases

- (i) Average size of readymade garments.
- (ii) Average intelligence of students in a class.
- (iii) Average production in a factory per shift.
- (iv) Average wage in an industrial concern
- (v) When the sum of absolute deviations from average is least.
- (vi) When quantities of the variable are in ratios.
- (vii) In case of open-ended frequency distribution.

Answer.

- (i) Mode, because it signifies the quantity with the highest frequency. Hence, the average size would be the highest in production.
- (ii) Median, because the average intelligence can be determined by sorting the students based on their intelligence and then taking the middle value, which is the median.
- (iii) Arithmetic Mean is the most suitable average value to represent the average value of production in a factory per shift.
- (iv) Mean will be the most suitable average in this case because it will take into account the fluctuations in the parameters.
- (v) Arithmetic mean, since the algebraic sum of deviations from the arithmetic mean is zero.
- (vi) Median is not affected by the end values, hence it will be the best suitable average in this case.

(vii) Median is not affected by the end values, hence it will be the best suitable average in this case.

Page : 71 , Block Name : Exercises

Q2 Indicate the most appropriate alternative from the multiple choices provided against each question.

(i) The most suitable average for qualitative measurement is

- (a) arithmetic mean
- (b) median
- (c) mode
- (d) geometric mean
- (e) none of the above

(ii) Which average is affected most by the presence of extreme items?

- (a) median
- (b) mode
- (c) arithmetic mean
- (d) none of the above

(iii) The algebraic sum of deviation of a set of n values from A.M. is

- (a) n
- (b) 0
- (c) 1
- (d) none of the above

Answer.

(i) Median, as it is not affected by the end values and still divides the observations into roughly equal parts.

(ii) Arithmetic mean, because it takes into account all the values of the observations.

(iii) Zero, by the properties of arithmetic mean.

Page : 71 , Block Name : Exercises

Q3 Comment whether the following statements are true or false.

- (i) The sum of deviation of items from median is zero.
- (ii) An average alone is not enough to compare series.
- (iii) Arithmetic mean is a positional value.
- (iv) Upper quartile is the lowest value of top 25% of items.
- (v) Median is unduly affected by extreme observations.

Answer.

- (i) False. The sum of deviation of items from arithmetic mean is zero.
- (ii) True.
- (iii) False, arithmetic mean is not a positional value.
- (iv) True.
- (v) False, it is not much affected by extreme observations.

Page : 72 , Block Name : Exercises

Q4 If the arithmetic mean of the data given below is 28, find (a) the missing frequency, and (b) the median of the series :

Profit per retail shop (in Rs)	0-10	10-20	20-30	30-40	40-50	50-60
Number of retail shops	12	18	27	-	17	6

Answer. Let the missing frequency be f.

Then, the mean can be calculated as

$$\frac{5 \times 12 + 15 \times 18 + 25 \times 27 + 35 \times f + 45 \times 17 + 55 \times 6}{80 + f}$$

Equating both the known and unknown means, we get:

$$\frac{5 \times 12 + 15 \times 18 + 25 \times 27 + 35 \times f + 45 \times 17 + 55 \times 6}{80 + f} = 28$$

$$\frac{2100 + 35f}{80 + f} = 28$$

7f=140

f=20

Now, the number of observations is 100.
The median will be the mean of 50th and 51st observation, which falls in 20-30 class range. Using formula,

Median

=

$$L + \frac{0.5N - cf}{f} \times h$$
$$= 20 + \frac{50 - 30}{27} \times 10$$
$$= 20 + 0.741 \times 10$$
$$= 27.41$$

(Ans. The value of missing frequency is 20 and value of the median is Rs 27.41)

Page : 72 , Block Name : Exercises

Q5 The following table gives the daily income of ten workers in a factory.
Find the arithmetic mean.

Work ers	A	B	C	D	E	F	G	H	I	J
Daily incom e	120	150	180	200	250	300	220	350	370	260

Answer. Sum of daily incomes

=

2400

Total number of workers

=

10

Mean

=

Sum of daily incomes/Total number of workers

$$\frac{2400}{10}$$

=

240

Page : 72 , Block Name : Exercises

Q6 Following information pertains to the daily income of 150 families.
Calculate the arithmetic mean.

Income (in Rs)	Number of families
More than 75	150
More than 85	140
More than 95	115
More than 105	95
More than 115	70
More than 125	60
More than 135	40
More than 145	25

Answer. The data can be tabulated as:

Class interval	Number of Families	Frequency (f)	Mid Value (m)	Total Income (fm)
75-85	150	10	80	800
85-95	140	25	90	2250
95-105	115	20	100	2000
105-115	95	25	110	2750

115-125	70	10	120	1200
125-135	60	20	130	2600
135-145	40	15	140	2100
145-155	25	25	150	3750
		$\sum f = 150$		$\sum fm = 17450$

Mean = $\frac{\sum fm}{\sum f}$

$= \frac{17450}{150}$

$= \text{Rs. } 116.33$

Page : 72 , Block Name : Exercises

Q7 The size of land holdings of 380 families in a village is given below. Find the median size of land holdings.

Size of Land Holdings (in acres)	Less than 100	100-200	200-300	300-400	400 and above
Number of families	40	89	148	64	39

Answer. The tabulated information can be given as:

Class Interval	Frequency (f)	Cumulative Frequency (cf)
0-100	40	40
100-200	89	129
200-300	148	277
300-400	64	341

400-500	39	380
	$\Sigma f=380$	

Since the total number of observations is 380, the median will be the mean of 190th and 191st observation. Using formula,

Median

=

$$L + \frac{0.5N - cf}{f} \times h$$

=

$$200 + \frac{N * (K + N - 1}{200 + 0.4121 \times 100$$

=

241.21

Page : 72 , Block Name : Exercises

Q8 The following series relates to the daily income of workers employed in a firm. Compute (a) highest income of lowest 50% workers (b) minimum income earned by the top 25% workers and (c) maximum income earned by lowest 25% workers.

Daily Income (in Rs)	10-14	15-19	20-24	25-29	30-34	35-39
Number of workers	5	10	15	20	10	5

Answer. The information can be tabulated as :

Class Interval	Frequency (f)	Cumulative Frequency (cf)
9.5-14.5	5	5
14.5-19.5	10	15
19.5-24.5	15	30

24.5-29.5	20	50
29.5-34.5	10	60
34.5-39.5	5	65
	$\sum f = 65$	

Median = $L + \frac{0.5N - cf}{f} \times h$

= $24.5 + \frac{32.5 - 30}{20} \times 5$

= $24.5 + 0.125 \times 5$

= 26.13

Minimum income earned by top 25% workers = Q_3

$Q_3 = L + \frac{0.75N - cf}{f} \times h$

= $24.5 + \frac{48.75 - 30}{20} \times 5$

= $24.5 + 4.68$

= 29.18

Minimum income earned by lowest 25% workers = Q_1

$Q_1 = L + \frac{0.25N - cf}{f} \times h$

= $19.5 + \frac{16.25 - 15}{15} \times 5$

= $19.5 + 0.416$

= 19.92

Page : 72 , Block Name : Exercises

Q9 The following table gives production yield in kg. per hectare of wheat of 150 farms in a village. Calculate the mean, median and mode values.

Production yield (kg. Per hectare)	50-53	53-56	56-59	59-62	62-65	65-68	68-71	71-74	74-77
Number of farms	3	8	14	30	36	28	16	10	5

Answer. To calculate Mean :

Production Yield	No. of farms	Mid value	A = 63.5	$d' = \frac{(X - A)}{c}$	fd'
50 – 53	3	51.5	–12	–4	–12
53 – 56	8	54.5	–9	–3	–24
56 – 59	14	57.5	–6	–2	–28
59 – 62	30	60.5	–3	–1	–30
62 – 65	36	63.5	0	0	0
65 – 68	28	66.5	+3	+1	28
68 – 71	16	69.5	+6	+2	32
71 – 74	10	72.5	+9	+3	30
74 – 77	5	75.5	+12	+4	20

Total	$\sum f = 150$				$\sum fd' = 16$
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Mean = $A + \frac{\sum fd'}{\sum f} \times c$
= $63.5 + 0.32$
= 63.82 kg/hectare

(ii) Median

Class Interval	Frequency (f)	Cumulative Frequency (CF)
50 – 53	3	3
53 – 56	8	11
56 – 59	14	25
59 – 62	30	55
62 – 65	36	91
65 – 68	28	119
68 – 71	16	135
71 – 74	10	145
74 – 77	5	150
Total	$\sum f=150$	

Median will be the 75th term, which is in the 62-65 interval.

Median

=

$$L + \frac{0.5N - cf}{f} \times h$$

=

$$62 + 0.55 \times 3$$

=

63.667 kg / hectare

(iii) Mode

Class Interval	I	II	III	IV	V	VI
50 – 53	3					
53 – 56	8	11	22	25	52	80
56 – 59	14					
59 – 62	30	44	66		94	
62 – 65	36					
65 – 68	28	64	44		80	54
68 – 71	16					
71 – 74	10	26	15	31		

74 – 77	5					
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Analysis Table

Column	50 – 53	53 – 56	56 – 59	59 – 62	62 – 65	65 – 68	68 – 71	71 – 74	74 – 77
I					✓				
II					✓	✓			
III				✓	✓				
IV				✓	✓	✓			
V					✓	✓	✓		
VI			✓	✓	✓				
Total	–	–	1	3	6	3	1	–	–

Modal class = 62 – 65

Mode = $L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$

Mode = 62 + $\frac{36 - 30}{14} \times 3$

= 62 + 1.28

= 63.28 kg / hectare

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