MATHS

BOOKS - KUMAR PRAKASHAN

STATISTICS

Textual Examples

1. The marks obtained by 30 students of class X of a certain school in a Mathematics paper consisting of 100 marks are presented in table below.

Find the mean of the marks obtained by the students .

Marks obtained (x_i)	10	20	36	40	50	56	60	70	72	80	88	9
Number of students (f_i)	1	1	3	4	3	2	4	4	1	1	2	3

After finding the mean directly, also group the data in classes 10-25, 25-40, ... 85-100 to find the mean by direct method , assumed mean method and step-deviation method.

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2. The table below gives the percentage distribution of female teachers in the primary schools of rural areas of various States and and Union Territories (U.T) of India. Find the mean percentage of female teachers by all the three methods discussed in this section.

Percentage of female teachers	$15-25$	$25-35$	$35-45$	$45-55$	55
Number of States /U.T.	6	11	7	4	

Source : Seventh All India School Education Survey conducted by NCERT

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3. The distribution below shows the number of wickets taken by bowlers in one-day cricket matches. Find the mean number of wickets by choosing a suitable method. What does the mean signify ?

Number of wickets	$20-60$	$60-100$	$100-150$	$150-250$	$250-$
Number of bowlers	7	5	16	12	2

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4. The wickets taken by a bowler in 10 cricket matches are as follows :

$2 \quad 6 \quad 4 \quad 5 \quad 0 \quad 2 \quad 1 \quad 3 \quad 2 \quad 3$

Find the mode of the data

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5. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the umber of family members in a household :

Family size	$1-3$	$3-5$	$5-7$	$7-9$	$9-11$
Number of families	7	8	2	2	1

Find the mode of this data.

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6. The marks distribution of 30 students in a mathematics examination are given in Table 3 of Example 1 . Find the mode of this data.

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7. A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained :

Height (in cm)	Number of girls
Less than 140	4
Less than 145	11
Less than 150	29
Less than 155	40
Less than 160	46
Less than 165	51

Find the median height.

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8. The median of the following data is 525 .Find the values of x and y, if the total frequency is 100

Class interval	Frequency
$0-100$	2
$100-200$	5
$200-300$	x
$300-400$	12
$400-500$	17
$500-600$	20
$600-700$	y
$700-800$	9
$800-900$	7
$900-1000$	4

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9. The annual profits earned by 30 shops of a shopping complex in a locality give rise to the following distribution :

Profit (₹ in lakhs)	Number of shops (frequency)
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3

Draw both ogives for the data above. Hence obtain the median profit.

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Other Important Examples

1. The marks obtained by 100 students of two classes in mathematics paper consisting of 100 marks are as follows :

Marks obtained (x_i)	15	20	25	32	35	45	50	60	70	77	80
Number of students (f_i)	2	3	7	4	10	12	9	8	6	8	11

Find the mean of the marks obtained by the students directly. Then , classify the data with classes of equal length as 10-25, 25-40, ... 85-100 and find the mean by all the three methods.

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2. Find the mean of the data given below by all the three methods :

Class	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$	60
Frequency	4	8	3	20	3	4	

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3. The mean of the following frequency distribution of 125 observations is

22.12 . Find the missing frequencies

Class	$0-4$	$5-9$	$10-14$	$15-19$	$20-24$	$25-29$	$30-34$
Frequency	3	8	12	–	35	21	–

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4. The data obtained for 100 shops for their daily profit per shop are as

follows :

Daily profit per shop (in ₹)	$0-100$	$100-200$	$200-300$	$300-4$
Number of shops	12	18	27	20

Find the median profit per shop ?

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5. The mode of the following frequency distribution of 165 observations in

34.5

Class	$5-14$	$14-23$	$23-32$	$32-41$	$41-50$	$50-59$	59
Frequency	5	11	a	53	b	16	

Find the values of a and b .

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6. In the following data, find the values of p and q . Also find the median class and the modal class :

Class	Frequency (fi)	cumulative frequency (cf)
$100-200$	11	11
$200-300$	12	p
$300-400$	10	33
$400-500$	q	46
$500-600$	20	66
$600-700$	14	80

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7. Find the missing frequencies f_1 and f_2 in the following frequency distribution, if n = 100 and median is is 32

Class	frequency (f_i)
$0-10$	10
$10-20$	f_1
$20-30$	25
$30-40$	30
$40-50$	f_2
$50-60$	10
Total	100

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8. A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained :

Height (in cm)	Number of girls
Less than 140	4
Less than 145	11
Less than 150	29
Less than 155	40
Less than 160	46
Less than 165	51

Find the median height.

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9. The frequency distribution of marks scored by 101 stuents at a test is as below

Marks	Number of students
$20-30$	10
$30-40$	8
$40-50$	12
$50-60$	24
$60-70$	6
$70-80$	25
$80-90$	16

Draw the ogives of both the types for the data and from that find the median marks scored by the students.

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Exercise 14 1

1. A survey was conducted by a group of students as a part of their environment awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality . Find the mean number of plants per house.

Number of plants	$0-2$	$2-4$	$4-6$	$6-8$	$8-10$	$10-12$	$12-$
Number of houses	1	2	1	5	6	2	3

Which method did you use for finding the mean, and why ?

Number of plants (Class)	Number of houses (f_i)	Class mark (x_i)	$f_i x_i$
0 - 2	1	1	1
2 - 4	2	3	6
4 - 6	1	5	5
6 - 8	5	7	35
8 - 10	6	9	54
10 - 12	2	11	22
12 - 14	3	13	39
Total	20	-	162

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2. Consider the following distribution of daily wages of 50 workers of a factory :

Daily wages (in ₹)	$500-520$	$520-540$	$540-560$	$560-580$	580
Number of workers	12	14	8	6	1

Find the mean daily wages of the workers of the factory by using an appropriatc method.

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3. The following distribution shows the daily pocket allowance of children of a locality . The mean pocket allowance is ₹ 18. Find the missing frequency f.

Daily pocket allowance (in ₹)	$11-13$	$13-15$	$15-17$	$17-19$	19
Number of children	7	6	9	13	

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4. Thirty women were examined in a hospital by a doctor and the number of heartbeats per minute were recorded and summarised as follows. Find

the mean heartbeats per minute for these women, choose a suitable method.

Number of heartbeats per minute	$65-68$	$68-71$	$71-74$	$74-77$
Number of women	2	4	3	8

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5. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying number of mangoes. The following was the distribution of mangoes according to the number of boxes :

Number of mangoes	$50-52$	$53-55$	$56-58$	$59-61$	$62-64$
Number of boxes	15	110	135	115	25

Find the mean number of mangoes kept in a packing box. Which method of finding the mean did you choose ?

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6. The table below shows the daily expenditure on food of 25 households in a locality :

Daily expenditure (in ₹)	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
Number of households	4	5	12	2	2

Find the mean daily expenditure on food by the step-deviation method.

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7. To find out the concentrations of SO_2 in the air (in parts per million, i.e., ppm) the data was collected for 30 localities in a certain city and its presented below :

Concentration of SO_2(in ppm)	$0.00-0.04$	$0.04-0.08$	$0.08-0.12$
Frequency	4	9	9

Find the mean concentration of SO_2 in the air

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8. A class teacher has the following absentee record of 40 student of a class for the whole term. Find the mean number of days a student was absent.

Number of days	$0-6$	$6-10$	$10-14$	$14-20$	$20-28$	$28-38$
number of students	11	10	7	4	4	3

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9. The following table gives the literacy rate (in percentage) of 35 cities .

Find the mean literacy rate.

Literacy rate (in%)	$45-55$	$55-65$	$65-75$	$75-85$	$85-95$
Number of cities	3	10	11	8	3

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Exercise 14 2

1. The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years)	$5-15$	$15-25$	$25-35$	$35-45$	$45-55$	$55-$
Number of patients	6	11	21	23	14	5

Find the mode the mean of the data given above. Compare and interpret the two measures of central tendency.

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2. The following data gives the information on the observed lifetime (in hours) of 225 electrical components :

Lifetime (in hours)	$0-20$	$20-40$	$40-60$	$60-80$	$80-100$	100
Frequency	10	35	52	61	38	2

Determine the modal lifetime of the components :

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3. The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families . Also, find the mean monthly expenditure.

Expenditure (in ₹)	Number of families
$1000-1500$	24
$1500-2000$	40
$2000-2500$	33
$2500-3000$	28
$3000-3500$	30
$3500-4000$	22
$4000-4500$	16
$4500-5000$	7

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4. The following distribution gives the state wise teacher student ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret the two measures .

Number of students per teacher	Number of States /U.T.
$15-20$	3
$20-25$	8
$25-30$	9
$30-35$	10
$35-40$	3
$40-45$	0
$45-50$	0
$50-55$	2

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5. The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches.

Runs scored	Number of batsmen
$3000-4000$	4
$4000-5000$	18
$5000-6000$	9
$6000-7000$	7
$7000-8000$	6
$8000-9000$	3
$9000-10000$	1
$10000-11000$	1

Find the mode of the data

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6. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data .

Number of cars	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$
Frequency	7	14	13	12	20	11

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Exercise 14 3

1. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality . Find the median, mean and mode of the data and compare them .

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

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2. If the median of the distribution given below is 28.5 , find the values of x and y

Class interval	Frequency
$0-10$	5
$10-20$	x
$20-30$	20
$30-40$	15
$40-50$	y
$50-60$	5
Total	60

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3. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years .

Age (in years)	Number of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

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4. The lengths of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table :

Length (in mm)	Number of leaves
$118-126$	3
$127-135$	5
$136-144$	9
$145-153$	12
$154-162$	5
$163-171$	4
$172-180$	2

Find the median length of the leaves.

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5. The following table gives the distribution of the lifetime of 400 neon lamps :

Lifetime (in hours)	Number of lamps
$1500-2000$	14
$2000-2500$	56
$2500-3000$	60
$3000-3500$	86
$3500-4000$	74
$4000-4500$	62
$4500-5000$	48

Find the median of a lamp.

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6. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows :

Number of letters	$1-4$	$4-7$	$7-10$	$10-13$	$13-16$	$16-19$
Number of surnames	6	30	40	16	4	4

Determine the median number of letters in the surnames . Find the mean number of letters in the surnames ? Also, find the modal size of the surnames .

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7. The distribution below gives the weights of 30 students of a class. Find the median weight of the students :

Weight (in kg)	$40-45$	$45-50$	$50-55$	$55-60$	$60-65$	65
Number of students	2	3	8	6	6	

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Exercise 14 4

1. During the medical check-up of 35 students of a class. their weights were recorded as follows :

weight (in kg)	Number of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

Draw a less than type ogive for the given data. Hence obtain the median weight from the graph and verify the result by using the formula

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Test Your Skills

1. Find the mean of the following frequency distribution :

Class	$0-20$	$20-40$	$40-60$	$60-80$	$80-100$
Frequency	15	18	21	29	17

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2. The mean of the following distribution is 18. The frequency f in the class interval 19-21 is missing

Class	$11-13$	$13-15$	$15-17$	$17-19$	$19-21$	$21-23$	23
Frequency	3	6	9	13	f	5	

Determine f .

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3. Find the mean marks of students for the following distribution.

Marks	Number of students
0 and above	80
10 and above	77
20 and above	72
30 and above	65
40 and above	55
50 and above	43
60 and above	28
70 and above	16
80 and above	10
90 and above	8
100 and above	0

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4. An aircraft has 120 passenger seats. The number of seats occupied during 100 flights is given in the following table. :

Number of seats occupied	$100-104$	$104-108$	$108-112$	$112-116$
No. of flights	15	20	32	18

Determine the mean number of seats occupied over the flights.

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5. The frequency distribution of the lifetimes of 400 T.V. picture tubes tested in a tube company is given below :

Lifetimes (in hours)	$300-399$	$400-499$	$500-599$	$600-699$	700
No. of picture tubes	14	46	58	76	

Find the average life of tube .

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6. During a medical check up to 35 students, their weights were recorded as follow :

Weight (in kg)	No. of students
Below 40	3
Below 42	5
Below 44	9
Below 46	14
Below 48	28
Below 50	31
Below 52	35

Compute the modal weight.

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7. Find the missing frequency f for the following data if the mode for the data is 39 :

Class	$5-15$	$15-25$	$25-35$	$35-45$	$45-55$	$55-65$	$65-$
Frequency	2	3	f	7	4	2	2

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8. The following table gives the heights (in cm) of a group of 55 students in a class :

Class	$140-142$	$142-144$	$144-146$	$146-148$	$148-1$
No. of students	4	6	9	12	9

Find the modal height of the students

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9. Find the mode of the following data :

Marks	Number of students
Below 10	8
Below 20	20
Below 30	45
Below 40	58
Below 50	70

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10. If the mode of the following data is 45. find x and y given $\sum f_t = 50$

Class	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$	$60-70$	70
Frequency	4	8	x	12	10	4	

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11. The table below shows the salartes of 280 persons :

Salary (in thousand ₹)	number of persons
$5-10$	49
$10-15$	133
$15-20$	63
$20-25$	15
$25-30$	6
$30-35$	7
$35-40$	4
$40-45$	2
$45-50$	1

Find the median and mode of the data

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12. The median of the following data is 50. find the values of p and q if the sum of all the frequencies is 90

Marks	Frequency
$20-30$	p
$30-40$	15
$40-50$	25
$50-60$	20
$60-70$	q
$70-80$	8
$80-90$	10

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13. Size of agriultural holdings in a survey of 200 families is given in the following table :

Size of agricultural hlodings (in ha)	Number of families
$0-5$	10
$5-10$	15
$10-15$	30
$15-20$	80
$20-25$	40
$25-30$	20
$30-35$	5

Compute median and mode size of the holdings.

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14. If the median of the following data is 240 then find the value of f.

Class	Frequency
$0-100$	15
$100-200$	17
$200-300$	f
$300-400$	12
$400-500$	9
$500-600$	5
$600-700$	2

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15. Find the median of the following frequency distribution :

Weekly wages (in ₹)	Number of workers
$60-69$	5
$70-79$	15
$80-89$	20
$90-99$	30
$100-109$	20
$110-119$	8

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16. The daily rainfall record of a ciry for 66 days is given in the following table :

Rainfall (in mm)	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$
Number of days	22	10	8	15	5	6

Calculate the median rainfall using both the ogives together. Also calculate the median rainfall using the formula.

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17. The distribution of heights (in cm) of 96 children is given below :

Height (in cm)	Number of children
$124-128$	5
$128-132$	8
$132-136$	17
$136-140$	24
$140-144$	16
$144-148$	12
$148-152$	6
$152-156$	4
$156-160$	3
$160-164$	1

Draw the less type cumulative frequency curve for this data and use it to compute the median height of the children.

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18. During the medical check-up of 36 students of a class. their weights were recorded as follows :

Weight (in kg)	Number of students
Less than 50	0
Less than 52	4
Less than 54	12
Less than 56	24
Less than 58	32
Less than 60	36

Draw a less than type ogive for the given data. Hence, obtain the median weight from the graph and verify the result using the formula .

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Practice Thoroughly

1. Heights (in cm) of girls of Class X of a school are recorded as under .

Height (in cm)	No. of girls
Less than 140	3
Less than 145	10
Less than 150	31
Less than 155	38
Less than 160	50

Make continuous frequency distribution for the above data

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2. Given below is a frequency distribution of daily income of 100 workers of a factory :

Daily income of workers (in ₹)	Number of workers
$200-300$	12
$300-400$	18
$400-500$	35
$500-600$	20
$600-700$	15

Convert this distribution to cumulative frequency distribution of more than type and less than type

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3. The following table gives the ages of 1000 persons who visited a shopping mall on Sunday :

Age (in years)	Number of persons
$0-10$	105
$10-20$	222
$20-30$	220
$30-40$	138
$40-50$	102
$50-60$	113
$60-70$	100

Find the mean, median and mode of the data.

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4. Find the missing frequency x of the following distribution if the mode is 34.5 marks.

Marks obtained	Number of students
$0-10$	4
$10-20$	8
$20-30$	10
$30-40$	x
$40-50$	8

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5. I.Q.s of 100 students are given in the following less than type cumulative frequency distrbution :

I.Q.	Number of students
Less than 110	0
Less than 120	10
Less than 130	29
Less than 140	64
Less than 150	78
Less than 160	90
Less than 170	100

Obtain the cumulative frequency distribution of more than type for the data.

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6. The median salary of 100 employees of a factory is ₹ 24.800, whose frequency distribution is given below. Find the missing frequencies f_1 and f_2

Salary (in ₹)	Number of employees
$10000 - 15000$	18
$15000 - 20000$	f_1
$20000 - 25000$	f_2
$25000 - 30000$	15
$30000 - 35000$	12
$35000 - 40000$	22

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7. The marks scored by the students in a class test are given in the following frequency distribution.

Marks	Number of students
$0 - 6$	1
$6 - 12$	4
$12 - 18$	9
$18 - 24$	3
$24 - 30$	3

Find the mean, median and mode of the data.

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8. The frequency distribution given below shows the height of 60 students of a class. If the mean of the data is 157 cm, find the missing frequenctes x and y

Height (in cm)	Number of students
$144-148$	x
$148-152$	8
$152-156$	15
$156-160$	y
$160-164$	16
$164-168$	6

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9. For the following distribution, draw a less than type ogive and from the curve, find the median :

Marks scored	number of students
Less than 20	2
Less than 30	7
Less than 40	17
Less than 50	40
Less than 60	60
Less than 70	82
Less than 80	85
Less than 90	90
Less than 100	100

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Objective Questions Fill In The Blanks

1. If the mean of 6, 7, x, 8, y, 14 is 9,then x + y = ...

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2. The mean of first n natural numbers is . . . . .

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3. If the mode of the observations 64, 40, 48, x, 43, 48, 43, 34, is 43, then x + 3 = ...

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4. If the median of the observations arranged in the ascending order as 24, 25, 26, x + 2, x + 3, 30, 31, 34 is 27.5, then x = ...

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5. If the mean of the following distribution is 2.6., then y = ...

x_i	1	2	3	4	5
f_t	4	5	y	1	2

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Objective Questions Mcq S

1. . . . . . .is not a measure of central tendency.

A. Mean

B. Median

C. Mode

D. Range

Answer: D

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2. The mean of n observations is $\bar{x}$. If the first observation is increased by 1, the second by 2 and so on, the new mean is . . . .

A. $\bar{x} + n$

B. $\bar{x} + \frac{n}{2}$

C. $\bar{x} + \frac{n+1}{2}$

D. $\bar{x}$

Answer: A::B

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3. For a frequency distribution, mean, median and mode are connected by the relation . . . . .

A. Mode = 3 Mean - 2 Median

B. Mode = 2 Median - 3 Mean

C. Mode = 3 Median - 2 Mean

D. Mode = 3 Median + 2 Mean

Answer: A::B::C::D

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4. For a frequency distribution, Mode-Median = ... $\times$ (Median-Mean)

A. 1

B. 2

C. 3

D. 4

Answer: B

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5. The median of a given frequency distribution is found graphically with the help of . . . . .

A. histogram

B. frequency curve

C. frequency polygon

D. ogive

Answer:

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6. If the median of the observations arranged in the ascending order as 6, 7, x-2, x, is 10 then the value of x is .....

A. 15

B. 16

C. 17

D. 18

Answer: A

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7. In the following frequency distribution, the median class is . . . . .

Class	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$
Frequency	12	18	25	15	10

A. $10-20$

B. $20 - 30$

C. $30 - 40$

D. $40 - 50$

Answer: C::D

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8. For a given frequency distribution, median = 13.2 and mean = 15.3. Then by the relation between mean, median and mode, mode = ...

A. 8.5

B. 8.2

C. 8.8

D. 9

Answer:

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9. In the following frequency distribution, the modal class is . . . . .

Class	$0-20$	$20-40$	$40-60$	$60-80$	$80-100$
Frequency	8	15	22	25	10

A. $0-20$

B. $20-40$

C. $40-60$

D. $60-80$

Answer:

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10. If the mode of a frequency distribution exceeds its mean by 12, then the mode exceeds its median by . . . .

A. 4

B. 8

C. 6

D. 10

Answer:

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Objective Questions

1. If the mode of the data 16, 15, 17, 16, 15, x, 19, 17, 14, is 15, then find x

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2. If the mean of first n natural numbers is $\frac{5n}{9}$, then find n

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3. For the following distribution, find the sum of the lower limit of the mediaan class and the upper limit of the modal class.

Class	$0-5$	$5-10$	$10-15$	$15-20$	$20-25$
Frequency	10	15	12	20	9

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4. Find the algebraic sum of the deviations of all the observations from their mean.

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5. Find the cumulative frequency of the class 40-50 in the following distribution.

Class	$40-50$	$50-60$	$60-70$	$70-80$	$80-90$	$90-100$
Frequency	10	25	28	12	10	15

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Objective Questions True Or False

1. For any frequency distribution, mean is always greater than mode.

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2. The formula to find mean from a grouped frequency table is . $\bar{x} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$. In the formula, $u_i = ...$

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3. The mean of 20 observations is 45. If each observation is divided by 3, the new mean is 15

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4. Median = 3 Mode - 2 Mean

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5. The value of mean is highly affected by the extreme values

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