Statistics

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1. The following data gives the number of boys of a particular age in a class of 40 students. Calculate the mean age of students:

Age (in years)	15	16	17	18	19	20
No. of student	3	8	10	10	5	4

Ans. We have

Age (in years) (x)	No. of students (f)	fx
15	3	45
16	8	128
17	10	170
18	10	180
19	5	95
20	4	80
	$\sum f = 40$	$\sum fx = 698$

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{698}{40} = 17.45$$

Mean   years

2. For the following grouped frequency distribution, find the mode.

Class	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Frequency	2	5	10	23	21	12	3

Ans. Since the maximum frequency = 23 and it corresponds to the class 12-15

∴ Modal class = 12-15

$l = 12, \ n = 3, \ f_1 = 23, \ f_0 = 10, \ f_2 = 21$

$$M_0 = l + h \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 12 + 3 \frac{23 - 10}{2 \times 23 - 10 - 21}$$

$$= 12 + 3 \times \frac{13}{46 - 31} = 12 + \frac{39}{15}$$

$$= 12 + \frac{13}{5} = 12 + 2.6 = 14.6$$

3. Construct the cumulative frequency distribution of the following distribution:

Class	12.5-17.5	17.5-22.5	22.5-27.5	27.5-32.5	32.5-37.5
Frequency	2	22	19	14	13

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class	Frequency	Cumulative frequency
12.5-17.5	2	2
17.5-22.5	22	24
22.5-27.5	19	43
27.5-32.5	14	57
32.5-37.5	13	70

4. The median and mode of a distribution are 21.2 and 21.4 respectively, find its mean.

Ans. We know that Mean = Mode + $\dfrac{3}{2}$ (Median – Mode)

$$= 21.4 + \frac{3}{2}(21.2 - 21.4)$$

$$= 21.4 + \frac{3}{2}(-0.2)$$

$$= 21.4 - 0.3 = 21.1$$

5. The marks distribution of 30 students in a mathematics examination are given below

Class Interval	10-25	25-40	40-55	55-70	70-85	85-100
No. of students	2	3	7	6	0	6

Ans. Since the maximum frequency = 7 and it corresponds to the class 40-55.
The modal class= 40-55
Here, $l = 40, h = 15, f_1 = 7, f_0 = 3, f_2 = 6$
We know that mode M_o is given by

$$M_o = l + h\frac{f_1 - f_0}{2f_1 - f_0 - f_2} = 40 + \frac{15(7-3)}{2(7)-3-6}$$

$$= 40 + \frac{15 \times 4}{5} = 40 + 12 = 52$$

Thus, Mode marks = 52

6. Find the mode of this data.

Construct the cumulative frequency distribution of following distribution:

Marks	39.5-49.5	49.5-59.5	59.5-69.5	69.5-79.5	79.5-89.5	89.5-99.5
Students	5	10	20	30	20	15

Ans. The required cumulative frequency distribution of the given distribution is given below.

Marks	No. of Students	Cumulative Frequency
39.5-49.5	5	5
49.5-59.5	10	15
59.5-69.5	20	35
69.5-79.5	30	65
79.5-89.5	20	85
89.5-99.5	15	100
	$N = \sum f = 100$	

7. If the values of mean and mode are respectively 30 and 15, then median =
(a) 22.5
(b) 24.5
(c) 25
(d) 26

Ans. Median = Mode $+ \dfrac{2}{3}$ (Mean – Mode)

$= 15 + \dfrac{2}{3}(30 - 15)$

$= 15 + \dfrac{2}{3} \times 15$

$= 15 + 10 = 25$

8. If the mean of the following data is 18.75. find the value of P.

xi	10	15	P	25	30
fi	5	10	7	8	2

Ans. We have

x_i	f_i		$x_i f_i$
10	5		50

15	10	150
P	7	7P
25	8	200
30	2	60
	$N = \sum f_i = 32$	$\sum f_i x_i = 460 + 7P$

Now mean $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i} = 18.75$

$$18.75 = \frac{406 + 7P}{32}$$

$$\Rightarrow 460 + 7P = \frac{32 \times 1875}{100}$$

$$\Rightarrow 460 + 7P = 8 \times 75 = 600$$

$$\Rightarrow 7P = 600 - 460$$

$$\Rightarrow 7P = 140$$

$$\Rightarrow P = 20$$

9. Find the mean of the following data.

Classes	10-20	20-30	30-40	40-50	50-60
Frequency	5	8	13	15	9

Ans. We have

Classes	Mid-value x_i	Frequency f_i	$f_i x_i$
10-20	15	5	75
20-30	25	8	200
30-40	35	13	455
40-50	45	15	675
50-60	55	9	495
		$\sum f_i = 50$	$\sum f_i x_i = 1900$

Now mean $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{1900}{50} = 38$

Hence, mean $\bar{x} = 38$

10. The following data gives the information observed life times (in hours) of 225 electrical components. Determine the modal life times of the components.

Life time (in hours)	0-20	20-40	40-60	60-80	80-100	100-200
Frequency	10	35	52	61	38	29

Ans. Since the maximum frequency = 61 and it corresponds to the class 60-80

∴ Modal class = 60-80

Here, $l = 60, h = 20, f_1 = 61, f_0 = 52, f_2 = 38$

We know that mode Mo is given by

$$Mo = l + h \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 60 + 20 \frac{61 - 52}{2(61) - 52 - 38}$$

$$= 60 + 20 \frac{9}{122 - 90}$$

$$= 60 + \frac{20 \times 9}{32}$$

$$= 60 + \frac{45}{8}$$

$$= 60 + 5.625$$

$$= 65.625 hours$$

Thus, modal life times = 65.625 hours

11. Construct the cumulative frequency distribution of the following distribution:

Class Interval	6.5-7.5	7.5-8.5	8.5-9.5	9.5-10.5	10.5-11.5	11.5-12.5	12.5-13.5
Frequency	5	12	25	48	32	6	1

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class Interval	Frequency	Cumulative Frequency
6.5-7.5	5	5
7.5-8.5	12	17
8.5-9.5	25	42
9.5-10.5	48	90
10.5-11.5	32	122
11.5-12.5	6	128
12.5-13.5	1	129
	$N = \sum f = 129$	

12. Calculate the median from the following data:

Marks	0-10	10-30	30-60	60-80	80-100
No. of students	5	15	30	8	2

Ans. We have

Marks	No. of students (f)	C.F
0-10	5	5
10-30	15	20
30-60	30	50
60-80	8	58
80-100	2	60
	$N = \sum f = 60$	

Since $\dfrac{N}{2} = 30$ which his in the class 30-60

∴ Median class is 30-60

We know that median Me is given by

$$Me = l_1 + \frac{\frac{N}{2} - C}{f} \times h$$

Here, $l_1 = 30, h = 30, \dfrac{N}{2} = 30, C = 20, F = 30$

$$\therefore Me = 30 + \frac{30 - 20}{30} \times 30$$

$= 30 + 10 = 40$

Hence, median $= 40$

13. Find the mean of the following data:

Classes	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	9	5	3

Ans. We have

Classes	Mid-value (x_i)	Frequency (f_i)	$x_i f_i$
0-10	5	3	15
10-20	15	5	75
20-30	25	9	225
30-40	35	5	175
40-50	45	3	135
		$\sum f_i = 25$	$\sum x_i f_i = 625$

Now Mean $\bar{x} = \dfrac{\sum x_i f_i}{\sum f_i} = \dfrac{625}{25} = 25$

14. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household. Find the mode.

Family size	1-3	3-5	5-7	7-9	9-11
No. of families	7	8	2	4	1

Ans. Since the maximum frequency = 8 and it corresponds to the class 3-5

Modal class = 3-5

Here, $l = 3, h = 2, f_1 = 8, f_0 = 7, f_2 = 2$

We know that mode Mo is given by

$$Mo = l + h \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 3 + 2 \frac{(8-7)}{2(8) - 7 - 2}$$

$$= 3 + 2 \frac{(1)}{7} = 3 + \frac{2}{7}$$

$$= 3 + 0.2857 = 3.286 \text{ nearly}$$

15. Construct the cumulative frequency distribution of the following distribution:

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	3	10	6	4	2

Ans. The required cumulative frequency distribution of the given distribution is given below:

Class Interval	Frequency (f)	Cumulative frequency
0-10	5	5
10-20	3	8
20-30	10	18
30-40	6	24
40-50	4	28
50-60	2	30
Total	N= 30	

16. If the values of mean and median are 26.4 and 27.2, what will be the value of mode?

Ans. We know that

Mode = 3 median -2 mean

= 3(27.2) – 2(26.4)

= 81.6 – 52.8 = 28.8
Mode = 28.8

17. 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 (xi)	10	20	36	40	50	56	60	70	72	80	88	92	98
students (fi)	1	1	3	4	3	2	4	4	1	1	2	3	1

Ans.

Marks obtained (x_i)	No. of students (f_i)	$f_i x_i$
10	1	10
20	1	20
36	3	108
40	4	160
50	3	150
56	2	112
60	4	240
70	4	280
72	1	72
80	1	80
88	2	176
92	3	276
95	1	95
	$\sum f_i = 30$	$\sum f_i x_i = 1779$

Mean $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{1779}{30} = 59.3$

Thus, mean $\bar{x} = 59.3$

18. A student noted the numbers of cars passing through a spot on a road for 100 periods each of 3 minutes and summarized in the table given below. Find the mode of the data.

No. of cars	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	7	14	13	12	20	11	15	8

Ans. Since the maximum frequency = 20
And it corresponds to the class 40-50
Modal class = 40-50

Here, $l = 40, h = 10, f_1 = 20, f_0 = 12, f_2 = 11$

We know that mode M_0 is given by

$$Mo = l + h \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

$$= 40 + 10 \left(\frac{20 - 12}{2(20) - 12 - 11} \right)$$

$$= 40 + \frac{80}{17} = 40 + 4.705$$

$$= 44.705 = 44.7$$

19. Construct the cumulative frequency distribution of the following distribution:

consumption (units)	65-85	85-105	105-125	125-145	145-165	165-185
Consumers (fi)	4	5	12	20	14	8

Ans. The required accumulative frequency distribution of the given distribution is given below.

Monthly consumption (in units)	No. of consumes (f_i)	Cumulative frequency (cf)
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
	N = 64	

20. If the values of mean and median are 53.6 and 55.81, what will be the value of mode?

Ans. We know that

Mode = 3 Median – 2 mean

Mean = $3(55.81) - 2(53.6)$

$= 167.43 - 107.2 = 60.23$