

STATISTICS

- 1) The marks of 9 students in a class are 34, 32, 48, 24, 30, 27, 21, 32, 35. Find the median marks.

ans:- $n = 9$, odd

on arranging the given observations in the ascending order,

21, 24, 27, 30, 32, 32, 34, 35, 48

median mark = $\left(\frac{n+1}{2}\right)^{\text{th}}$ observation

$$= \frac{9+1}{2} = \frac{10}{2} = 5^{\text{th}} \text{ observation}$$

- 2) Find the mode of the following data:

120, 110, 130, 110, 120, 140, 130, 120, 140, 120

ans: mode = 120, the most

frequently occurring observation.

Observations	frequency
110	2
120	4
130	2
140	2

- 3) Find the median of the following data:

x	10	20	30	40	50
f	2	3	2	3	1

ans:-

x	f	c. f
10	2	2
20	3	5
30	2	7
40	3	10
50	1	11

$n = 11$, odd
median = $\left(\frac{n+1}{2}\right)^{\text{th}}$ observation

$$= \frac{11+1}{2} = 6^{\text{th}} \text{ observation}$$
$$= \underline{\underline{30}}$$

- 4) If the mean of 5 observations $x, x+2, x+4, x+6$ and $x+8$ is 11, then find the value of x .

ans:- mean = $\frac{\text{Sum of observations}}{\text{no. of observations}}$

$$\Rightarrow 11 = \frac{x+x+2+x+4+x+6+x+8}{5}$$

$$\Rightarrow 55 = 5x + 20$$

$$(\div 5) \Rightarrow 11 = x + 4$$

$$\therefore x = 11 - 4 = \underline{\underline{7}}$$

5) Find the modal class of the following data:

class	50-60	60-70	70-80	80-90	90-100
Frequency	9	12	20	11	16

ans:- Highest frequency = 20

\therefore the modal class is 70-80

6) Mode is the value which occurs most frequently in a set of observations. Is it true?

ans:- True

7) Mean = 3Median - Mode. Is it true?

ans:- False

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$

$$\therefore 2\text{Mean} = 3\text{Median} - \text{Mode}$$

8) Find the mean of all factors of 20.

ans:- Factors of 20 are 1, 2, 4, 5, 10, 20

$$\begin{aligned}\therefore \text{Mean} &= \frac{\text{Sum of observations}}{\text{no. of observations}} = \frac{1+2+4+5+10+20}{6} \\ &= \frac{42}{6} = \underline{7}\end{aligned}$$

9) What is the other name of Cumulative frequency curve?

ans:- Ogive

10) Write the formula for finding mode of a grouped data.

$$\text{ans:- Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

11) If the values of mean and mode are respectively 9 and 9, then find the value of median.

ans:- Using empirical formula, mode = 3median - 2mean

$$9 = 3\text{median} - 2 \times 9$$

$$3\text{median} = 9 + 18 = 27$$

$$\therefore \text{median} = \frac{27}{3} = \underline{9}$$

12) Find the mode of the following data:

7, 4, 5, 4, 4, 3, 2, 1, 6, 6, 5, 4

ans:- On arranging, 1, 2, 3, 4, 4, 4, 4, 5, 5, 6, 6, 7

\therefore Mode = 4, the most frequently occurring observation.

13) Find the mean of first 3 odd natural numbers

$$\text{ans:- mean} = \frac{\text{sum of observations}}{\text{Total no. of observations}} = \frac{1+3+5}{3} = \frac{9}{3} = \underline{3}$$



Case-Study

- 14) A 100m race was organised in a school during SPORTS DAY. The time was recorded by the coach. A table shown below describes the time in which the race was finished by the 42 students of class X.

Time (in sec)	0-20	20-40	40-60	60-80	80-100
No. of students	5	15	8	4	10

Based on the above data, answer the following questions:

- * (i) What will be the lower limit of the modal class?
(a) 30 (b) 40 (c) 60 (d) 20

ans:- Modal class = 20-40
lower limit = 20 (d)

- * (ii) The average time in seconds taken by the students to finish the race is:

(a) 49.5 (approx) (b) 47.1 (approx) (c) 50.2 (approx) (d) 30.6 (approx)

ans:-

C. I	x_i	f_i	$x_i f_i$
0-20	10	5	50
20-40	30	15	450
40-60	50	8	400
60-80	70	4	280
80-100	90	10	900

$\sum f_i = 42$ $\sum x_i f_i = 2080$

Average time taken = $\frac{\sum x_i f_i}{\sum f_i} = \frac{2080}{42} = 49.5$ seconds (a)

- * (iii) The cumulative frequency table is constructed to determine
(a) mean (b) mode (c) median (d) all of the above

ans:- median (c)

- * (iv) How many students finished the race within 1 minute?

(a) 28 (b) 23 (c) 19 (d) 14

ans:- 1 minute = 60 seconds

no. of students finished the race within 60 seconds
= $5 + 15 + 8 = 28$ (a)

- * (v) The cumulative frequency of a class is the frequency obtained by — the frequencies of all the classes preceding

the given class.

(a) subtracting (b) dividing (c) multiplying (d) adding.

ans:- adding (d)

15) Find the mean of the following frequency distribution table :-

x	2	3	4	5	6
f	49	43	57	38	13

ans:-

x_i	f_i	$x_i f_i$
2	49	98
3	43	129
4	57	228
5	38	190
6	13	78
	$\Sigma f_i = 200$	$\Sigma x_i f_i = 723$

$$\begin{aligned} \therefore \text{Mean} &= \frac{\Sigma x_i f_i}{\Sigma f_i} \\ &= \frac{723}{200} = 361.5 \\ &= \underline{\underline{3.615}} \end{aligned}$$

16) Find the mode of the following frequency distribution table:

Age (in years)	5-15	15-25	25-35	35-45	45-55
No. of policies	6	11	23	14	5

ans:-

C. I	f
5-15	6
15-25	11 f_0
25-35	23 f_1
35-45	14 f_2
45-55	5

Modal class = 25-35
 $l = 25; h = 10; f_0 = 11; f_1 = 23; f_2 = 14$
 $\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

$$= 25 + \frac{23 - 11}{2 \times 23 - 11 - 14} \times 10$$

$$= 25 + \frac{12}{21} \times 10$$

$$= 25 + \frac{120}{21} = 40$$

$$= 25 + 5.71$$

$$= 30.71 \approx \underline{\underline{31 \text{ years}}}$$

17) Calculate the median for the following distribution table:

x	15	25	35	45	55	65
f	4	28	15	20	17	16

ans:-

x	f	C.f
15	4	4
25	28	32
35	15	47
45	20	67
55	17	84
65	16	100

$n = 100$, even

$$\begin{aligned} \text{median} &= \frac{1}{2} \left[\frac{n}{2}^{\text{th}} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ observation} \right] \\ &= \frac{1}{2} \left[50^{\text{th}} + 51^{\text{st}} \text{ observation} \right] = \frac{1}{2} (45 + 45) \\ &= \frac{90}{2} = \underline{\underline{45}} \end{aligned}$$

18) Find the mean age of 100 residents of a Colony from the following data:

Age in years (\geq)	0	10	20	30	40	50	60	70
No. of persons	100	90	75	50	25	15	5	0

ans:-

C.I	C.f	x_i	f_i	$d_i = x_i - a$	$f_i d_i$
0-10	100	5	10	-30	-300
10-20	90	15	15	-20	-300
20-30	75	25	25	-10	-250
30-40	50	a (35)	25	0	0
40-50	25	45	10	10	100
50-60	15	55	10	20	200
60-70	5	65	5	30	150
70-80	0	75	-	-	-

$\sum f_i = \underline{\underline{100}}$ $\sum f_i d_i = \underline{\underline{-400}}$

$$\text{Mean} = a + \frac{\sum f_i d_i}{\sum f_i} = 35 - \frac{400}{100} = 35 - 4 = \underline{\underline{31}} \text{ years}$$

19) If the mean of the following distribution is 6, find the value of p .

x	2	4	6	10	$p+5$
f	3	2	3	1	2

ans:-

x_i	f_i	$x_i f_i$
2	3	6
4	2	8
6	3	18
10	1	10
$p+5$	2	$2(p+5)$
	$\sum f_i = 11$	$\sum x_i f_i = 2p+52$

Mean = $\frac{\sum x_i f_i}{\sum f_i}$
 $\Rightarrow 6 = \frac{2p+52}{11}$
 $\Rightarrow 66-52 = 2p$
 $\therefore 2p = 14$
 $p = 7$

2) The mode of the following series is 154. find the missing frequency f .

class interval	120-130	130-140	140-150	150-160	160-170
Frequency	2	8	f	20	8

ans:-

C.I	f
120-130	2
130-140	8
140-150	f
150-160	20
160-170	8

Modal class = 150-160
 $l = 150, h = 10, f_0 = f, f_1 = 20, f_2 = 8$
Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$
 $154 = 150 + \frac{20 - f}{40 - f - 8} \times 10$
 $4 = \frac{10(20 - f)}{32 - f}$
 $4(32 - f) = 10(20 - f)$
 $128 - 4f = 200 - 10f$
 $6f = 72$
 $\therefore f = \frac{72}{6} = \underline{\underline{12}}$

2) Calculate the mode for the following frequency distribution:

Marks	0-10	10-20	20-30	30-40	40-50
Number of students	6	10	12	32	20

ans:-

C.I	f
0-10	6
10-20	10
20-30	12
30-40	32
40-50	20

Modal class = 30-40
 $l = 30, h = 10, f_0 = 12, f_1 = 32, f_2 = 20$
Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$
 $= 30 + \frac{32 - 12}{2 \times 32 - 12 - 20} \times 10$
 $= 30 + \frac{200}{32} = 30 + 6.25$
 $= 36.25$ marks

22) The lengths of 40 leaves of a plant are measured correct to the nearest millimeter and the data obtained is represented in the following table:-

length (in mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
No. of leaves	3	5	9	12	5	4	2

find the median length of the leaves.

ans:-

C.I	f	C.f
117.5-126.5	3	3
126.5-135.5	5	8
135.5-144.5	9	17
144.5-153.5	12	29
153.5-162.5	5	34
162.5-171.5	4	38
171.5-180.5	2	40

$$n = 40 ; \frac{n}{2} = 20$$

$$\text{median class} = 144.5 - 153.5$$

$$l = 144.5, h = 9, C.f = 17, f = 12$$

$$\text{Median} = l + \frac{\frac{n}{2} - C.f}{f} \times h$$

$$= 144.5 + \frac{20 - 17}{12} \times 9$$

$$= 144.5 + \frac{9}{4}$$

$$= 144.5 + 2.25$$

$$= \underline{\underline{146.75 \text{ mm}}}$$

23) Compute the median of the following data

Marks more than or equal to	70	60	50	40	30	20	10
No. of students	0	11	23	43	58	72	82

ans:-

C.I	C.f (>)	f	C.f (<)
10-20	82	10	10
20-30	72	14	24
30-40	58	15	39
40-50	43	20	59
50-60	23	12	71
60-70	11	11	82
70-80	0	-	

$$n = 82 ; \frac{n}{2} = 41$$

$$\text{median class} = 40 - 50$$

$$f = 20 ; C.f = 39$$

$$h = 10, l = 40$$

$$\text{Median} = l + \frac{\frac{n}{2} - C.f}{f} \times h = 40 + \frac{41 - 39}{20} \times 10$$

$$= 40 + \frac{2}{20} \times 10 = 40 + 1 = \underline{\underline{41}}$$

24) Find the mean of the following data by assumed mean method and hence find the mode, given that median of the data is 42.5

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	8	10	12	10	4	2

ans:-

C.I	f_i	x_i	$d_i = x_i - a$	$f_i d_i$
10-20	4	15	-30	-120
20-30	8	25	-20	-160
30-40	10	35	-10	-100
40-50	12	^a 45	0	0
50-60	10	55	10	100
60-70	4	65	20	80
70-80	2	75	30	60
	<u>50</u>			<u>-140</u>

$$a = 45 ; \sum f_i d_i = -140 ; \sum f_i = 50$$

$$\text{mean} = a + \frac{\sum f_i d_i}{\sum f_i} = 45 - \frac{140}{50} = 45 - 2.8 = \underline{\underline{42.2}}$$

$$\text{median} = 42.5$$

$$\begin{aligned} \text{Mode} &= 3\text{Median} - 2\text{Mean} \\ &= 3 \times 42.5 - 2 \times 42.2 \\ &= 127.5 - 84.4 = \underline{\underline{43.1}} \end{aligned}$$