

2. From the following table find the mean height

Height (in inches)	60	61	62	63	64
no. of children	2	3	5	8	7

X	f	d $d=x-62$	fd
60	2	-2	-4
61	3	-1	-3
62	5	0	0
63	8	1	8
64	7	2	14
	$\Sigma f = 25$		$fd = 15$

The A.M.

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

$$= 62 + \frac{15}{25}$$

$$= 62 + 0.6$$

$$= 62.6$$

3. The following is the age distribution of 100 persons in a village. Calculate the arithmetic mean.

Age groups: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60
 No. of persons: 5, 10, 25, 30, 20, 10

X	f	X mid of X	d $d = X - 35$	fd
0-10	5	5	-30	-150
10-20	10	15	-20	-200
20-30	25	25	-10	-250
30-40	30	35	0	0
40-50	20	45	10	200
50-60	10	55	20	200

$$\Sigma f = 100.$$

$$\Sigma fd = -200$$

$$A.M = A + \frac{\Sigma fd}{\Sigma f}$$

$$= 35 + \frac{-200}{100}$$

$$= 35 - 2$$

$$A.M = 33$$

14. Find the missing frequency for the following distribution if the mean is 12.9

C.I	0-5	5-10	10-15	15-20	20-25
frequency	3	F	8	5	4

$$A = 12.5$$

$$\bar{x} = 12.9$$

X	F	midx	$d = 2 - A$ $d = 2 - 12.9$	fd
0-5	3	2.5	-10	-30
5-10	F	7.5	-5	-5F
10-15	8	12.5	0	0
15-20	5	17.5	5	25
20-25	A	22.5	10	40

$$20 + F$$

$$35 - 5F$$

$$\text{Mean } \bar{x} = A + \frac{\sum fd}{\sum f}$$

$$12.9 = 12.5 + \frac{35 - 5F}{20 + F}$$

$$0.4 = \frac{35 - 5F}{20 + F}$$

$$0.4(20 + F) = 35 - 5F$$

$$8 + 0.4F = 35 - 5F$$

$$5F + 0.4F = 35 - 8$$

$$5.4F = 27$$

$$F = \frac{27}{5.4}$$

$$F = 5$$

5. The mean height of 25 male workers in factory is 61 cm and the mean height of 35 female workers in the same factory is 58 cm. find the combined mean height of 60 workers in the factory.

$$\bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

$$n_1 = 25 \quad \bar{x}_1 = 61$$

$$n_2 = 35 \quad \bar{x}_2 = 58$$

$$\bar{x} = \frac{25 \times 61 + 35 \times 58}{25 + 35}$$

$$= 59.25$$

6. In a class of 50 students 10 have failed and their average marks is 25. The total marks secured by the entire class 2810. find average of those who have passed.

$$\text{Combined mean of entire class} = \frac{2810}{50} = 56.2$$

$$n_1 - \text{number of stud failed} = 10.$$

$$\bar{x}_1 = 25$$

$$n_2 - \text{number of stud passed} = 50 - 10 = 40.$$

$$\bar{x}_2 = ?$$

$$\text{Total no. of stud} = 50.$$

$$\bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

$$56.2 = \frac{(10 \times 25) + (40 \times \bar{x}_2)}{40 + 40}$$

$$40 + 40.$$

$$56.2 = \frac{250 + 10x}{50}$$

$$2810 = 250 + 10x$$

$$2810 - 250 = 10x$$

$$2560 = 10x$$

$$x = \frac{2560}{10}$$

$$x = 256$$

Median.

Median is the value which divides distribution into two halves. Thus median is the mid value of the distribution.

formula:

When frequencies are given, by forming the cumulative frequency column median is found.

i.e. Median = Size of $\left(\frac{N+1}{2}\right)^{\text{th}}$ item.

In continuous series ^{to} determine the median we use the formula that is median

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To find exact value of the median we use the formula

$$\text{Median} = L + \frac{\frac{N}{2} - c.f}{f} \times i$$

$$56.2 = \frac{250 + 40\bar{x}}{50}$$

$$2810 = 250 + 40\bar{x}$$

$$2810 - 250 = 40\bar{x}$$

$$2560 = 40\bar{x}$$

$$\bar{x} = \frac{2560}{40}$$

$$\bar{x} = 64.$$

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where L = lower limit of the class.
unit median.

$C.f$ = cumulative frequency of the class preceding the median class

f = frequency corresponding to median class.

i = length of the median class.

1. Find the median marks of 9 students 40, 60, 75, 90, 65, 80, 42, 65, 72.

First arrange the ascending order.

42, 60, 65, 65, 70, 72, 75, 80, 90

$$\text{Median} = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ item}$$

$$= \left(\frac{9+1}{2}\right)^{\text{th}} \text{ item.}$$

$$= \frac{10}{2} = 5^{\text{th}} \text{ item.}$$

$$\text{Median} = 70$$

2. Calculate the median for the following data distribution.

x (heights in cm)	120	122	124	126	128	130
y (no. of students)	5	7	9	6	4	10

120

where L = lower ^{limit} ~~limit~~ of the ^{median} class.

$C \cdot f$ = cumulative frequency of the class preceding the median class

f = frequency corresponding to median class.

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First arrange the ascending order.

42, 60, 65, 65, 70, 72, 75, 80, 90

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2. calculate the median for the following data distribution.

x (heights in cm)	120	122	124	126	128	130
y (NO. of Students)	5	7	9	6	4	10

~~120~~

x	f	C.f
120	5	5
122	7	12
124	9	21
126	6	27
128	4	31
130	10	41

$$\text{Median size} = \left(\frac{N+1}{2} \right)^{\text{th}} \text{ item.}$$

$$= \left(\frac{41+1}{2} \right)^{\text{th}} \text{ item.}$$

$$= \left(\frac{42}{2} \right)^{\text{th}} \text{ item.}$$

$$= (21)^{\text{th}} \text{ item.}$$

$$\text{Median} = 124.$$

Calculate the median for the following data.

C. I	120-150	150-180	180-210	210-240	240-270
	frequency				
frequency	25	65	135	430	320
	270-300	300-330	330-360		
	145	79	21		

C.I	frequency	C.F
120 - 150	25	25
150 - 180	65	90
180 - 210	185	225
210 - 240	430	655 → Median
240 - 270	320	975
270 - 300	175	1150
300 - 330	79	1229
330 - 360	21	1250 → "

Median = Size of $\left(\frac{N}{2}\right)^{\text{th}}$ item.

= Size of $\left(\frac{1250}{2}\right)^{\text{th}}$ item.

= Size of (625)th item. → Median

Median = 210 - 240.

$$\text{Median} = L + \frac{\frac{N}{2} - C.F}{f} \times i$$

$L = 210, N = 1250, C.F = 225$
↓

Lower limit $f = 430$

$i = 30. \rightarrow \text{difference of C.I}$

$$\text{Median} = \frac{210 + 625 - 225}{430} \times 30.$$

$$= 210 + \frac{400}{430} \times 30$$

$$= 210 + 27.9$$

$$\text{Median} = 237.9$$

$$= 210 + 0.930 \times 30$$

1. Find out the missing frequency from the data whose arithmetic mean is 67.15 inches. follow

NO. of matches	59.5 - 62.5	62.5 - 65.5	65.5 - 68.5	68.5 - 71.5	71.5 - 74.5
NO. of boxes	5	18	f	27	8
x					
	F	mid x	$d = x - A$	$A = 5$	fd
59.5 - 62.5	5	61	-6	-30	
62.5 - 65.5	18	64	-3	-54	
65.5 - 68.5	f	67	0	0	
68.5 - 71.5	27	70	3	81	
71.5 - 74.5	8	73	6	48	
	$\Sigma f = 58 + f$				$\Sigma fd = 153$

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

$$67.15 = 67 + \frac{153}{58 + f}$$

$$67.15 - 67 = \frac{153}{58 + f}$$

$$0.15 = \frac{153}{58 + f}$$

$$0.15 = \frac{153}{58 + f}$$

$$0.15$$

The mode is that value which occurs most often in the data, that is with highest frequency. In some cases more than one value or ϕ may have same frequency or may repeat some number of times as say that the series is bimodal or multimodal.

Notes 1

Grouping table - grouping table has six columns in column 1.

* I - The given frequencies are taken

* In column - II The frequencies are group in two's

* In column - III The first frequency is left and remaining values are group in two's.

* In column - IV The frequencies are group into three's.

* In column - V The first frequencies are ^{left} group remaining frequencies are group in three's.

* In column - VI The first ^{two} ~~two~~ frequencies are left and remaining frequencies are group in three's.

Analysis

After preparing the analysis table
to find the exact value of mode for
continuous series we use the formula

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

where L = lower limit of the modal class

f_1 = frequency of the modal class

f_0 = frequency of the class

preceding the modal class

f_2 = frequency of the class succeeding
the modal class

i = class interval.

Note 3:

Empirical formula

The empirical formula gives the relationship
between mean, median and mode.

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

1. Find the mode for the set of numbers 2, 2, 3, 5, 6, 8, 5, 9, 5.

Soln:

The maximum repeated value is 5

$$\therefore \text{mode} = 5.$$

2. Calculate the mode for the following data.

x	3	5	7	9	11	13	15	17
f	2	5	7	8	15	7	5	1

Soln:

x	3	5	7	9	11	13	15	17
f	2	5	7	8	15	7	5	1

Successing and preceeding are not in the frequency. take the value $x = \text{mode}$. $15 - 11$.

$$m.f \text{ is } 15.$$

$$\therefore \text{Mode is } = 11$$

3. Calculate the mode from the following data.

x	25	30	35	40	45	50	55
f	7	11	17	15	14	10	11

Here, Inseption methods fails because the difference between maximum frequency and next frequency is very small, so we form grouping and analysing table.

X	I	II	III	IV	V	VI
25	7	18				
30	11			35		
35	17	32	28		43	
40	15		29			46
45	14	24		39		
50	10		21		35	
55	11					

Analyse Table:

X	I	II	III	IV	V	VI	Total
25	7						0
30	11				1		1
35	17				1	1	3
40	15	1	1	1	1	1	5
45	14					1	3
50	10			1			1
55	11						0

The mode is 40.

A. Calculate mode for the following frequency distribution.

Marks below	10	20	30	40	50	60
no. of Students	6	14	29	31	26	28

Soln:

Here, Inspection method fails because, the difference between maximum frequency and next frequency is very small, so, we form grouping and analyzing table.

Grouping table:

X	f _I	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
10	6					
20	14	20		49		
30	29		43		(74)	(96)
40	31	60	(67)			
50	26			(105)		
60	28	(74)				

Since inspection method fails because the difference between maximum frequency and next frequency is very small, so we form grouping and analyzing table.

Analyzing table.

X	f _I	<u>ii</u>	<u>iii</u>	<u>iv</u>	<u>v</u>	<u>vi</u>	Total
10	6						0
20	14				1		1
30	29				1	1	2
40	31			1	1	1	4
50	36	1	1	1		1	4
60	38	1		1			2

✓ calculate the mode from the following data

C. I.	90-100	100-110	110-120	120-130	130-140	140-150
f	4	2	18	12	21	19

150-160	160-170	170-180
10	3	2

Here, inspection method fails because the difference between maximum frequency and next frequency is very small, so we use the analyzing table.

Grouping table

X	I	II	III	IV	V	VI
90-100	4	6				
100-110	2			24		
110-120	18		20		42	
120-130	22	40	42			61
130-140	21	40	62		50	
140-150	19		29			32
150-160	10	13				
160-170	3		5	15		
170-180	2					

Analysing table

X	I	II	III	IV	V	VI	Total
90-100	4						0
100-110	2						0
110-120	18	1				1	2
120-130	22	1	1	1	*	1	5
130-140	21	1	1	1	1	1	5
140-150	19	1		1	1		3
150-160	10				1		1
160-170	3						0
170-180	2						0

True, in this method calculating mode got failed because of getting double. So, we get with empirical method to calculate mode.

$$\text{Mode} = 3\text{median} - 2\text{mean}$$

$$\text{median} = \frac{N}{2} - \text{C.F.} \\ \Delta + \frac{\quad}{f} \times i$$

$$\text{mean} = A + \frac{\sum fd}{\sum f}$$

C.I	frequency	C.F
90 - 100	4	4
100 - 110	2	6
110 - 120	18	24
120 - 130	22	46
130 - 140	21	67
140 - 150	19	86
150 - 160	10	96
160 - 170	3	99
170 - 180	2	101

$$L = 120, N = 50.5, \text{C.F} = 67, i = 10, f = 22$$

$$120 + \left[\frac{50.5 - 67}{22} \right] \times 10$$

$$120 + \frac{25.25 - 67}{22} \times 10$$

$$120 + \frac{-41.75}{22} \times 10$$

In an examination 20% of candidates got second class class when the data are represented by pie chart. what is the angle corresponded by

$$100\% = 360^\circ$$

$$= \frac{360^\circ}{100}$$

$$20\% = \frac{360^\circ}{100} \times 20$$

$$= 72^\circ$$

In a pie chart depicting total expenses of the company in the year 2017 raw material had central angle of 45° if total expenses were Rs 504,00,000 what were the company expenses on raw material?

$$5,04,00,000 = 360^\circ$$

$$\frac{5,04,00,000}{360} = 1^\circ$$

$$1^\circ = 1,40,000 \times 45$$

$$45^\circ = 63,00,000.$$