Mean, Mode and Median

Find mean , mode and median of the given data

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

mean ($\bar{x}$) = $\frac{\text{Sum of all the observation}}{\text{total no of observation}}$

= $\frac{70}{20}$

= 3.5

mode :→ 5

observation having highest frequency

Frequency distribution table

x_i	f_i	$f_i x_i$
1	2	2
2	5	10
3	4	12
4	1	4
5 //	6	30
6	2	12

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{70}{20} = 3.5$$

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Find mean , mode and median of the given data

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

Frequency distribution table

x_i	f_i	$f_i x_i$
1	2	2
2	5	10
3	4	12
4	1	4
5	6	30
6	2	12

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

$n = 20$

$$\text{Median} = \frac{\left(\frac{20}{2}\right)^{th} + \left(\frac{20}{2}+1\right)^{th}}{2}$$

$$= \frac{10^{th} + 11^{th}}{2} \Rightarrow \frac{3+3}{2} = \frac{6}{2} = \boxed{3}$$

n : odd

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

n : even

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

Mean, Mode and Median

Class size = upper limit - lower limit

2, 3, 18, 20, 25, 35, 42, 19, 28, 20, 35, 49, 48, 42, 8, 13, 17, 29, 39, 42, 47, 36, 35, 16
15, 10, 20, 21, 15, 16, 18, 21, 13, 49, 32, 26, 28

Direct method

Interval	f_i	x_i	$f_i x_i$
0–10	3	5	15
10-20	11	15	165
20-30	10	25	250
30-40	6	35	210
40-50	7	45	325

lower limit

upper limit

$$x_i = \frac{\text{upper} + \text{lower}}{2}$$

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

QUESTION

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.

No. of plants	f_i	x_i	$f_i x_i$
0 – 2	1	1	1
2 – 4	2	3	6
4 – 6	1	5	3 5
6 – 8	5	7	3 5
8 – 10	6	9	5 4
10 – 12	2	11	2 2
12 – 14	3	13	3 9
	20		1 6 2

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{162}{20} = \frac{81}{10} = 8.1$$

QUESTION

H Assume mean method

The table below shows the daily expenditure on food of 25 households in a locality
Find the mean daily expenditure on food by a suitable method.

Daily expenditure	f	x_i	$d_i = x_i - A$	$f_i d_i$
100 – 150	4	125	-100	-400
150 – 200	5	175	-50	-250
200 – 250	12	225	0	0
250 – 300	2	275	50	100
300 – 350	2	375	100	200
	25			-350

$A = 225$
↳ Assumed mean.

$-650 + 300 = -350$

$$\bar{x} = A + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

$$\bar{x} = 225 + \frac{-350}{25} = 225 - 14$$

$= 211$ → mean.

QUESTION

Step deviation method

h : class size
520 - 500 = 20

Consider the following distribution of daily wages of 50 workers of a factory.
Find the mean daily wages of the workers of the factory by using an appropriate method.

Daily wages	f	x_i	$d_i = x_i - A$	$u_i = \frac{d_i}{h}$	$f_i u_i$
500 – 520	12	510	-40	-2	-24
520 – 540	14	530	-20	-1	-14
540 – 560	8	550	0	0	0
560 – 580	6	570	20	1	6
580 – 600	10	590	40	2	20
	50				-12

A = 550

$$\bar{x} = A + \left(\frac{\Sigma f_i u_i}{\Sigma f_i}\right) \times h$$

$$550 + \left(\frac{-12}{50}\right) \times 20$$

$$550 - \frac{24}{5}$$

$$550 - 4.8$$

545.2

QUESTION

The following table shows the ages of the patients admitted in a hospital during a year:
Find the mode of the data

Age (in year)	Number of patients	
5 – 15	6	$h = 10$
15 – 25	11	$l = 35$
25 – 35	21	f_0
35 – 45	23	f_1
45 – 55	14	f_2
55 – 60	14	
60 – 65	5	

Modal class

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

$$= 35 + \left(\frac{23 - 21}{46 - 21 - 14}\right) \times 10$$

$$= 35 + \left(\frac{2}{25 - 14}\right) \times 10$$

$$= 35 + \left(\frac{20}{11}\right) \Rightarrow 35 + 1.8$$

$$= 36.8$$

QUESTION

$\Sigma f_i = n = 68$ $\quad \frac{n}{2} = \frac{68}{2} = 34$

The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median of the given data.

Monthly consumption (in unit)	Number of consumers (f)	C.F
65 – 85	4	4
85 – 105	5	9
105 – 125	13	22 (cf)
125 – 145 ($l = 125$, $h = 20$)	20 (f)	42
145 – 165	14	56
165 – 185	8	64
185 – 205	4	68

$\Sigma f_i = n = 68$

$$M = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$\Rightarrow 125 + \left(\frac{34 - 22}{20}\right) \times 20$$

$$\Rightarrow 125 + 12$$

$$\Rightarrow 137$$

QUESTION

The following table shows the cumulative frequency distribution of marks of 800 students in an examination. Construct a frequency distribution table for the given data.

Marks	Number of Students	Interval	f
Below 10	3	0-10	3
Below 20	12	10-20	9
Below 30	27	20-30	15
Below 40	57	30-40	30
Below 50	75	40-50	18
Below 60	80	50-60	5

QUESTION

Form the frequency distribution table from the following data :

Marks obtained	Number of students	Interval	Frequency
More than or equal to 0	63	0-10	5
More than or equal to 10	58	10-20	3
More than or equal to 20	55	20-30	4
More than or equal to 30	51	30-40	3
More than or equal to 40	48	40-50	6
More than or equal to 50	42	50-	42

QUESTION

$n = \Sigma f_i = 60$ $\left(\frac{n}{2} = 30\right)$

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

Class interval	F	cf
0 – 10	5	5
10 – 20	x	$x+5 = cf$
20 – 30	20 = f	$x+25$
30 – 40	15	$x+40$
40 – 50	y	$x+y+40$
50 – 60	5	$x+y+45$
Total	60	

$l = 20$

$x + y + 45 = 60$

$x + y = 15 \quad (1)$

$y = 15 - 8$

$y = 7$

$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{F}\right) \times h$

$28.5 = 20 + \frac{[30 - (x+5)]}{20} \times 10$

$28.5 - 20 = \frac{30 - x - 5}{2}$

$\frac{8.5}{1} = \frac{25 - x}{2}$

$17 = 25 - x$

$x = 25 - 17$

$x = 8$

Mean, Mode and Median

Empirical Relationship

$$3\,\text{Median} = 2\,\text{Mean} + \text{Mode}$$