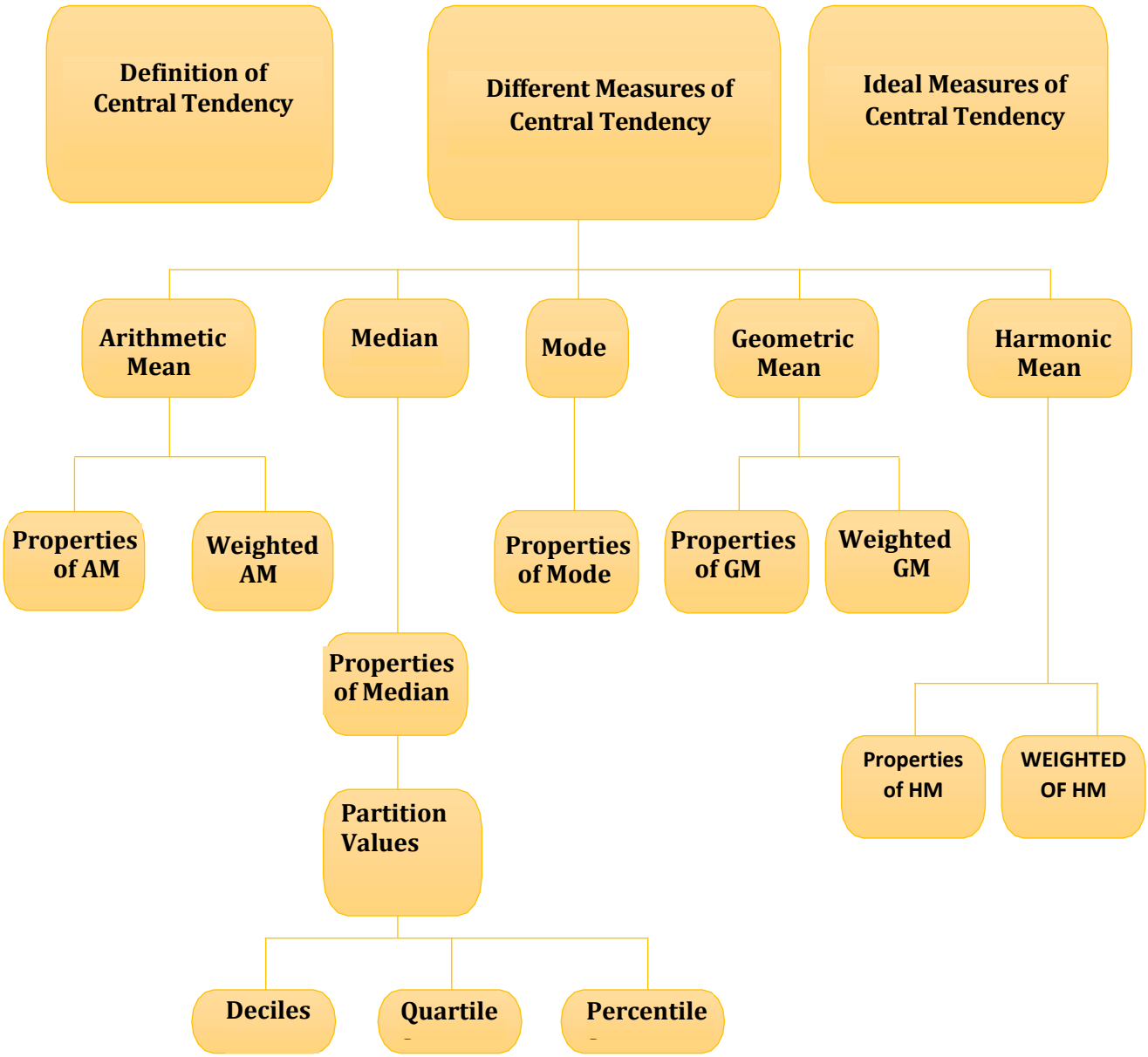
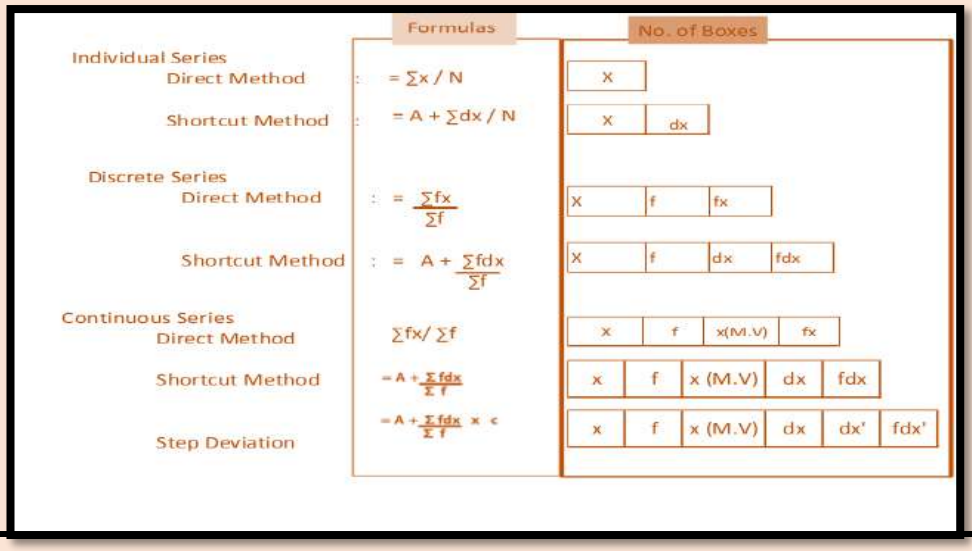
CHAPTER - 14
MEASURES OF CENTRAL TENDENCY AND DISPERSION



UNIT I: MEASURES OF CENTRAL TENDENCY

CENTRAL TENDENCY	**Tendency of a given set of observations to cluster around a single central or middle value and the single value that represents the given set of observations is described as a measure of central tendency or, location, or average.**
ARITHMETIC MEAN	**The AM may be defined as the sum of all the observations divided by the number of observations. Thus, if a variable x assumes n values $x_1, x_2, x_3, \ldots\ldots\ldots x_n$, then the AM of x, to be denoted by $\bar{X}$, is given by:** 
MEDIAN – PARTITION VALUES	$Median = l + \frac{h}{f}\left(\frac{N}{2} - c\right)$ Where: l = lower class boundary of the median class h = Size of the median class interval f = Frequency corresponding to the median class N = Total number of observations i.e. sum of the frequencies c = Cumulative frequency preceding median class.

Types of median	**Calculation of Quartiles, Deciles and Percentiles** • **For Continuous Series** 1. Q_1=Size of N/4th item 2. Q_3 =Size of 3N/4th item 3. D_1=Size of N/10th item 4. D_9=Size of 9N/10 item 5. P_1 =Size of N/100th item 6. P_{99}=Size of 99N/100th item • **Formula to be used in continuous series:** 1. $Q_1=L_1+N/4-c.f*i/f$ 2. $Q_3=L_1+3N/4-c.f*i/f$ 3. $D_1=L_1+N/10-c.f*i/f$ 4. $D_9=L_1+9N/10-c.f*i/f$ 5. $P_1=L_1+N/100-c.f*i/f$ 6. $P_{99}=L_1+99N/100-c.f*i/f$
Mode	Formula of Mode : $Z = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$ where, Z = value of Mode l_1 = lower limit of modal class f_0 = Frequency of the preceding modal class f_2 = Frequency of the subsequent modal class or post modal class i = Class interval of the modal class
GEOMETRIC MEAN & HARMONIC MEAN& WEIGHTED MEAN	Geometric Mean: $GM = \sqrt[n]{\prod_{i=1}^{n} x_i} = \sqrt[n]{x_1 x_2 x_3 \dots x_n}$ Harmonic Mean: $HM = \frac{n}{\sum_{i=1}^{n} \frac{1}{x_i}} = \frac{n}{\frac{1}{x_1}+\frac{1}{x_2}+\frac{1}{x_3}+\dots+\frac{1}{x_n}}$ Weighted Mean: $WM = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i} = \frac{w_1x_1+w_2x_2+w_3x_3+ \dots +w_nx_n}{w_1+w_2+w_3+ \dots +w_n}$
Relationship between Mean, Median and	**Mean – Mode = 3(Mean– Median)** **Mode = 3 Median – 2 Mean**
Relation between AM, GM, and HM	**AM >GM >HM**

Question 1

Relationship between Mean, Median and Mode

(a) Mean – Mode = 3(Mean – Median) (b) Mode = 3 Median – 2 Mean

(c) Both (a & b) (d) None of these

Answer: C

Explanation:

If a frequency distribution is positively skewed, the mean is greater than median and median is greater than mode.

Question 2

If median – 20 and mean-22.5 in a moderately skewed distribution then compute approximate value of mode

(a) 15 (b) 20

(c) 25 (d) 30

Answer: A

Explanation:

Mean – Mode = 3(Mean – Median)

22.5 – Mode = 3(22.5 – 20)

22.5 – Mode = 7.5

Mode = 22.5 – 7.5

Mode = 15

Question 3

A numerical value used as a summary measure for a sample, such as sample mean, is known as a

(a) Population parameter (b) Sample parameter

(c) Sample statistic (d) population mean

Answer: C

Explanations:

If it pertains to sample it is called a statistic, if it pertains to population, it is called a parameter.

Question 4

Since the population size is always larger than the sample size, then the sample statistic

(a) Can never be equal to the population parameter (b) Can never be zero

(c) Can never be smaller than the population parameter (d) None of the above answers is correct

Answer: D

Explanation:

Sample statistic will depend upon the sample chosen. It can be less than, greater than, equal to population parameter. It can assume the value of zero.

Question5

Mu is an example of a

(a) Population parameter
(b) Sample statistic
(c) Population variance.
(d) Mode

Answer: A

Explanation:

M is a standard representation for population parameter.

Question 6

The mean of a sample is

(a) Always equal to the mean of the population
(b) Always smaller than the mean of the population
(c) Computed by summing the data values and dividing the sum by (n – 1)
(d) Computed by summing all the data values and dividing the sum by the number of items

Answer: D

Explanation:

Mean = Total of sample values/ sample size

Question 7

The sum of the percent frequencies for all classes will always equal

(a) One
(b) The number of classes
(c) The number of items in the study
(d) 100

Answer: D

Explanation:

If we count the total frequency, it is equal to the sample size n. $\frac{n}{n} \times 100 = 100$

Question8

In a five number summary, which of the following is not used for data summarization?

(a) The smallest value
(b) The largest value
(c) The median
(d) The 25th percentile

Answer: D

Explanation:

The 25th percentile

Question 9

Since the mode is the most frequently occurring data value, it

(a) Can never be larger than the mean
(b) Is always larger than the median
(c) Is always larger than the mean
(d) None of the above answers is correct.

Answer: D

Explanation:

The mean, median and mode values will be distributed according to the skewness of the distribution. Accordingly, mode can be greater than or less than mean or mode.

Question 10

The following table gives the distribution of 100 accidents during seven days of the week of a given month. During a particular month there were 5 Fridays and Saturdays and four each of other days. Calculate the average number of accidents per day.

Days	Sun	Mon	Tue	Wed	Thru	Fri	Sat.	Total
Number of accidents	20	22	10	9	11	8	20	100

(a) 14 (b) 12
(c) 17 (d) 19

Answer: A

Explanation:

Calculation of number of Accidents per day

Day	No. of Accidents (x)	No. of days in Month (f)	Total fx
Sunday	20	4	80
Monday	22	4	88
Tuesday	10	4	40
Wednesday	9	4	36
Thursday	11	4	44
Friday	8	5	40
Saturday	20	5	100
Total	100	N =30	Σfx = 428

$\frac{\sum fx}{N} = \frac{428}{30} = 14.27$

14 accidents per day

Question 11

Following are the daily wages in Rupees of a sample of 9 workers: 58, 62, 48, 53, 70, 52, 60, 84, 75. Compute the mean wage.

(a) 62.44 (b) 62.04
(c) 60.44 (d) 31.22

Answer: a

Explanation:

Let x denote the daily wage in rupees.
Then as given $x_1 = 58$, $x_2 = 62$, $x_3 = 48$, $x_4 = 53$, $x_5 = 70$, $x_6 = 52$,
$X_7 = 60$, $x_8 = 84$ and $x_9 = 75$. Applying (15.1.1) the mean wage is
Given by,

$= \frac{\Sigma xi}{n}$

$\frac{58+62+48+53+70+52+60+84+75}{9}$

$\frac{562}{9} = 62.44$

Question 12

Find the AM for the following distribution:

class interval	350-369	370-389	390-409	410-429	430-449	450-469	470-489
Frequency	23	38	58	82	65	31	11

(a) 416 (b) 416.17

(c) 416.71 (d) 41.71

Answer: C

Explanation:

Computation of AM

Class Interval		Frequency(f)	Mid-Value(x)	d= xi-A xi = -419.50	fx
(1)		(2)	(3)	(4)	(5) = (2) × (4)
350 – 369		23	359.50	-3	-69
370 – 389		38	379.50	-2	-76
390 – 409		58	399.50	-1	-58
410 – 429		82	419.50	0	0
430 – 449		65	439.50	1	65
450 - 469		31	459.50	2	62
470 - 489		11	479.50	3	33
Total		308	-	-	-43

The required AM is given by

$X=A+\frac{\Sigma fidi}{N}\times C$

$=419.50+\frac{(-43)}{308}\times 20$

$=419.50-2.79$

$=416.71$

Question 13

The mean salary for a group of 40 female workers is Rs. 5200 per month and that for a group of 60 male workers is Rs. 6800 per month. What is the combined mean salary?

(a) 6160 (b) 616

(c) 6.16 (d) 61.6

Answer: A

Explanation:

As given $n_1 = 40$, $n_2 = 60$, $x_1 =$ Rs. 5200 and

$X_2 =$ Rs.6800

Hence, the combined mean salary per month is

$X=\frac{n_1x_1+n_2x_2}{n_1+n_2}$

$\frac{40\times Rs.5200+60\times Rs.6800}{40+60}$

$=6160$

Question 14

The sum of the deviation of a given set of individual observations from the arithmetic mean is always infinite. The statement is True or not?

(a) Correct (b) Incorrect

(c) Error (d) None

Answer: B

Explanation:

According to Mathematical properties of the Arithmetic Mean: The sum of the deviation of a given set of individual observations from the arithmetic mean is always zero. Symbolically = 0. It is due to this property that property the arithmetic mean is characterized as the center as the center gravity i.e., the sum of positive deviations from the mean is equal to the sum of negative deviations.

Question 15

The mean age of a combined group of men and women is 30 years. If the mean age of the group of men is 32 and that of women group is 27. Find out the percentage of men and women in the group.

(a) 30%, 70%
(b) 20%, 80%
(c) 60%, 40%
(d) 40%, 60%

Answer: C

Explanation:

Let us take group of men as first group and women as second group. Therefore = 32 years, = 27 years, and = 30 years. In the problem, we are not given the number of men and women. We can assume

N1 + N2 = 100 and therefore. N1 = 100 – N2

Apply =

30 = (Substitute $N_1 = 100 - N_2$)

$30 \times 100 = 32(100 - N_2) + 27N_2$ or $5N_2 = 200$

$N_2 = \frac{200}{5} = 40\%$

$N_1 = (100 - N_2) = (100 - 40) = 60\%$

Therefore, the percentage of men in the group is 60 and that of women is 40.

Question 16

Median and mode of the wage distribution are known to be Rs. 33.5 and 34 respectively. Find the third missing values.

Wages (Rs.)	No. of Workers
0-10	4
10—20	16
20-30	?
30-40	?
40-50	?
50-60	6
60-70	4
Total	230

(a) 6
(b) 10
(c) 9
(d) 40

Answer: D

Explanation:

We assume the missing frequencies as 20 – 30 as x, 30 – 40 as y, and 40 – 50 as 230 – (4 + 16 + x + y + 6 +4) = 200 – x – y.

We now proceed further to compute missing frequencies:

Wages (Rs.) x	No. of workers f	Cumulative frequencies cf
0-10	4	4
10-20	16	20
20-30	x	20 + x
30-40	y	20 + x + y
40-50	200-x-y	220
50-60	6	226
60-70	4	230

	N = 230	

Apply median =
33.5 =
Y (33.5 – 30) = (115-20-x) 10
3.5y = 1150 – 200 – 10x
10x + 3.5y = 950 … (i)
Apply mode =
34 =
4(3y – 200) = 10(y – x)
10x + 2y = 800 …. (ii)
Subtract equation (ii) from equation (i),
1.5y = 150, y = 100
Substitute the value of y = 100 in equations (i0, we get
10x + 3.5(100) = 950
10x = 950-350
X = $\frac{600}{10}$ = 60
Third missing frequency = 200 – x – y = 200 – 60 – 100 = 40.

Question 17

Calculate mode from the following data:

Marks	Frequency
Below 10	4
‘‘20	6
‘‘30	24
‘‘40	46
‘‘50	67
‘‘60	86
‘‘70	96
‘‘80	99
‘‘90	100

(a) 41.3
(b) 40
(c) 40.13
(d) 89

Answer: A

Explanation:

Since we are given the cumulative frequency distribution of marks, first we shall convert it into the normal frequency distribution:

Marks	Frequencies
0-10	4
10-20	6-4=2
20-30	24-6=18
30-40	46-24=22
40-50	67-46=21
50-60	86-67=19
60-70	96-86=10
70-80	99-96=3
80-90	100-99=1

It is evident from the table that the distribution is irregular and maximum chances are that the distribution would be having more than one mode. You can verify by applying the grouping and analyzing table.
The formula to calculate the value of mode in cases of bio-modal distribution is:

Mode = 3 median – 2 mean.

Computation of Mean and Median

Marks	Mid-Value x	Frequency f	Cumulative frequencies cf	(dx)	fdx
0-10	5	4	4	-4	-16
10-20	15	2	6	-3	-6
20-30	25	18	24	-2	-36
30-40	35	22	46	-1	-22
40-50	45	21	67	0	0
50-60	55	19	86	1	19
60-70	65	10	96	2	20
70-80	75	3	99	3	9
80-90	85	1	100	4	4
	405	$\Sigma f = 100$	528	0	$\Sigma fdx = -28$

Mean =?
Median = size of item = 50^{th} item
Because 50 is similar to 67 in C.f. column, Median class is 40 – 50
Apply Mode = 3 median – 2 Mean
Mode = 3 × 41.9 - 2 × 42.2 = 125.7 – 84.6 = 41.3

Question 18

Find the arithmetic mean of the first 7 natural numbers.

(a) 5 (b) 6
(c)7 (d) 4

Answer: D

Explanation:

The first 7 natural numbers are 1, 2, 3, 4, 5, 6 and 7.
Let x denote their arithmetic mean.
Then mean = Sum of first 7 natural numbers/number of natural numbers
X = (1 + 2 + 3 + 4 + 5 + 6 + 7)/7
= 28/7
= 4
Hence, their mean is 4.

Question 19

The heights of five runners are 160cm, 137 cm, 149 cm, 153 cm, and 161 cm respectively. Find the mean height per runner.

(a) 152 (b) 150
(c) 148 (d) 120

Answer: A

Explanation:

Mean height = Sum of the heights of the runners/number of runners
$= \frac{(160+137+149+153+161)}{5cm}$

$= \frac{760}{5cm}$
= 152 cm.
Hence the mean height is 152 cm.

Question 20
Find the mean of the first five prime numbers.
(a) 4.6 (b) 6.5
(b) 78 (d) 5.6
Answer: D
Explanation:
The first five prime numbers are 2, 3, 5, 7 and 11.
Mean = Sum of first five prime numbers/number of prime numbers
$= \frac{(2+3+5+7+11)}{5}$
$= \frac{28}{5}$
= 5.6
Hence, their mean is 5.6

Question 21
Find the mean of the first six multiples of 4.
(a) 12 (b) 13
(c) 14 (d) 15
Answer: C
Explanation:
The six multiples of 4 are 4, 8, 12, 16, 20, and 24.
Mean = Sum of the first six multiples of $\frac{4}{\text{No.of multiple}}$
$= \frac{(4+8+12+16+20+24)}{6}$
$= \frac{84}{6}$
= 14.
Hence, their mean is 14.

Question 22
If the mean of 9, 8, 10, x, 12 is 15, find the value of x.
(a) 30 (b) 41
(c) 36 (d) 63
Answer: C
Explanation:
Mean of the given numbers = $\frac{(9+8+10+x+12)}{5} = \frac{(39+x)}{5}$
According to the problem, mean = 15 (given).
Therefore, $\frac{(39+x)}{5} = 15$
➔ 39 + x = 15 × 5
➔ 39 + x = 75
➔ 39 – 39 + x = 75 – 39
➔ x = 36
Hence x = 36.

Question 23

If the mean of five observations x, x+4, x+6, x+8, and x+12 is 16, find the value of x.

(a) 154 (b) 54

(c) 451 (d) 541

Answer: C

Explanation:

Mean of the given observations

$=\frac{x+(x+4)+(x+6)+(x+8)+(x+12)}{5}$

$=\frac{(5x+30)}{5}$

According to the problem mean = 16 (given).

Therefore, $\frac{(5x+30)}{5} = 16$

➔ 5x + 30 = 16 × 5

➔ 5x + 30 = 80

➔ 5x + 30 – 30 = 80 – 30

➔ 5x = 50

➔ $x = \frac{50}{5}$

➔ x = 10

Hence, x = 10.

Question 24

The mean of 40 numbers was found to be 38. Later on, it was detected that a number 56 was misread as 36. Find the correct mean of given numbers.

(a) 38 (b) 26

(c) 38.5 (d) 89

Answer: C

Explanation:

Calculated mean of 40 numbers = 38.

Therefore, calculated sum of these numbers = (38 × 40) = 1520.

Correct sum of these numbers

= [1520 – (wrong item) + (correct item)]

= (1520 – 36 + 56)

= 1540.

Therefore, the correct mean = $\frac{1540}{40}$ = 38.5.

Question 25

The mean of the heights of 6 boys is 152 cm. If the individual heights of five of them are 151 cm, 153 cm, 155 cm, 149 cm and 154 cm, find the height of the sixth boy.

(a) 157 (b) 159

(c) 150 (d) 89

Answer: C

Explanation:

Mean height of 6 boys = 152 cm.

Sum of the heights of 6 boys = (152 × 6) = 912 cm

Sum of the heights of 5 boys = (151 + 153 + 155 + 149 + 154) cm = 762 cm.

Height of the sixth boy

= sum of the heights of 6 boys) – (sum of the heights of 5 boys)

= (912-762) cm = 150 cm.
Hence, the height of the sixth girl is 150 cm.

Question 26
Find the mode of the following set of marks.

Marks	1	2	3	4	5
Frequency	6	7	7	5	3

(a) 2 and 4
(b) 4 and 3
(c) 2 and 3
(d) 2 and 5
Answer: C
Explanation:
The marks 2 and 3 have the highest frequency. So, the modes are 2 and 3.
Note: The above example shows that a set of observation may have more than one mode.

Question 27
There are 8 number cards with values 0 – 7. Each time a card is drawn at random and the card value is recorded. The frequency refers to the number of times a value is shown.

Card values	0	1	2	3	4	5	6	7
Frequency	8	12	7	10	12	13	12	10

(a) 75,5
(b) 5, 79
(c) 80, 89
(d) None
Answer: A
Explanation:
(a) Mode: 75 kg (highest frequency of 12)
(b) Mode: 5 (highest frequency of 13)

Question 28
The following frequency table shows the marks obtained by students in a quiz. Given that 4 is the mode, what is the least value for x?

Marks	1	2	3	4	5	6
Number of students (frequency)	7	9	10	x	9	11

(a) 12
(b) 10
(c) 3
(d) 6
Answer: A
Explanation:
X is as least 12 (if x is less than 12 then 4 will not be the mode)

Question 29
The mean of the following frequency distribution is

Class Interval	**Frequency**
0-10	**4**
10-20	**6**
20-30	**10**
30-40	**16**

40-50	**14**

(a) 25 (b) 35
(c) 30 (d) 31

Answer: D

Explanation:

Class interval	Mid-point	Freq.	Diff, from (A = 25)	fd
0-10	5	4	-20	-80
10-20	15	6	-10	-60
20-30	25	10	0	0
30-40	35	16	10	160
40-50	45	14	20	280
Total	Σf=50			Σfd = 300

$(x) = A + \frac{\Sigma FD}{\Sigma F} = 25 + \frac{300}{50} = 31$

Question 30

Mean of twenty observations is 15. If two observations 3 and 14 replaced by 8 and 9 respectively, then the new mean will be

(a) 14 (b) 15
(c) 16 (d) 17

Answer: D

Explanation:

Mean of 20 observations = 15

∴ Sum of 20 observations = 15 × 20 = 300

Replacing 3 and 14 by 8 and 9 will mean that 3 + 14 = 17 is replaced by 8 + 9 = 17

Hence there will be no effect on the sum. It will remain 300, so the mean will not change and will remain 15.

Question 31

Factory A	Factory B
No. of wage of earners 250	**200**
Average daily wage Rs. 2.00	**Rs. 2.50**

The average of daily wages for the earners of the two factories combined is

(a) Rs. 2.12 (b) Rs. 2.06
(c) Rs. 2.20 (d) Rs. 2.22

Answer: D

Explanation:

Required average $= \frac{250\times2.00+\times2.50\times200}{250+200}$

$= \frac{1000}{450}$

$= \frac{20}{9}$

Rs. 2.22

Question 32

The height of 30 boys of a class are given in the following table:

Height in cm	Frequency

120-129	2
130-139	8
140-149	10
150-159	7
160-169	3

If by joining of a boy of height 140 cm, the median of the heights is changed from M_1 to M_2 then $M_1 - M_2$ in cm is

(a) 0.1 (b) -0.1

(c) 0 (d) 0.2

Answer: C

Explanation:

Height in cms	Frequency	Cumulative frequency	Actual Class limit
120-129	2	2	119.5-129.5
130-139	8	10	129.5-139.5
140-149	10	20	139.5-149.5
150-159	7	27	149.5-159.5
160-169	3	30	159.5-169.5
n = 30			

Here n = 30

$\therefore \frac{n}{2} + 1 = 15 + 1 = 16$

$\therefore$ 16 is under cumulative frequency 20. So median class be 140-149

$L_1 = 139.5$, $L_2 = 149.5$, f = 10, n = 30, c = 10.

Median $M_1 = L_1 + \frac{L_2 - L_1}{f}\left(\frac{n}{2} - c\right)$

$= 139.5 + \frac{10}{10}(15 - 10)$

$= 139.5 + \frac{10}{10} \times 5 = 144.5$

If by joining f a boy of height 140 cms, the n=31, f=11

$\therefore$ Median $M_2 = 139.5 + \frac{149.5 - 139.5}{11}(15.5 - 10)$

$= 139.5 + \frac{10}{11} \times 5.5 = 144.5$ cms

Then $M_1 - M_2 = 144.5 - 144.5 = 0$

Question 33

The marks awarded to seven students in a school admission test were:

	Mathematics	English
A	55	35
B	45	32
C	75	44
D	15	50
E	10	45
F	40	60
G	06	40

Which subject has the better median value?

(a) Mathematics
(b) English
(c) Both (a) and (b) above
(d) None of the above

Answer: B

Explanation:

The awarded makes in Mathematics and English were arranged in ascending in ascending order separately.

Maths	English
06	32
10	35
15	40
40	44
45	45
55	50
75	60

Hence, English has the better median value.

Question 34

Identify the mode of the given distribution.

Marks	4	5	6	7	8
Number of students	3	5	10	6	1

(a) 7
(b) 1
(c) 8
(d) 6

Answer: D

Explanation:

Mode is 6 as it has the highest frequency

Question 35

The given data are the times (in minutes), it takes seven students to go to school from their homes.

11	**6**	**22**	**7**	**10**	**6**	**15**

Which statement about the data is false?

(a) Their median is 11.
(b) Their mean is 15.
(c) Their range is 16.
(d) Their mode is 6.

Answer: a

Explanation:

Arranging the given data in ascending order, we get 6, 6, 7, 10, 11, 15, 22

Mean = $\frac{6+6+7+10+11+15+22}{7}$

$\frac{77}{7} = 11$

Mode = 6 Median = 4^{th} value = 10

Question 36

The medians of the following two sets of numbers are equal, and the sets are arranged in ascending order {1, 4, x, 8} and {2, 5, y, 9}. What is y – x?

(a) -1 (b) 0
(c) -2 (d) 3

Answer: a

Explanation:

Recall that the median of an even-numbered of numbers is the arithmetic mean of the pair of middle terms. Thus $\frac{(4+x)}{2}$ = median of the first set and $\frac{(5+y)}{2}$ -= median of the second set. Since both median are equal, we can set the equations equal to each other. $\frac{(4+x)}{2} = \frac{(5+y)}{2}$. Multiply both sides by 2 and we get 4 + x =5 + y. we also know that 4 < x < 8 and 5 < y < 9, since the sets are arranged in ascending order. This narrows our options for x and y down significantly. Plugging in various values will eventually get you to x = 7 and y = 6, since 7 + 4 = 11 and 5 + 6 =11, and thus the median in both cases would be 5.5. thus, y-x = -1

Question 37

What is the median in the following set of numbers 16, 19, 16, 7, 2, 20, 9, 5.

(a) 2 (b) 16
(c) 4.5 (d) 12.5

Answer: d

Explanation:

16, 19, 16, 7, 2, 20, 9, 5
Order the numbers from smallest to largest.
2, 5, 7, 9, 16, 19, 20
The median is the number in the middle.
In this case, there is a 9 and 16 in the middle.
When that happens, take the average of the two numbers.

Question 38

Find the median: 4,4,4,4,6,7,9,9,12,12,12,12,12,12,12,18,76,90.

(a)11.9 (b) 9
(c) 76 (d) 12

Answer: d

Explanation:

To find the median, arrange the numbers from smallest to largest:
4,4,4,4,6,7,9,9,12,12,12,12,12,12,18,76,90
There are 17 numbers in total. Since 17 is an odd number, the median will be the middle number of the set. In this case, it is the 9th number, which is 12.

Question 39

There are 3,500 people in group A and 5,000 people in group B:

Car type	% in group A who own	% in group B who own
Motorbike	4	9
Sedan	35	25
Minivan	22	15
Van	9	12
Coupe	3	6

What is the median of the number of people in group B who own either a minivan.Van or coupe?

(a) 600 (b) 300
(c) 1500 (d) 750
Answer: A
Explanation:
Treat the percentage as a list, as we are including every demographic from the 3 vehicle types mentioned. If we do each 0.06(5000), 0.12(5000), and 0.15(5000) we note from observation that the median, or middle value, would have to be the 12% row
Since the sample size does not change. The question asks for EITHER of 3 categories, so we can ignore the other two.
0.12(5000) = 600(van) is the median of the 3 categories.
8, 12, 9, 8, 7, 11, 10, 6

Question 40
The grades on a test taken by 15 students are 50, 70, 87, 95, 100, 34, 56, 76, 43, 88, 92, 76, 82, 45, and 65 respectively. What was the medians score for this test?
(a) 73 (b) 76
(c) 70 (d) 89
Answer: b
Explanation:
To solve this problem, we must be aware of the definition of a median for a set of numbers. The median is defined as the number that is in middle of a set of numbers sorted from smallest to largest. Therefore, we must first sort the numbers from largest to smallest.
34,43,45,50,56,65,70,76,76,87,88,92,95,100
43,45,50,56,65,70,76,81,87,88,92,95
45,50,56,65,70,76,76,87,88,92
50, 56, 65, 70, 76,76,87,88
56, 65, 70,76,76,87
65, 70, 76, 76
70, 76, 76
76
Then by slowly eliminations the smallest and the largest numbers we find that the median score for this test is 76.

Question 41
Set A = [-10, 4, 2,-14,-2]
Quantity A: The mean of Set A
Quantity B: The median of set A
(a) Quantity B is greater. (b) Quantity A is greater.
(c) The relationship cannot be determined (d) The two quantities are equal.
Answer: a
Explanation:
Begin by reordering the set in numerical order:
Set A = [-10, 4, 2,-14,-2]
Then becomes
Set A = [-14,-10,-2, 2, 4]
Since there are an odd number of values, the median is the middle value.
Quantity B: -2
Now, to find the arithmetic mean, take the sum of values divided by the total number of values.

$$\frac{-14-10-2+2+4}{5}$$

Quantity A: -4

Question 42

The arithmetic mean of 2-x,3x2,7-15x,x2-8x+23 is -1

Quantity A: 3

Quantity B: The median of 2, x, 1, 4, 10, 8,, 2, x, 1, 4, 10, 8

(a) Quantity B is greater.
(b) Quantity A is greater
(c) The relationship cannot be determined
(d) The two quantities are equal.

Answer: a

Explanation:

X is an unknown value, but it can be found given what we know about the mean of the set 2-x,3x2,7-15x,x2-8x+23:

$$\frac{(2-x)+(3x^2)+(7-15x)+(x^2-8x+23)}{4}=-1$$

$4x^2-24x+32=-4$

$x^2-6x+8=-1$

$x^2-6x+9=0$

(X-3)(X-3)=0

X=3

Now, Quantity B: is out of order; arrange in numerically:

1, 2, x=3, 4, 8, 10

Since, there is even number of values; the median is the mean of the two middle most values:

Quantity B: $\frac{3+4}{2}$ = 3.5

3+42=3.5

Question 43

Bill runs for 30 minutes at 8 mph and then runs for 15 minutes at 13 mph. what was his average speed during his entire run?

(a) 10 mph
(b) $9\frac{2}{3}$ mph
(c) 11 mph
(d) $10\frac{1}{2}$mph

Answer: b

Explanation:

Rate = distance/time.

Find the distance for each individual segment of the run (4 miles and 3.25 miles.). Then add total distance and divide by total time to get the average rate, while making sure the units are compatible (miles per hour not mils per minute), which means the total 45 minute run time needs to be converted to 0.75 of an hour ; therefore (4 miles + 3.25miles/0.75 hour) is the final answer.

Question 44

Find the mode for the following data.

Age	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Frequency	6	11	25	35	18	12	6

(a) 20.22 (b) 19.47
(c) 21.12 (d) 20.14

Answer: a

Explanation:

Since, maximum class frequency is 35, so the mode class is 18-24.

Now, Mode = L + $\frac{f_1-f_0}{2f_1-f_0-f_2} \times h$

$18+\left(\frac{35-25}{2\times35-25-18}\right) \times 6$

= 18+2.22 = 20.22

Question 45

Find the median for the following distribution of workers.

Daily wages	No. of workers	Daily wages	No. of workers
1-3	6	9-11	21
3-5	53	11-13	16
5-7	85	13-15	4
7-9	86	15-17	4

(a) 7.14 (b) 6.84
(c) 5.92 (d) 5.57

Answer: b

Explanation:

Daily wages	No. of workers	Cumulative frequency (cf)
1-3	6	6
3-5	53	59
5-7	85	144
7-9	86	230
9-11	21	251
11-13	16	267
13-15	4	271
15-17	4	275

Here, n = 275

$\frac{n}{2}$ = 137.5

Median class 5-7

Median = l + $\left(\frac{\frac{n}{2}-c.f.}{f}\right) \times$ h

= 5 + $\left(\frac{137.5-59}{85}\right)\times2$ = 5 + $\frac{78.5}{85} \times 2$

= 5 + 1.84

= 6.84

Question 46

In an examination of 675 candidates of maximum marks 100 the examiner supplied the following information.

Marks obtained	No. of candidates
Less than 10%	7
Less than 20%	39

Less than 30%	**95**
Less than 40%	**201**
Less than 50%	**381**
Less than 60%	**545**
Less than 70%	**631**
Less than 80%	**675**

Calculated median and mode respectively of the percentage marks obtained.

(a) 47, 58, 46, 33
(b) 49, 12, 48, 22
(c) 45, 24, 46, 22
(d) 47. 58, 48.22

Answer: d

Explanation:

Marks (fi)	cf	Frequency
0-10	7	7
10-20	39	32
20-30	95	56
30-40	201	106
40-50	381	180
50-60	545	164
60-70	631	86
70-80	675	44

Here, n = 675

$\frac{n}{2}$ = 337.5

So, median class 40-50

Median = $l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$

40 + 7.58 = 47.58

Now, maximum frequency is 180

So modal class is 40-50

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

$40 + \left(\frac{180-106}{2\times180-106-164}\right) \times 10$

$40 + \frac{74}{90} \times 10 = 40 + 8.22 = 48.22$

Question 47

Find the mean, median and mode of the following data.

Classes	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**	**100-120**	**120-140**
Frequency	**6**	**8**	**10**	**12**	**6**	**5**	**3**

(a) 88
(b) 60
(c) 65
(d) 100

Answer: C

Explanation:

Class	(xi)	Frequency (fi)	xifi	Cumulative frequency (cf)
0-20	10	6	60	6
20-40	30	8	240	14

40-60	50	10	500	24
60-80	70	12	840	36
80-100	90	6	540	42
100-120	110	5	550	47
120-140	130	3	390	50
Total		Σfi = 50	Σfixi = 3120	

Mean = $\frac{\Sigma fixi}{\Sigma fi}$

= $\frac{3120}{50}$ = 62.4

n = 50, $\frac{n}{2}$ = 25

Median class is 60-80

Median = l + $\frac{\left(\frac{n}{2}-c.f.\right)}{f}$ × h

= 60 + $\left(\frac{25-24}{12}\right)$ × 20

= 60 + 1.67

Maximum frequency is 12, so modal class is 60-80

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

60 + $\left(\frac{12-10}{2\times12-10-6}\right)$ × 20

60+5 = 65

Question 48

The mean of 1, 3, 4, 5, 7, 4 is m. The numbers 3,2,2,4,3,3, p have mean m^{-1} and median q. Then, p + q=

(a) 4 (b) 5

(c) 6 (d) 7

Answer: d

Explanation:

Mean of 1, 3, 4, 5, 7 and 4 is m.

➔ $\frac{1+3+4+5+7+4}{6}$ = m

M = 4

Now, mean of 3, 2, 2, 4, 3, 3 and p is m^{-1}

$\frac{3+2+2+4+3+3+p}{6}$ = 3

(∴ m = 4) ➔ 17+p = 21

➔ p = 4

Arranging 3, 2, 2,4,3,3 and 4 in ascending order, we get 2,2,3,3,3,4,4

∴Median (q) = n$\left(\frac{7+1}{2}\right)^{m}$ term – 4^{th} term = 3

∴ p + q = 4 + 3 = 7

Question 49

The mean of six numbers is 21. If one number is excluded, then their mean is 19, the excluded number is ___.

(a) 31 (b) 26

(c) 28 (d) 25

Answer: a

Explanation:

Let the excluded number be x and the sum of rest of numbers be y. then, $21 = \frac{x+y}{6}$

➔ 126 = x + y

$19 = \frac{y}{5}$

➔ y = 95

∴ From (i)

x = 31

Question 50

If 7, 2, 9, and 5 occur with frequencies 2, 3, 6 and 4 respectively, then the arithmetic mean is -____.

(a) 6.25 (b) 6.75

(c) 6.27 (d) 6.42

Answer: c

Explanation:

Arithmetic mean = $\frac{x1f1+x2f2+\cdots+xnfn}{f1+f2+\cdots+fn}$

$\frac{(7\times2)+(2\times3)+(9\times6)+(5\times4)}{2+3+6+4}$

$\frac{14+6+54+20}{15} = \frac{94}{15} = 6.27$

Question 51

Find n such that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between a and b:

(a) $\frac{1}{2}$ (b) 1

(c) $\frac{-1}{2}$ (d) 0

Answer: c

Explanation:

We know that geometric mean between a & b is a & b = $\sqrt{ab}$

It is given that

G.M. between a & b = $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$

$\sqrt{ab} = \frac{a^{n+1}+b^{n+1}}{a^n+b^n}$

$ab^{\frac{1}{2}} = \frac{a^{n+1}+b^{n+1}}{a^n+b^n}$

$(ab)^{\frac{1}{2}(a^n+b^n)=a^{n+1}} + b^{n+1}$

$a^{\frac{1}{2}} b^{\frac{1}{2}} (a^n + b^n) = a^{n+1} + b^{n+1}$

$\frac{1}{a^2}$ + n = $\frac{b^n+\frac{1}{2}\left[\frac{1}{b^2}-\frac{1}{a^2}\right]}{\frac{1}{b^2}-\frac{1}{a^2}}$

$\frac{1}{a^2}$ + n = 1

$\left(\frac{a}{b}\right)^{\frac{1}{2}+n} = \left(\frac{a}{b}\right)^0$

Comparing power

$\frac{1}{2}$ + n = 0

n = $-\frac{1}{2}$

Question 52

What is the mode of 10, 2, 8, 6, 7, 8, 9, 10, 10, 11 and 10?

(a) 10 (b) 12

(c) 14 (d) 8

Answer: a

Explanation:

Mode = observation with the highest frequency = 10

Question 52

The mean of the marks in statistics of 100 students in class x was 72. The mean of marks for boys was 75, while their number was 70. What is the mean of marks of girls in the class?

(a) 35 (b) 65

(c) 68 (d) 86

Answer: b

Explanation:

$$\frac{\text{Total marks of boys}}{\text{Total number of girls}}$$

$$\frac{100 \times 72 - 75 \times 70}{30} = \frac{7200 - 5250}{30}$$

$$\frac{1950}{30} = 65$$

Question 53

Which of the following is true about the mode of a given data?

(a) It may or may not exist for a Given data. (b) It is always unique.

(c) It is very difficult to compute Mode. (d) We cannot calculate mode without The empirical formula.

Answer: a

Explanation:

Mode of a given data may or may not exist sometimes.

Range = 22 – 6 = 16

Question 54

The A.M. of 12 observations is 15. If an observation 20 is removed, what is the arithmetic mean of the remaining observations?

(a) 14.5 (b) 13

(c) 15 (d) 13.5

Answer: a

Explanation:

he A.M. of 12 observations is 15.

➔ Sum of 12 observations = 12×15 = 180

An observation 20 is removed

➔ Mean of the remaining observations

$= \frac{180-20}{(12-1)} = \frac{160}{11} = 14.5$

Question 55

If for a given data median is 125.6 and mean is 128, find mode.

(a) 120.8 (b) 128.0
(c) 108.2 (d) 180.2

Answer: a

Explanation:

Given median = 125.6 and mean = 128. Mode = 3 Median – 2 Mean
= (3 × 125.6)-(2×128)
= 376.8 – 256
= 120.8

Question 56

What is the arithmetic mean of a+2, a and a-2?

(a) a+2 (b) a
(c) a-2 (d) 3a

Answer: b

Explanation:

Mean = $\frac{a+2+a+a-2}{3} = \frac{3a}{3}$ = a

Question57

Which of the following is not a measure of central tendency?

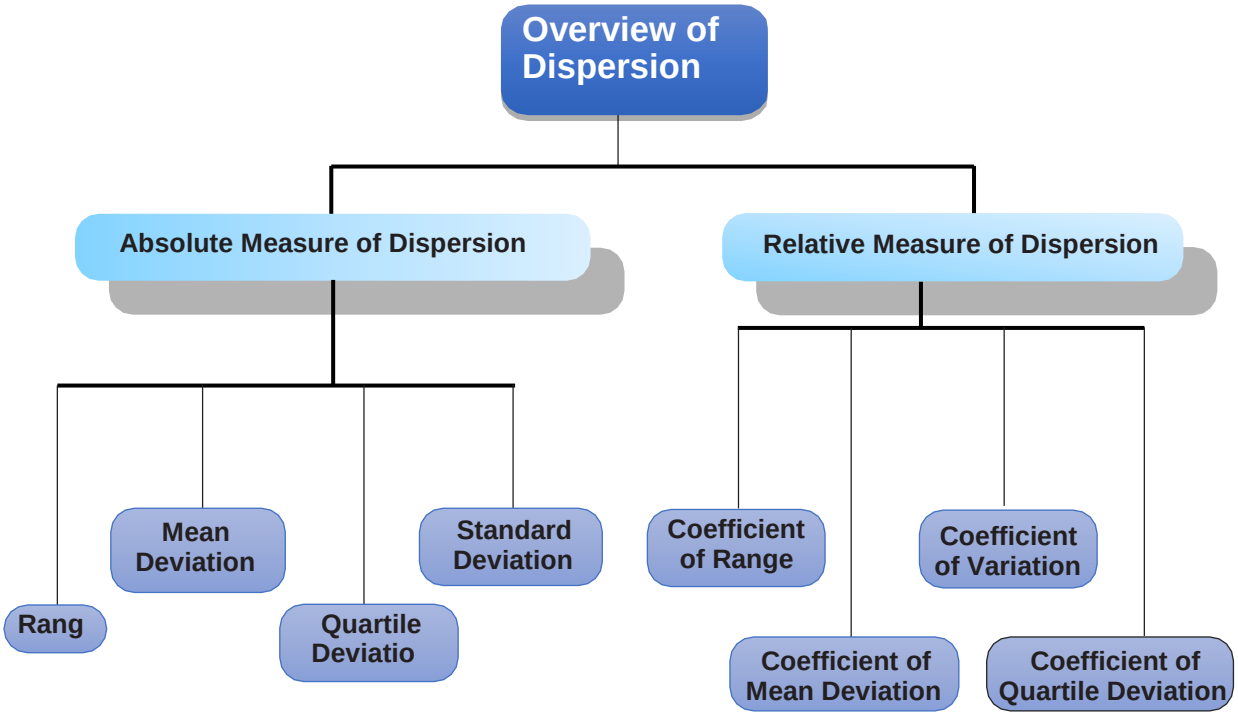
(a) Mean (b) Median
(c) Mode (d) Standard deviation

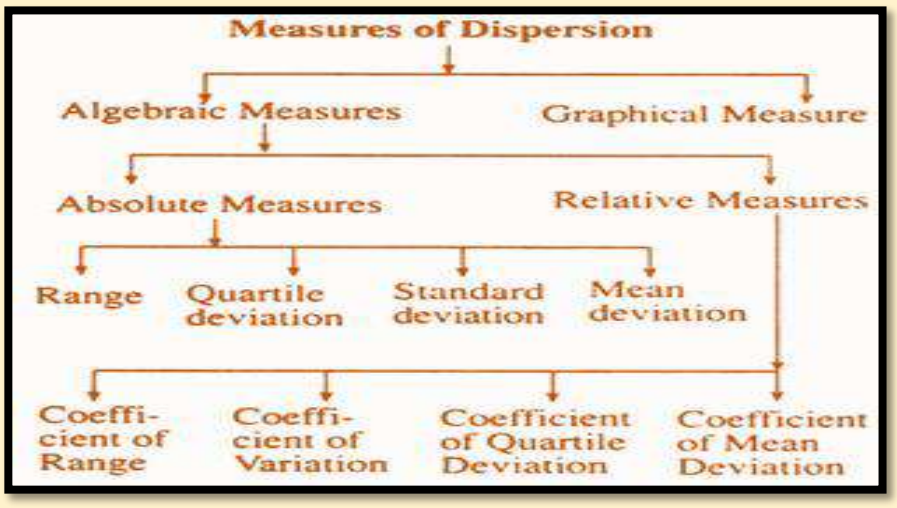
Answer: d

Explanation:

Mean, median and mode are the measures of central tendency.

UNIT II: DISPERSION



DISPERSION	**The amount of deviation of the observations, usually, from an appropriate measure of central tendency. Two distributions may be identical in respect of its first important characteristic i.e. central tendency and yet they may differ on account of scatterness.**
CLASSIFICATION OF DISPERSION	

ALGEBRIC MEASURES	***Range = L-S*** $Mean(population) = \mu = \frac{\sum_{i=1}^{k} f_i x_i}{n}$ $Standard Deviation(population) = \sigma = \sqrt{\sum_{i=1}^{k} \frac{f_i (x_i - \mu)^2}{n}}$ $Variance(population) = \sigma^2 = \sum_{i=1}^{k} \frac{f_i (x_i - \mu)^2}{n}$
RELATIVE MEASURES	(i) Coefficient of Range $= \frac{\text{Range}}{\text{Highest value + Lowest value}} \times 100$ (ii) Coefficient of Variation $= \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$ (iii) Coefficient of Quartile Deviation $= \frac{\text{Quartile Deviation}}{\text{Median}} \times 100$ (iv) Coefficient of Mean Deviation $= \frac{\text{Mean Deviation}}{\text{Mean or Median}} \times 100$

Question 1

Following are the wages of 8 workers expressed in rupees: 82, 96, 52, 75, 70, 65, 50, 70. Find the range and also its coefficient.

(a) 46,31.51 (b) 64,32

(c) 56, 76 (d) 90,33

Answer: a

Explanation:

The largest and the smallest wages are L = Rs. 96 and S = Rs. 50 Thus range = Rs. 96 – Rs. 50 = Rs.46

Coefficient of range = $\frac{96-50}{96+50} \times 100$
= 31.51

Question 2

What is the coefficient of range for the following distribution of weights?

Weights in kgs:	50-54	55-59	60-64	65-69	70-74
No. of students	12	18	23	10	3

(a) 20 (b) 21
(c) 20.16 (d) 40.34

Answer: c

Explanation:

The lowest class boundary is 49.50 kgs. And the highest class boundary is 74.50 kgs.
Thus we have
Range = 74.50 kgs, - 49.50 kgs.
=25 kgs.
Coefficient of range = $\frac{74.50-49.50}{74.50+49.50} \times 100$
= $\frac{25}{124} \times 100$
= 20.16

Question 3

Anubhav scored 85, 91, 88, 78, 85 for a series of exams. Calculate the mean deviation for his test scores?

(a) 3.28 (b) 5.78
(c) 6.89 (d) None

Answer: a

Explanation:

Given test score; 85, 91, 88, 78, 85

Mean = $\frac{(85+91+88+78+85)}{5}$ = 85.4

Subtracting mean from each score:

x	x_i - x	$\lvert x_i - x \rvert$
85	-0.4	0.4
91	5.6	5.6
88	2.6	2.6
78	-7.4	7.4
85	-0.4	0.4

Mean deviations = $\frac{16.4}{5}$ = 3.28

Question 4

The wheat production (in kg) of 220 acres is given as: 1120, 1240, 1320, 1040, 1080, 1200, 1440, 1360, 1680, 1730, 1785, 1342, 1960, 1880, 1755, 1720, 1600, 1470, 1750, and 1885. Find the quartile deviation

(a) 246.875 (b) 246
(c) 246.89 (d) 175

Answer: a

Explanation:

After arranging the observations in ascending order, we get

1040, 1080, 1120, 1200, 1240, 1320, 1342, 1360, 1440, 1470, 1600, 1680, 1720, 1730, 1750, 1755, 1785, 1880, 1885, 1960.

Q1 = Value of $\left(\frac{n+1}{4}\right) th$ item

= Value of $\left(\frac{20+1}{4}\right)^{th}$

= Value of $(5.25)^{th}$ item

= 5^{th} item + $0.25(6^{th}$ item – 5^{th} item) = 1240+0.25(1320-1240)

Q1 = 1240 + 20 = 1260

Q3 = value of $3\left(\frac{n+1}{4}\right)^{th}$ item

= value of $3\left(\frac{20+1}{4}\right)^{th}$item

= value of $(15.75)^{th}$ item = 15^{th} item + $0.75(16^{th}$ item – 15^{th} item) = 1750

Q3=1750+3.75=1753.75

Q. D. = $\frac{Q_3-Q_1}{2} = \frac{1753.75-1260}{2} = \frac{492.75}{2}$

= 246.875

Question 5

Compute coefficient of variation from the following data:

Age :	under 10	under 20	under 30	under 40	under 50	under 60
No. of persons dying:	10	18	30	45	60	80

(a) 48.83 (b) 89.88

(c) 756.34 (d) None

Answer: a

Explanation:

Age in years class interval	No. of persons dying (f_i)	Mid value (x_i)	$d_i = x_i - 25$ 10	$f_i d_i$	$f_i d_i^2$
0-10	10	5	-2	-20	40
10-20	18-10=8	15	-1	-8	8
20-30	30-18=12	25	0	0	0
30-40	45-30=15	35	1	15	15
40-50	60-45=15	45	2	30	60
50-60	80-60=20	55	3	60	180
Total	80	-	-	77	303

The AM is given by:

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

$=25\left(\frac{77\times10}{80}\right)$ years CV = $\frac{S}{X} \times 100$

= 34.63 years

The standard deviation is

$\sqrt{\frac{\Sigma f_i d_i}{N} - \left[\frac{\Sigma f_i d}{N}\right]^2} \times C$

$\sqrt{\frac{303}{80} - \left[\frac{77}{80}\right]^2} \times 10 years$

$\sqrt{3.79 - 0.93} \times 10$ year

= 16.91 years

Thus the coefficient of variation is given by

$= \frac{16.91}{34.63} \times 100$

= 48.83

Question 6

What is the mean deviation about mean for the following numbers? 5, 8 , 10, 10, 12, 9.

(a) 1.74 (b) 1.67

(c) 1.87 (d) 1.47

Answer: b

Explanation:

The mean is given by

$\overline{X} = \frac{5+8+10+10+12+9}{6}$

= 9

Computation of MD about AM

X_i	$X_i - X$
5	4
8	1
10	1
10	1
12	3
9	0
Total	10

Thus mean deviation about mean is given by

$X_i - X = \frac{\Sigma 10}{6} = 1.67$

Question 7

From the above data calculate coefficient of mean deviation

(a) 12.45 (b) 123

(c) 989 (d) None

Answer: a

Explanation:

Coefficient of mean deviation = $\frac{MD\ about\ Median}{Median} \times 100$

$\frac{8714.28}{70000} \times 100$

= 12.4

Question 8

For a group of 60 boy5 students, the mean and SD of stats. Marks are 45 and 2 respectively. The same figures for a group of 40 girl students are 55 and 3 respectively. What is the SD of marks if the two groups are pooled together?

(a) 5.44 (b) 5.48

(c) 49 (d) 3

Answer: c

Explanation:

$X = \frac{n_1x_1+n_2x_2}{n_1+n_2}$

$\frac{60\times45+40\times55}{60+40}$

$= 49$

Question 9

From the above questions and expression find standard deviation of marks

(a) 5.44 (b) 5.48

(c) 30 (d) 3

Answer: b

Explanation:

$d_1 = X_1 - X = 45 - 49 = -4$

$S = \sqrt{\frac{n_1{s_1}^2+n_2{s_2}^2+n_1{d_1}^2+n_2{d_2}^2}{n_1+n_2}}$

$d_1 = X_1 - X = 55 - 49 = 6$

$$\frac{\sqrt{60 \times 2^2 + 40 \times 3^2 + 60 \times (-4)^2 + 40 + 6^2}}{60 + 40}$$

$\sqrt{30} = 5.48$

Question10

Calculate the mean deviation about median for the following data

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	7	15	$\frac{1}{6}$	4	2

(a) 10.16 (b) 30.69

(c) 28 (d) 30

Answer: a

Explanation:

Class	Frequency	Cumulative frequency	Mid – point x_i
0-10	6	6	5
10-20	7	7 +6 = 13	15
20-30	15	13 + 15 = 28	25
30-40	16	28 + 16 = 44	35
40-50	4	44 + 4 = 48	45
50-60	2	48 + 2 = 50	55
	50		

$N \Sigma f_i = 50$

Median Class $\left(\frac{N}{2}\right)^{th}$ term

$\left(\frac{50}{2}\right)^{th}$ term

25^{th}

In above data cumulative frequency of class 20-30 is 28 which is slightly greater than 25.

$\therefore$ Median class = 20 – 30

Median = $l + \frac{\frac{N}{2}-c}{f} \times h$

Where,

L = Lower limits of median class

N = Sum of frequencies

F = frequency of median class

C = Cumulative frequency of class before median class

Here, l = 20, N = 50, C = 13, h = 10, f = 15

Median = $l + \frac{\frac{N}{2}-c}{f} \times h$

$20+ \frac{\frac{50}{2}-13}{15} \times 10$

$20+\frac{12}{15} \times 10$

20 + 8 = 28

Finding mean deviations about Median = $\frac{\Sigma f_i|x_I-M|}{\Sigma f_i}$

Class	Frequency	Cumulative frequency	Mid – point x_i	$\|x_i - M\|$	$f_i\|x_i - M\|$
0-10	6	6	5	$\|5 - 28\|$=23	6 × 23 = 138
10-20	7	7+6 = 13	15	$\|15 - 28\|$=13	7 × 13 = 91
20-30	15	13+15 = 28	25	$\|25 - 28\|$=3	15 × 3 = 45
30-40	16	28+16=44	35	$\|35 - 28\|$=7	16 × 7 = 112
40-50	4	44+4=48	45	$\|45 - 28\|$=17	4 × 17 = 68
50-60	2	48+2=50	55	$\|55 - 28\|$=27	2 × 27 = 54
	Σf_i = 50			$\Sigma f_i\|x_i - M\|$	508

$\sum f_i$ = 50 &$|x_i - M|$ = 508

$\therefore$ Mean deviation (M) = $\frac{\sum f_i|x_i-M|}{\sum f_i}$

$\frac{508}{50}$ = 10.16

Question 11

5 students obtained following marks in statistics: 20, 35, 25, 30, 15 find out range and coefficient of range.

(a) 20, 0.4 (b) 20, 0.5

(c) 30, 10 (d) 30, 5

Answer: a

Explanation:

Here,

Highest value (H) = 35

Lowest value (L) = 15

Range = Highest value –Lowest value

i.e. R = H-L

Substituting the given values in the formula

R = 35 – 15 = 20

Coefficient of range is as follows:

CR = $\frac{H-L}{H+L}$

Or, CR = $\frac{35-15}{35+15}$

$= \frac{20}{50}$

CR = 0.4
Hence, the range (R) of the above data is 20 and coefficient of Range (CR) is 0.4

Question 12

Prices of shares of a company were not as under from Monday through Saturday. Find out range and the coefficient of range.

Day	Mon.	Tues.	Wed.	Thu.	Fri	Sat.
Price	200	210	208	160	220	250

(a) 20, 0.4
(b) 90, 0.22
(c) 30, 0.65
(d) 30, 5.69

Answer: b

Explanation:

Here,

Highest value among the prices of shares =
250 Lowest value among the prices of shares = 160
Range (R) = Highest value (H) – Lowest value (L) or, R = 250-160
R = 90
Coefficient of Range 9CR) = $\frac{H-L}{H+L}$
Or, CR = $\frac{250-160}{250+160}$
$= \frac{90}{410}$
CR = 0.219 or 0.22 (Approx.)

Question13

You know share market is going bullish during the last several months. Collect weekly data on the share price of any two important industries during the past six months. Calculate the range of share prices. Comment on how volatile is the share prices.

(a) Tata motors shares are more volatile as compared to the prices of Reliance shares.
(b) Tata motors shares are less volatile as compared to the prices of Reliance shares.
(c) Tata motors shares are equal as a To the prices of Reliance shares.
(d) None of these

Answer: b

Explanation:

Month	Price of shares Tata Motors	Price of shares Reliance
Oct.	325	913.35
Nov.	397	900.25
Dec.	405	750.90
Jan.	415	780.70
Feb.	420	799.25
Mar.	388	850.35

For TATA Motors Highest Value = 420 Lowest Value = 325
Range (R) = Highest Value (H) – Lowest Value (L) or, R_1 = 420-325
R_1 = 95
Coefficient of Range (CR) = $\frac{H-L}{H+L}$

Or, Cr = $\frac{420-325}{420+325}$
= $\frac{95}{745}$ = 0.127
For Reliance
Highest Value = 913.35
Lowest value = 750.90
Range (R) = Highest Value (H) – lowest Value (L) or, R_2 = 913.25 – 750.90
R_2 = 162.45
Coefficient of Range (CR) = $\frac{H-L}{H+L}$
CR = $\frac{913.35-750.90}{913.35+750.90}$
= $\frac{162.45}{1664.25}$ = 0.097
From the above results we can observe that the price of the Tata Motors shares is less volatile as compared to the prices of Reliance shares.

Question14
Calculate range and the coefficient of range of the following series:

Marks	**10**	**20**	**30**	**40**	**50**	**60**	**70**
No. of students	**15**	**18**	**25**	**30**	**16**	**10**	**9**

(a) 20,0.4
(b) 20,0.5
(c) 60,0.75
(d) 30,5
Answer: c
Explanation:
Here,
Highest value = 70
Lowest value = 10
Range (R) = Highest value (H) – Lowest Value (L)
= 70 – 10
= 60
Coefficient of Range (CR) = $\frac{H-L}{H+L}$
CR = $\frac{70-10}{70+10}$ = $\frac{60}{80}$ = 0.75
Hence, the Range (R) of the above series is 60 and coefficient of Range (CR) is 0.75

Question15
Find the variance of the following data: 6, 8, 10, 12, 14, 16, 18, 20, 22, 24.
(a) 33
(b) 15
(c) 10
(d) 14
Answer: a
Explanation:

x_i	$d_i = \frac{x_i - 14}{2}$	x_i - x	$(x_i - x)^2$
6	$\frac{6-14}{2} = -4$	6 – 15 = -9	$(-9)^2$ = 81
8	$\frac{8-14}{2} = 3$	8 – 15 = -7	$(-7)^2$ = 49

10	$\frac{10-14}{2}=-2$	10 -15 = -5	$(5)^2=25$
12	$\frac{12-14}{2}=-1$	12 -15 = -3	$(-3)^2=9$
14	$\frac{14-14}{2}=0$	14 – 15 = -1	$(-1)^2=1$
16	$\frac{16-14}{2}=1$	16 – 15 = 1	$(1)^2=1$
18	$\frac{18-14}{2}=2$	18 – 15 = 3	$(3)^2=9$
20	$\frac{20-14}{2}=3$	20 – 15 = 5	$(5)^2=25$
22	$\frac{22-14}{2}=4$	22 – 15 = 7	$(7)^2=49$
24	$\frac{24-14}{2}=5$	24 – 15 = 9	$(9)^2=81$
	$\sum_1^{10} d_i=5$		$\sum_1^{10}(x_i-x)^2=330$

Mean $\bar{X}$ = assumed mean $\frac{\sum_1^{10}}{n}\times h$

Where a = assumed mean = 14

$d_i=\frac{x_i-a}{h}$

h = class width = 8-6 = 2

n = number of observation = 10

Mean $\bar{X}=14+\frac{5}{10}\times 2=15$

Variance $(O^2)=\frac{1}{n}\Sigma(x_i-\bar{X})^2$

$\frac{1}{10}\times 330$

33

Question16

Find the standard deviation of the following data:

Class	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
Frequency	**3**	**7**	**12**	**15**	**8**	**3**	**2**

(a) 14
(b) 50
(c) 62
(d) 14.17

Answer: d

Explanation:

Class	Frequency (f_i)	Mid – point (x_i)	f_ix_i
30-40	3	35	35 × 3 = 105
40-50	7	45	45 × 7 = 315
50-60	12	55	55 × 12 = 660
60-70	15	65	65 × 15 = 975
70-80	8	75	75 × 8 = 600

80-90	3	85	85 × 3 = 255
90-100	2	95	95 × 2 = 190
	$\sum f_i = 50$		$\sum f_i x_i = 3100$

$\sum f_i x_i = 3100$
$\sum f_i = 50$
Mean $\bar{X} = \frac{\sum f_I x_i}{\sum f_i}$
$\frac{3100}{50} = 62$
Variance $(O'^2) = \frac{1}{n}\Sigma(x_i - \bar{X})^2$
$\frac{1}{50} \times 10050 = 201$
Standard deviation $(O') = \sqrt{201}$
$(O') = 14.17$

Questioin17
Estimate coefficient of quartile deviation of the following data:

Sr. No.	1	2	3	4	5	6	7	8	9	10	11
Data	8	9	11	12	13	17	20	21	23	25	27

(a) 3.53
(b) 0.353
(c) 0.689
(d) 0.591

Answer: b

Explanation:
In order to find the quartile deviation in case of individual series, we need to find out the values of third quartile and first quartile using the following equations:

Q_1 = size of $\left(\frac{N+1}{4}\right)^{th}$ item
Q_1 = size of $\left(\frac{11+1}{4}\right)^{th}$ item
Q_1 = size of 3th term
$Q_1 = 11$
Q_1 = size of $3\left(\frac{N+1}{4}\right)^{th}$ item
Q_1 = size of $3\left(\frac{11+1}{4}\right)^{th}$ item
Or, Q_3 = size of 9^{th} term
Or, $Q_3 = 23$
Calculating Quartile Deviation and Coefficient of Quartile Deviation:
Quartile Deviation (Q.D.)$\frac{Q_3 - Q_1}{2}$
Q.D.$\frac{23-11}{2}$
Q.D.$\frac{12}{2}$
Q.D. = 6
Coefficient of Quartile Deviation (Q.D.)$\frac{Q_3 - Q_1}{Q_3 + Q_2} = \frac{23-11}{23+11} = \frac{12}{34} = 0.353$

Question18
A measure of relative dispersion is given by the:

(a) Co-efficient of variance (b) Standard deviation
(c) Quartile deviation (d) Variance
Answer: a
Explanation:
Co-efficient of variance: This term is used commonly to mean scatter, deviation, Fluctuation, Spread or variability of data. …. Relative Measures of Dispersion Relative measures of dispersion are also known as coefficient of dispersion are obtained as ratios or percentages.

Question19
The ____ is the easiest measure of dispersion to calculate.

Symbol	Symbol Name	Meaning / definitions
Var (X)	variance	variance of random variable X
O'^2	variance	variance of population values
std (X)	standard deviation	standard deviation of random variable X
O'_x	standard deviation	standard deviation value of random variable X

(a) Standard Deviation (b) Range
(c) Mean absolute deviation (d) Variance
Answer: b
Explanation:
Range is basically the difference between the lowest and highest values.

Question20
Which of the following symbols represents the standard deviation of the population?
(a) O'^2 (b) μ
(c) O' (d) $\bar{X}$
Answer: c
Explanation:
O'

Question21
The variance can never be
(a) Larger than the standard deviation (b) Negative
(c) Smaller than the standard deviation (d) Zero
Answer: b
Explanation:
Sometimes (negative or positive number) squared is always a positive number, except zero squared which is still zero. …. Because the squared deviations are all positive numbers or zeroes, their smallest possible mean is zero. It can't be negative. This average of the squared deviations is in fact variance. Hence the variance can be negative.

Question22
The numerical value of the standard deviation can never be
(a) Negative (b) Larger than the variance
(c) Zero (d) None
Answer: a
Explanation:

Standard deviation formula is computed using squares of the numbers. Square of a number cannot be negative. Hence standard deviation cannot be negative. Here (x-mean) is squared, so, this cannot be negative. N, number of terms cannot be negative, hence SD cannot be negative.

Question23

The description measure of dispersion that is based on the concept of a deviation about the mean is

(a) The absolute value of the range
(b) Range
(c) Standard deviation
(d) Inter quartile range

Answer: c

Explanation:

A measure of dispersion is a numerical value describing the amount of variability present in a data set. The standard deviation (SD) is the most commonly used measures of dispersion. With the SD you can measure dispersion relative to the scatter of the values about their mean.

Question24

When should measures of location and dispersion be computed from grouped data rather than from individual data values?

(a) Whenever computer packages for descriptive statistics are unavailable
(b) As much as possible since computations are easier
(c) Only when the data are from a population
(d) Only when individual data values are unavailable

Answer: d

Explanation:

Only when individual data values are unavailable should measures of location and dispersion be computed from grouped data rather than from individual data values.

Question25

Which information is false regarding Lorenz curve

(a) The Lorenz curve devised by Dr. Max O. is a graphic method of studying Dispersion.
(b) Used this technique to show employment of a group of people
(c) The Lorenz curve always lies below the line of equal distribution, unless the distribution is uniform
(d) The area between the line of equal distribution and the plotted curve gives the extent of inequality in the items. The larger the area, more is the inequality

Answer: b

Explanation:

A graph on which the cumulative percentage of total national income (or some other variable) is plotted against the cumulative percentage of the corresponding population (ranked in increasing size of share). The extent to which the curve saqs below a straight diagonal line indicates the degree of inequality of distribution.

Question25

Adding a constant to each value in a data set does not change the distance between values so the standard deviations remains .....

(a) Constant
(b) Vary
(c) Vary with multiple of prime
(d) None of these

Answer: a

Explanation:
For example, consider the following numbers
2,3,4,4,5,6,8,10 for this set odd data standard deviation would be

$$8 = \sqrt{\frac{\sum_{i=1}^{n}(x_i - x)^2}{n-1}}$$

$$8 = \sqrt{\frac{(2-5.25)^2+(3-5.25)^2+\cdots+(10-5.25)^2}{8-1}}$$

8 = 2.65922
If we were to add 5 to each value in this data set. The new set of values would be 7, 8, 9, 9, 10, 11, 13, 15

$$8 = \sqrt{\frac{(7-10.25)^2+(8-10.25)^2+\cdots+(15-10.25)^2}{8-1}}$$

8 = 2.65922
As you can see the s.d. remains the same unless you multiply every value by a constant

PAST EXAMINATION QUESTIONS:

MAY 2018

Question1
If the variables x and z are so related that z = ax + b for each x = x_1 where a and b are constant, then $\bar{Z} = a\bar{X} + b$

(a) True (b) False
(c) Both (d) None

Answer: a
Explanation:
If the variable 'X' and 'Z' are so related that Z = ax + b for each x
= x; where and a and b are constant then Z=ax + b then it is true.

Question2
Relation between mean, median and mode is:

(a) Mean-mode = 2 (mean – median) (b) Mean-median = 3(mean – mode)
(c) Mean-median = 2 (mean - mode) (d) Mean-mode = 3(mean- median)

Answer: d
Explanation:
We know that
Mode = 3 Median – 2 Mean
Mode – Mean = 3 Median – 2 Mean – Mean
Mode – Mean = 3 (Median – Mean)
Mode – Mean = 3 (Median – Mean)

Mean – Mode = 3 (Mean – Median)

Question3

$\frac{(Q_3-Q_1)}{(Q_3+Q_1)}$ is known as

(a) Coefficient of Range (b) Coefficient of Q.D
(c) Coefficient of S.D (d) Coefficient of M.D

Answer: b

Explanation:

Coefficient of Q.D =. $\frac{(Q_3-Q_1)}{(Q_3+Q_1)}$

Question4

If each item is reduced by 15 A. M is

(a) Reduced by 15 (b) Increased by 15
(c) Reduced by 10 (d) None

Answer: a

Explanation:

If each item is reduced by 15 then new A.M. is reduced because the shifting of origin, the A.M. is changed.

Question5

For 899, 999, 391, 384, 390, 480, 760, 111, 240 Rank of m is

(a) 2.75 (b) 8.25
(c) 5.5 (d) none

Answer: c

Explanation:

Write the terms in Ascending order 111, 240, 384, 391, 480, 590,760, 899, 999.
Here No of observations (N) = 10

Median (m_e) = $\left[\frac{n+1}{2}\right]^{th}$ term
= $\left[\frac{10+1}{2}\right]^{th}$ term
= 5.5^{th} term
Rank of median (m_e) = 5.5

Question 6

The average of a series of overlapping averages, each of which is based on a certain number of item within a series is known as:

(a) Moving average (b) Weighted average
(c) Simple average (d) None

Answer: a

Explanation:
The average of a series of over lapping averages, each of which based on a certain number of item within a series is known as Moving Average.

Question 7

If the S.D. of the 1st n natural Nos. is $\sqrt{30}$. Then the value of n is

(a) 19 (b) 20
(c) 21 (d) None

Answer: a

Explanation:
S.D of first 'n' natural numbers

$= \sqrt{\frac{n^2-1}{12}}$

$= \sqrt{30} = \sqrt{\frac{n^2-1}{12}}$

On squaring both side $30 = \frac{n^2-1}{12}$

$360 = n^2 - 1$

$n^2 = 360 + 1$

$n^2 = 361$

$n = \sqrt{361}$

n = 19

Question 8

If the random variables x and v are related by Y=2-3x, then the SD of v is given by

(a) 3 × SD of x (b) -3 × SD of x
(c) 9 × SD of x (d) 2 × SD of x

Answer: a

Explanation:
Given equation

Y = 2-3x

3x+y-2 = 0

$b = \frac{-coefficient\ of\ x}{coefficient\ of\ y} = \frac{-3}{1} = -3$

S.D of y = |b| S.D of x

= |-3|. SD of x

3 x SD of x

NOV 2018

Question 1

The median of the data 5, 6, 7, 7, 8, 9, 10, 11, 11, 12, 15, 18 and 19 is

(a) 10.5 (b) 10

(c) 11 (d) 11.5

Answer: a

Explanation:

Write the term is Ascending 5, 6, 7, 7, 8, 9, 10, 11, 11, 12, 15, 18 and 19

Here, No. of terms (N) = 14

Median = $\frac{1}{2}\left[\frac{N^{th}}{2} term + \left[\frac{n+1}{2}\right]^{th} term\right]$

$\frac{1}{2}\left[\frac{14^{th}}{2} term + \left[\frac{14+1}{2}\right]^{th} term\right]$

$\frac{1}{2}[7th\ term + 8th\ term]$

$\frac{1}{2}$ [10+11]

$\frac{1}{2}$ × [21]

10.5

Question2

The mean of 20 items of a data is 5 and if each item is multiplied by 3, then the new mean will be

(a) 5 (b) 10

(c) 15 (d) 20

Answer: c

Explanation:

By shifting the scale Mean is changed

New mean = K x original mean = 5

K = 3

New mean= 3×5

= 15

Question 3

The Geometric mean of 3, 6, 24, and 48 is

(a) 8 (b) 12

(c) 24 (d) 6

Answer: b

Explanation:

G.M. = $(x_1 x_2 . x_3 x_4)^{\frac{1}{4}}$ {Here, n = 4}

$(3 \times 6 \times 24 \times 48)^{\frac{1}{4}}$

$= \sqrt[4]{3 \times 6 \times 24 \times 48}$

$= \sqrt[4]{3 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3}$

= 2×2×3

= 12

Question 4

The Algebraic sum of the deviation of a set of values from their arithmetic mean is

(a) >0 (b) =0
(c) <0 (d) None

Answer: b

Explanation:

The arithmetic sum of the deviation of a set of value from their A.M is always zero.

Question 5

Which one of the following is not a central tendency?

(a) Mean Deviation (b) Arithmetic mean
(c) Median (d) Mode

Answer: a

Explanation:

M.D is not a central tendency.

Question 6

If the range of a set of values is 65 and maximum value in the set is 83, then the minimum value in the set is

(a) 74 (b) 9
(c) 18 (d) None of the above

Answer: c

Explanation:

Maximum Value (L) = 83
Range (R) = 65
Minimum Value (S) =?
Range (R) = L – S
65 = 83 – S
S = 83 – 65
S = 18

Question 7

If total frequencies of three series are 50, 60 and 90 and their means are 12, 15, and 20 respectively, then the mean of their composite series is

(a) 16 (b) 15.5
(c) 16.5 (d) 14.5

Answer: c

Explanation:

$n_1 = 50$ $\bar{X}_1 = 12$
$n_2 = 60$ and $\bar{X}_2 = 15$

$n_3 = 90$ $\bar{X}_3 = 20$

Compared mean $\bar{X} = \frac{n_1\bar{X}_1+n_2\bar{X}_2+n_3\bar{X}_3}{n_1+n_2+n_3}$

$$\frac{50 \times 12 + 60 \times 15 + 90 \times 12}{50 + 60 + 90}$$

$$\frac{600 + 900 + 1800}{200}$$

$$\frac{3300}{200} = 16.5$$

Question 8

If the variance of 5, 7, 9 and 11 is 4, then the coefficient of variation is:

(a) 15 (b) 0.25

(c) 17 (d) 19

Answer: b

Explanation:

Variance of 5, 7, 9 and 11 is 4.

i.e. Variable = 4

S.D (σ) = $\sqrt{4} = 2$

Mean ($\bar{X}$) = $\frac{\sum x}{N} = \frac{5+7+9+11}{4} = \frac{32}{4} = 8$

CV = $\frac{\text{SD}}{\text{M}} = \frac{2}{8} = \frac{1}{4} = 0.25$

Question9

Standard deviation for the marks obtained by a student in test in mathematic (out of 50) as 30, 35, 25, 20, 15 is

(a) 25 (b) $\sqrt{50}$

(c) $\sqrt{30}$ (d) 50

Answer: b

Explanation:

Given data's are

15, 20, 25, 30, 35

Mean ($\bar{X}$) = $\frac{\sum X}{N} = \frac{15+20+25+30+35}{5} = \frac{125}{5} = 5$

For S.D

x	$\bar{X}$	d = x - $\bar{X}$	d^2
15	25	-10	100
20	25	-5	25
25	25	0	0

30	25	5	25
35	25	10	100
N=5			$\sum d^2 = 250$

$SD = \sqrt{\frac{\sum d^2}{N}} = \sqrt{\frac{250}{5}} = \sqrt{50}$

Question10

If in a moderately skewed distribution, the values of mode and mean are 32.1 and 35.4 respectively, then the value of the median is

(a) 34.3 (b) 33.3
(c) 34 (d) 33

Answer: a

Explanation:

Given
Mode = 32.1, Median =?
Mean = 35.4
Mode = 3 Median – 2 Mean
32.1 = 3 Median – 2 × 35.4
32.1 = 3 Median – 70.8
Median = 32.1 + 70.8
Median $\frac{102.9}{3}$ = 34.3

Question11

If the standard deviation for the marks obtained by a student in monthly test is 36. Then the variance is:

(a) 7 (b) 5
(c) 8 (d) 11

X	f	F. x
2	3	6
4	2	8
6	3	18
10	1	10
P+5		2P + 10
N = 11	$\sum fx = 2P + 52$	

Answer: a

Explanation:

$\bar{X} = \frac{\sum fx}{N} = \frac{2P+52}{11}$

Given

$\bar{X} = 6$

$\frac{6}{1} = \frac{2P+52}{11}$

2P + 52 = 66

2P = 14

P = 7

MAY 2019

Question1

The AM of 15 observations is 9 and the AM of first 9 observations is 11 and the AM of remaining observation is

(a) 11 (b) 6

(c) 5 (d) 9

Answer: b

Explanation:

15 OBSERVATION = 9

9 OBSERVATION = 11

$\overline{x_1}\ of\ 15 = 9 = \frac{\Sigma_{x_1}}{9} = 9$

$\overline{x_2} of\ 9 = 11 = \frac{\Sigma_{x_2}}{9} = 11$

$\sum x_1 = 15 \times 9 = 135$

$\sum x_2 = 11 \times 9 = 199$

Remaining $\sum x_1 - \sum x_2 = 135 - 99 = 36$

$\bar{x}_{30} = \frac{36}{6} = 6$

Question2

In a moderately skewed distribution, the values of mean & median are 12 & 18 respectively. The value of mode is

(a) 6 (b) 12

(c) 15 (d) 30

Answer: d

Explanation:

Mean – mode = 3(Mean – Median)

Put the value in this equation

= 12 – mode = 3(12-18)

= 30

Question3

Which of the following is positional average?

(a) Median (b) GM
(c) HM (d) AM

Answer: a

Explanation:

There are two types of positional average: the median and the mode. The median is the average value of the series in which half values are less than the median and half the values are greater than the median. The mode, the second positional average, shows a higher frequency in the series 2.

Question4

For the distribution

X	1	2	3	4	5	6
F	6	9	10	14	12	8

The value of median is

(a) 3.5 (b) 3
(c) 4 (d) 5

Answer: c

Explanation:

x	f	c f
1	6	6
2	9	15
3	10	25
4	14	39
5	12	51
6	8	59
Total	59	

$\frac{N+1}{2} = 30$

So Median be 4

Question5

For a symmetric distribution

(a) Mean = Median = Mode (b) Mode = 3 Median – 2 Mean
(c) Mode = $\frac{1}{3}$ median = $\frac{1}{2}$ (d) None

Answer: a

Explanation:

In a symmetric distribution, the mean, mode and median all fall at the same point. The mode is the most common number and it matches with the highest peak (the ''mode'' here is the different from the ''mode'' in bimodal or unimodal, which refers to the number of peaks).

Question6

If = $(\sigma^2)100$ and coefficient of variation = 20% then $\bar{x}$ =

(a) 60 (b) 70

(c) 80 (d) 50

Answer: d

Explanation:

σ^2 = Variance

To find SD = σ

SD = $\sqrt{100} = 10$

Coef. Of V = $\frac{\sigma}{x}$

$20 = \frac{10}{x} \times 100$

$\bar{x} = \frac{10}{20} \times 100$

$\bar{x} = 50$

Question7

Coefficient of quartile deviation is $\frac{1}{4}$ then $\frac{Q_3}{Q_1}$ is

(a) $\frac{5}{3}$ (b) $\frac{4}{3}$

(c) $\frac{3}{4}$ (d) $\frac{3}{5}$

Answer: a

Explanation:

$\frac{1}{4} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$

Talking option a

$Q_3 = 5$ &$Q_1 = 3$

$\frac{5-3}{5+3} = \frac{2}{8} = \frac{1}{4}$

Question8

Standard deviation is _____ times of $\sqrt{MD \times QD}$

(a) $\frac{2}{3}$ (b) $\frac{4}{5}$

(c) $\sqrt{\frac{15}{8}}$ (d) $\sqrt{\frac{8}{15}}$

Answer: c

Explanation:

MD = $\frac{4}{5}$ SD

4SD = 5MD = 6QD

$SD = \frac{5}{4} MD \quad = \frac{6}{4} QD$

$SD = \sqrt{\frac{5}{4} \times \frac{6}{4}} = \sqrt{\frac{30}{16}} = \sqrt{\frac{15}{8}}$

Question9

Standard Deviation of first five natural numbers.

(a) $\sqrt{\frac{n^2+1}{6}}$ (b) $\sqrt{\frac{n^2-1}{12}}$

(c) $\sqrt{\frac{n^2-1}{12}}$ (d) $\sqrt{\frac{n^2-1}{6}}$

Answer: b

Explanation:

Mean, $u = \frac{(1+2+3.....+n)}{n}$

$\therefore u = \frac{1}{2}(n\ +1\ )$

Variance, $\sigma^2 = \frac{\sum(x_i - u)^2}{n} = \frac{\sum x_i^2}{n} - u^2$

$\therefore \sigma^2 \frac{\sum n^2}{n} - \frac{1}{2}(n+1)^2$

$\therefore \sigma^2 \frac{1}{n} \frac{n\,(n+1)(2n+1)}{n} - \left(\frac{1}{2}(n+1)\right)^2$

$\therefore \sigma^2 = \frac{n^2-1}{12}$

Standard Deviation, S.D = $\sqrt{\sigma^2}$

∴S.D=\sqrt{\dfrac{n^2-1}{12}}

Question10

The Q.D. of 6 numbers 15, 8, 36, 40, 38, 41 is equal to

(a) 12.5 (b) 25

(c) 13.5 (d) 37

Answer: c

Explanation:

$Q_1 = \left(\frac{n+1}{2}\right)^{th}$ of = $\left(\frac{6+1}{4}\right)^{th}$ of = $\left(\frac{7}{4}\right)^{th}$ of 1.75^{th}

8+0.75(15-8)

8+5.25

$Q_1 = 13.25$

$Q_3 = 3\left(\frac{n+1}{2}\right)^{th}$ of = $3\left(\frac{n+1}{2}\right)^{th}$ of $3 \times \frac{7}{4} = 3 \times 1.75 = 5.25$

$Q_3 = 5^{th}$ of + $0.25(6^{th} - 5^{th})$

40+0.25(41-40)

$Q_3 = 40.25$

QD = $\frac{Q_3-Q_1}{2} = \frac{40.25-13.25}{2}$

13.5

NOV 2019

Question1

The approximate ratio of SD, MD, Q D is:

(a) 3:4:5 (b) 2:3:4

(c) 15:12:10 (d) 5:6:7

Answer: c

Explanation:

(c) We know that

4SD = 5MD = 6QD

Net 4SD = 5MD = 6QD = K

So,

SD = $\frac{K}{4}$, MD = $\frac{K}{5}$; QD = $\frac{K}{6}$

Now, SD: MD: QD

=> $\frac{K}{4} : \frac{K}{5} : \frac{K}{6}$

=> $\frac{30K}{120} : \frac{24K}{120} : \frac{20K}{120}$ [$\because$ LCM OF 4, 5,6 is 120]

=> 30:24:20

=> 15:12:10 so,

SD:MD: QD = 15:12:10

Question2

The deviations are minimum when taken from:

(a) Mean (b) Median

(c) Mode (d) None

Answer: b

Explanation:

(b) The sum of deviations are minimum when taken from median

$\sum| x - Mean$

$\sum| x -$ Median | {Minimum}

$\sum| x -$ Mode

Question3

If the AM & GM of two numbers are 30 and 24 respectively. Find the no's

(a) 12 and 24 (b) 48 and 12

(c) 30 and 30 (d) 40 and 20

Answer: b

Explanation:

(b) Let the two no's be a and b

AM = 30 GM = 24

$\frac{a+b}{2} = 30$ $\sqrt{ab} = 24$ (-2)

a + b = 60

a = 60 – b (-1)

put eq 1 in eq 2

$\sqrt{(60-b)b} = 24$

(on squaring both sides)

(60 – b)b = 576

60b – b^2 = 576

b^2 – 60 b + 576 = 0

b^2 - 48 b – 12 b + 576 = 0

b (b – 48) – 12 (b – 48) = 0

(b-12) (b-48) = 0

b = 12 or b = 48

a = 60 – b a = 60 – 48

a = 48 a = 12

(12, 48) or (48, 12)

So the two no's are 48 and 12

After Method [Do by hit and trial]

i.e. try with the given options whether their AM is 30 and GM 24

Question4

Origin is shifted by 5, what will happen

(a) SD will increase by 5 (b) QD will increase by 5

(c) MD will increase by 5 (d) There will be no change

Answer: d

Explanation:

(d) SD is not affected of remains in changed by shifting of origin. So here if the origin is shifted by 5 there will be no change in SD.

Question5

Coefficient of variation is equal to:

(a) $\frac{SD}{Mean}$ (b) $\frac{SD}{Mean} \times 100$

(c) $\frac{Mean}{SD} \times 100$ (d) $\frac{Mean}{SD}$

Answer: b

Explanation:

(b) In probability theory and statistics the coefficient of variation also known as relative standard deviation is a standardized measure of dispersion of frequency distribution.

It is expressed as a percentage and defined as the ratio of SD and mean.
SD so. Coefficient of variation = $\frac{\text{SD}}{\text{Mean}} \times 100$

Question6

Find mode of the following date

3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 – 21
2	5	10	23	21	12

(a) 14 (b) 15
(c) 16.5 (d) 14.6

Answer: d

Explanation:

(c) CI f
3 – 6 2
6 - 9 5
9 – 12 10
12 – 15 23×Modal class
15 – 18 21
18 - 21 12

Since 23 is the highest frequency, so 12 – 15 is the modal class.
So, $f_1 = 23$, $f_0 = 10$, $f_2 = 21$
$L_1 = 12$ i = 3
Mode = $L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$ xi

$= 12 + \frac{23-10}{2(23)-10-21} \times 3$
$= 12 + \frac{13}{15} \times 3$
= 12 + 2.599
= 14.59
= 14.6 (approx)

Question7

Find SD of the following

1, 2, 3, 4, 5, 6, 7, 8, 9

(a) 2.58 (b) $\frac{60}{9}$
(c) $\frac{60}{3}$ (d) 3.20

Answer: a

Explanation:

(a) SD = $\sqrt{\frac{\Sigma X2}{N} - \left(\frac{\Sigma X}{N}\right)^2}$

Here N = 9

$x^2 = 1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots 9^2$

= 285

$\frac{\sum X}{N} = \frac{1+2+3+4+5+6+7+8+9}{9} = 5$

Put in above formula,

$SD = \sqrt{\frac{285}{9} - \frac{25}{1}}$

$SD = \frac{\sqrt{60}}{9}$

$SD = \sqrt{6.67}$

SD = 2.58

Question8

If mean = 200 and variance = 80. Find coefficient of variation.

(a) 2.56 (b) 4.47

(c) 32 (d) 0.32

Answer: b

Explanation:

(b) We know

$CV = \frac{SD}{Mean} \times 100$

$CV = \sqrt{\frac{Variance}{Mean}} \times 100$ $SD = \sqrt{Variance}$

$CV = \sqrt{\frac{80}{200}} \times 100$

$CV = \sqrt{\frac{80}{2}}$

CV = 4.47 (approx.)

Question9

Which of the following is affected by shifting of scale.

(a) SD (b) MD

(c) QD (d) None of these

Answer: a

Explanation:

(a) Since SD, MD, QD are measures of absolute dispersion, So, a change in scale neither affect SD nor MD and QD.

Question10

Histogram is used for to represent

(a) Mode (b) Median

(c) Percentile (d) Quartile

Answer: a

Explanation:

(a) Histogram is a graphical representation of grouped frequency distribution. It is used to locate mode. X – axis- class interval y-axis- frequency.

Question11

Coefficient of variation is 80. Mean is 20. Find variance:

(a) 640 (b) 256

(c) 16 (d) 250

Answer: b

Explanation:

(b) We know,

Coefficient of variation (CV) = $\frac{\text{SD}}{\text{Mean}} \times 100$

Here mean = 20 ; CV = 80

$80 = \frac{S.D}{Mean} \times 100$

S.D. = 16

Variance = $(S.D.)^2$

Variance = $(16)^2 = 256$

Question12

Find the median of the following.

CI	0 -10	10 -20	20 – 30	30 – 40	40 -50
f	2	3	4	5	6

(a) 35 (b) 32

(c) 36 (d) 37.5

Answer: b

Explanation:

CI	f	c .f
0-10	2	2
10-20	3	5
20-30	4	9
30-40	5	14
40-50	6	20

$\sum f = 20$

N = 20

So 30 – 40 is the median class

L, = 30 C =Pre. Cof. of median class

C => 9 F => 5

Median = $4 + \frac{\left(\frac{N}{2} - c\right)}{f} \times i$

$= 30 + \left(\frac{10-9}{5}\right) \times 10$

$= 30+2$

$= 32$

Question13

Difference between upper limit and lower limit of a class is known

(a) Range (b) Class mark

(c) Class size (d) Class boundary

Answer: c

Explanation:

(c) ● Difference between upper limit and lower limit of class is class size.

● Range = Largest value - Smallest value

● Class mark = $\frac{(Lowest\ Limit+Upper\ Limit\ )}{2}$

● Class boundary = Class interval of exclusive data series.

Question14

Find the made of the following:

0 - 10	10 – 20	20 - 30	30 – 40	40 – 50	50 – 60
7	14	22	34	20	19

(a) 32 (b) 34.61

(c) 25.42 (d) 35

Answer: b

Explanation:

CI	f
0 – 10	7
10 – 20	14
20 – 30	22
30 – 40	34
40 – 50	20
50 - 60	19

Since 34 is the highest frequency so, 30 – 40

$F_1 = 34$ $f_0 = 22$ $f_2 = 20$

i=10

Mode = $L_1 + \frac{f_1-f_0\times i}{2f_1-f_0-f_2}$

$= 30 + \frac{(34-22)}{2\times34-22-20}\times 10$

$= 30 + \frac{12}{26} \times 10$

= 34.61

Question15

Find the median of the following:

CI	0 – 10	10 – 20	20 - 30	30 - 40	40 - 50
f	5	15	28	10	2

(a) 10.57 (b) 23.57

(c) 25 (d) None

Answer: b

Explanation:

CI	f	c.f
0 – 10	5	5
10 – 20	15	20
20 – 30	28	48*
30 – 40	10	58
40 - 50	2	60

$\sum f = 60$

$\frac{N}{2} = \frac{60}{2} = 30$

So 20 – 30 is the median class

$L_1 = 20$ L = 30

C – 20 f – 28

Median = $L_1 + \frac{\left(\frac{N}{2} - C\right)}{f} \times$ i

$= 20 + \frac{(30-20)}{28} \times 10$

= 23.57

Question16

$\sum_{i=1}^{n}(x - x_i)$ is equal to

(a) $x\sum_{i=1}^{n} \bar{xl}$ (b) n $\left(x \sum_{i=1}^{n} \bar{xl}\right)$

(c) $\bar{x} - n\bar{x}$ (d) zero

Answer: d

Explanation:

(d) $\sum_{i=1}^{n}(x - x_i)$

Since the sum of deviations about their AM is always zero.

Question17

SD from numbers 1, 4, 5, 7, 8 is 2.45. If 10 is added to each them SD will be:

(a) 12.45 (b) 24.5

(c) 12 (d) will not change

Answer: d

Explanation:

(d) We know a change in origin of SD causes no change in SD
So, New SD = Original SD when 10 will be added
So, SD will not change .

DEC 2020

Question1

Given the weights for the numbers 1, 2, 3,…….n are respectively 1^2 , 2^2 , 3^2 ,…..n^2 . Then weighted HM is ____

(a) $\frac{2n+1}{4}$ (b) $\frac{2n+1}{6}$
(c) $\frac{2n+1}{3}$ (d) $\frac{2n+1}{2}$

Answer: c

Explanation:

Since the harmonic mean is the reciprocal of the average of reciprocals, the formula to define the harmonic mean "HM" is given as follows:
If x_1, x_2, x_3,…, x_n are the individual items up to n terms, then,
Harmonic Mean, HM = n / $[(1/x_1)+(1/x_2)+(1/x_3)+…+(1/x_n)]$. Hence = $\frac{2n+1}{3}$

Question2

Which measure is suitable for open - end classification?

(a) Median (b) Mean
(c) Mode (d) GM

Answer: a

Explanation:

For open end classification median is the best measure of central tendency. Median is the most suitable central tendency measure when there are some extreme scores in data distribution and also when there is a skewed data set.

Question3

50^{th} percentile is equal to ____

(a) Median (b) Mode
(c) Mean (d) None

Answer: a

Explanation:

The 50th percentile is generally the median (if you're using the third definition—see below). The 75th percentile is also called the third quartile. The difference between the third and first quartiles is the interquartile range.

Question4

For a distribution Mean, Median and Mode are 23, 24 and 25.5 respectively, then it is most likely ___ skewed distribution

(a) Positively (b) Symmetrical
(c) Asymptotically (d) Negatively

Answer: d

Explanation:

For Negatively skewed means is likely to be less than mode and median

Question5

If any two numbers are in AP, then GM^2 = ____

(a) AM x HM (b) AM + HM
(c) M x Z (d) AM x M

Answer: a

Explanation:

The relationship between AM, GM and HM is given by:
AM x HM = GM^2

Question6

Two values yielded an arithmetic mean of 24 and a harmonic mean of 6. The geometric mean of these values is ____

(a) 8 (b) 12
(c) 14 (d) 16

Answer: b

Explanation:

GM = $\sqrt{AM \times HM}$

$GM = \sqrt{24 \times 6}$

$GM = \sqrt{144}$

$GM = 12$

Question 7

The HM of A and B is 1/3 and HM of C and D is 1/5. Then HM of A, B, C and D is ____

(a) $\frac{8}{15}$ (b) $\frac{1}{4}$
(c) $\frac{15}{8}$ (d) $\frac{4}{15}$

Answer: d

Explanation:

AB-1/3 & CD-1/5
HM of ABCD = n/2

$\frac{\frac{1}{3}+\frac{1}{5}}{2}\left(\frac{n}{2}\right) = \frac{8}{30} = \frac{4}{15}$

Question 8

Which one of these is least affected by extreme values?

(a) Mean (b) Median
(c) Mode (d) None

Answer: b

Explanation:

Median is the middle most value of a given series that represents the whole class of the series. So since it is a positional average, it is calculated by observation of a series and not through the extreme values of the series which. Therefore, median is not affected by the extreme values of a series.

Question9

Ten matches' data is given. Then which of the following cannot be found?

(a) Least Score (b) Highest Score
(c) Best Score (d) Median Score

Answer: c

Explanation:

From Best Score method we can do this

Question10

If the AM and HM of two numbers are 6 and 9 respectively, then GM is_____

(a) 7.35 (b) 8.5
(c) 6.75 (d) None

Answer: a

Explanation:

We know the relation between Arithmetic Mean, Harmonic Mean, and Geometric Mean of Two Numbers:

$A.M. \times H.M. = (G.M.)^2$

$\Rightarrow G.M. = 7.35$.

Question11

Which of the following measure of dispersion is based on absolute deviations?

(a) Range (b) SD
(c) Mean Deviation (d) Quartile Deviation

Answer: c

Explanation:

The Mean Deviation gives more information than range or the Quartile Deviation as it is based on all the observed values. The Mean Deviation does not give undue weight to occasional large deviations, so it should likely to be used in situation where such deviations are likely to occur.

JAN 2021

Question1

From the records on sizes of shoes sold in a shop, one can compute the following to determine the most preferred shoe size.

(a) Mean (b) Median
(c) Mode (d) Range

Answer: c

Explanation:

The number which appears most often in a set of numbers. Example: in {6, 3, 9, 6, 6, 5, 9, 3} the Mode is 6

Question2

Which of the following measure does not possess mathematical properties?

(a) Arithmetic mean (b) Geometric mean
(c) Harmonic mean (d) Median

Answer: d

Explanation:

Median Properties - The median value is fixed by its position and is not reflected by the individual value. The distance between the median and the rest of the values is less than the distance from any other point. Every array has a single median. Median cannot be manipulated algebraically. **Hence, Median does not possess mathematical properties**

Question 3

If y = 3 + (4.5) x and the mode for x-value is 20, then the mode for y-value is

(a) 3.225 (b) 12
(c) 24.5 (d) 93

Answer: d

Explanation:

y = 3+(4.5)x
x is 20
y = 3+4.5 × 20
y = 93
Because Mode is affected by change of origin & scale both

Question 4

If there are two groups with n_1 and n_2 observations and H_1 and H_2 are respective harmonic means, then the harmonic mean of combined observations is

(a) $\frac{n_1H_1+n_2H_2}{n_1+n_2}$ (b) $\frac{n_1H_1+n_2H_2}{H_1+H_2}$

(c) $\frac{n_1+n_2}{n_1H_1+n_2H_2}$ (d) $\frac{(n_1+n_2)H_1H_2}{n_1H_2+n_2H_1}$

Answer: d

Explanation:

$$\frac{(n_1+n_2)H_1H_2}{n_1H_2+n_2H_1}$$

Question 5

The best statistical measure used for comparing two series is

(a) Mean absolute deviation (b) Range

(c) Certificate of variation (d) Standard deviation

Answer: c

Explanation:

The coefficient of standard deviation is calculated by dividing the standard deviation of the series by its mean and then multiplying it by 100. It is regarded as the best measure of dispersion to compare two different series because it is expressed in percentage.

Question 6

The relationship between P-series and Q-series is given by 2P – 3Q – 10. If the range of P – series is 18. What would be the range of Q?

(a) 10 (b) 15

(c) 9 (d) 12

Answer: d

Question 7

It is given that the mean $(\bar{X})$ is 10 and standard deviation (s.d.) is 3.2. If the observations are increased by 4, then the new mean and standard deviations are:

(a) $\bar{x}$ = 10, s.d. = 7.2 (b) $\bar{x}$ = 10, s.d. = 3.2

(c) $\bar{x}$ = 14, s.d. = 3.2 (d) $\bar{x}$ = 14, s.d. = 7.2

Answer: d

Explanation:

$\bar{x} + 4 = New\ Mean$

$\bar{x} = 10 + 4 = 14$

Mean is affect by change in origin

S.D. = σ + 4

S.D. = 3.2 + 4 = 3.2

as SD is not affected by change of origin

Question 8

Which one of the following is a relative measure of dispersion?

(a) Range (b) Mean deviation

(c) Standard deviation (d) Coefficient of quartile deviation

Answer: d

Explanation:

The relative Measures of dispersion are: Coefficient of Variation, Coefficient of Quartile Deviation, Coefficient of Mean Deviation

Question 9

Find the coefficient of mean deviation about mean for the data: 5, 7, 8, 10, 11, 13, 19

(a) 17.28 (b) 28.57

(c) 32.12 (d) 18.56

Answer: c

Explanation:

$$\textbf{\textit{Mean}}\ (\bar{x}) = \frac{5+7+8+10+11+13+19}{7} = \frac{54}{7} = 7.714$$

	$\lvert x_i - \bar{x}\rvert$
5	2.271
7	0.714
8	0.29
10	2.29
11	3.29
13	5.29
$\sum \lvert x_i - \bar{x}\rvert$	14.15

NOTE: The correct Ans is: 32.12

JULY 2021

Question 1

Expenditures of a company (in Million Rupees) per item in various Years

Year	Item of Expenditures				
	Salary	Fuel and Transport	Bonus	Interest on Loans	Taxes
1998	288	98	3.00	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

What is average amount of interest per year which the company had to pay

during this period?

(a) 33.66 (b) 36.66
(c) 31.66 (d) 39.66

Answer: Options (b)

Question 2

There are n numbers. When 50 is subtracted from each of these numbers the sum of the numbers so obtained is -10. When 46 is subtracted from each of the original n numbers, then the sum of numbers, so obtained is 70. What is the mean of the original n numbers?

(a) 56.8 (b) 25.7
(c) 49.5 (d) 53.8

Answer: Options (c)

Question 3

The mean of 'n' observation is 'X'. If k is added to each observation, then the new mean is __

(a) X (b) XK
(c) X - K (d) X + K

Answer: Options (d)

Explanation:

Let us take n observation X_1.....X_n

If $\bar{X}$ be the mean of the n observation, then we have

$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$

➔ $\sum_{i=1}^{n} X_i = n\bar{X}$

Add a constant k to each of the observations. Then the observations becomes

$X_i + k$, ..., $X_n + K$

If $\bar{Y}$ be the mean of the new observations. Then the observations becomes

$\bar{Y} = \frac{1}{n}\sum_{i=1}^{n}(X_i + k)$

$= \frac{1}{n}\sum_{i=1}^{n} X_i + \frac{1}{n}\sum_{i=1}^{n} k$

$= \bar{X} + \frac{1}{n}.nk$

$= \bar{X} + k$

Question 4

If y =3 + 1.9 x, and mode of x is 15, then the mode of y is:

(a) 15.9 (b) 27.8
(c) 35.7 (d) 31.5

Answer: Options (d)

Question 5

The mean deviation of the numbers 3, 10, 6, 11, 14,17,9,8,12 about the mean is (correct to one decimal place)

(a) 8.7 (b) 4.2
(c) 3.1 (d) 9.8

Answer: Options (c)

Question 6

The standard deviation of 1 to 9 natural number is___

(a) 6.65 (b) 2.58
(c) 6.75 (d) 5.62

Answer: Options (b)

Question 7

The probable value of mean deviation when $Q_3 = 40$ and $Q_1 = 15$ is__

(a) 15 (b) 18.75
(c) 17.50 (d) 0

Answer: Options (a)

Explanation:

Q3=40 Q1=15
QD= Q3-Q1 / 2
QD= 40-15 / 2
=25 / 2
=12.5
WKT, 6QD=5MD=4SD
MD= 6 * 12.5 /5
MD=15

Question 8

If the numbers are 5, 1, 8, 7, 2, then the coefficient of variation is

(a) 56.13% (b) 59.13%
(c) 48.13% (d) 44.13%

Answer: Options (b)

Question 9

If every observation is increased by 7 then

(a) Standard Deviation increases by 7 (b) Mean deviation increases by 7
(c) Not affected at all (d) Quartile Deviation increases by 7

Answer: Options (c)

Question 10

If a school has 14 teachers, their heights (in cm) are:

172, 173, 164, 178, 168, 169, 173, 172, 173, 164, 178, 168, 169, 173, then average deviation of this data is

(a) 2.43 approx. (b) 3.93 approx.
(c) 3.43 approx. (d) 2.92 approx.

Answer: Options (c)

Question 11

If the relationship between x and y is given by 2x + 3y = 10 and the range of y is 10, then what is the range of x?

(a) 10 (b)18
(c) 8 (d) 15

Answer: Options (d)

DEC 2021

Question 1

If there are 3 observations 15, 20, 25 then the sum of deviation of the observations from their AM is

(a) 0 (b) 5
(c) -5 (d) 10

Answer: a

Explanation:

Sum of deviations from their Arithmetic Mean is always zero.

Question 2

If the AM and GM for 10 observations are both 15, then the value of HM is

(a) less than 15 (b) more than 15
(c) 15 (d) cannot be determined

Answer:

Explanation:

If both AM and GM are 15, it means that all the observations are constant, i.e., 15. Therefore, HM will also be 15.

Question 3

If average mark for a group of 30 girls is 80, a group of boys is 70 and combined average is 76, then how many are in the boy's group?

(a) 21 (b) 20
(c) 22 (d) 19

Answer: b

Explanation:

We have $n_1 = 30$; $\overline{X_1} = 80$; $n_2 = ?$; $\overline{X_2} = 70$; $= \bar{X} = 76$

We know that $\bar{X} = \frac{n_1\overline{X_1}+n_2\overline{X_2}}{n_1+n_2}$

$$Therefore, 76 = \frac{(30 \times 80) + (n_2 \times 70)}{30 + n_2}$$

Now, try the options.

Option (a) – 21

RHS = $\frac{(30\times80)+(21\times70)}{30+21} = 75.88 \neq 76$

Option (b) - 20

$$RHS = \frac{(30 \times 80) + (20 \times 70)}{30 + 20} = 76 = LHS$$

Question 4

If two variables a b and b are related by C = ab then G.M. of c is equal to

(a) G.M. of a + G.M. of b
(b) G.M. of a x G.M. of b
(c) G.M. of a - G.M. of b
(d) G.M. of a / G.M. of b

Answer: b

Explanation:

If two variables a and b are related by c = ab b then GM of c = GM of a × GM of b

Question 5

For a moderately skewed distribution the median is twice the mean, then the mode is_____ times the median.

(a) 3
(b) 2
(c) 2/3
(d) 3/2

Answer: b

Explanation:

We know that for a moderately skewed distribution,
Mode = 3 Median - 2Mean ... Eq. (1)
Given:
Median = 2 Mean
Therefore, Mean = Median/ 2
Putting
the value of Mean = Median/ 2
in Eq. (1), we get:
Mode= 3 Median - 2 | Median)
Mode= 3 Median - Median = 2 Median
Therefore, Mode is two times of Median.

Question 6

The median value of the set of observations 48, 36, 72, 87, 19, 66, 56, 91 is

(a) 53
(b) 87

(c) 61 (d) 19

Answer: c

Explanation:

First, arrange the terms in ascending order:

19, 36,48, 56, 66, 72, 87, 91

Since the number of terms is even, i.e., 8, the median will be obtained by the average of the two middle terms, i.e., 56, and 66.

Therefore,

Median =56 + 66/ 2 = 61

Question 7

The marks secured by 5 students in a subject are 82, 73, 69, 84, 66. What is the coefficient of Range

(a) 0.12 (b) 12

(c) 120 (d) 0.012

Answer: b

Explanation:

Coefficient of Range $=\frac{Largest\ Observation - Small}{Largest\ Observation + Small}$

Coefficient of Range $=\frac{84-66}{84+66} \times 100 = 12$

Question 8

For a data having odd number of values, the difference between the first and the middle value is equal to the difference between the last and the middle value; similarly the difference between the second and middle values is equal to that of second last and middle value so on. Therefore, the middle value is equal to

(a) Half of the range (b) Half of standard deviation

(c) Mode (d) Mean

Answer: d

Explanation:

Here No. of data's = odd (let 3)

i.e. a, b, c

Difference b/w the 1st and the middle value

Diff. b/w the last and the middle value

b-a=c-b

2b = a + b

b $=\frac{a+c}{2}$

The middle value is known as mean and similarly other case is also satisfied.

Question 9

One hundred participants expressed their opinion on recommending a new

product to their friends using the attributes: most unlikely, not sure, likely, most likely. The appropriate measure of central tendency that can be used here is

(a) Mean (b) Mode
(c) Geometric mean (d) Harmonic mean

Answer: b

Explanation:

One hundred participants expressed their opinion on recommending a new product to their friends using the Attributes; most unlikely, not sure, likely, most likely. The appropriate measure of central tendency that can be used here is **Mode.**

Question 10

A long a road there are 5 buildings of apartments, marked as 1, 2, 3, 4, 5. Number of people residing in each building is available. A bus stop is to be setup near one of the buildings so that the total distance walked by the residents to the bus stop from their buildings must be kept minimum. One must consider involving _____ to find the position of the bus stop.

(a) Mean (b) Mode
(c) Median (d) Weighted mean

Answer:

Explanation:

'Median' The total distance walked by the residents to the bus stop from their building must DO kept minimum.

Question 11

Given that Mean = 70.20 and Mode = 70.50, the Median is expected to be.

(a) 70.15 (b) 70.20
(c) 70.30 (d) 70.35

Answer:

Explanation:

Since Mean and Mode are different, this data is clearly not symmetric.
For moderately skewed data, we know that Mode= 3Median -2 Mean.

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

Median $=\frac{70.50+(2\times 70.20)}{3}=70.30$

JUNE 2022

Question 1

Which is not a measure of central tendency

(a) Mean (b) Median
(c) Quartile deviation (d) Mode

Answer: c

Explanation:

Quartile deviation is not a measure of central tendency.

Question 2

Mean Deviation of data 3, 10, 10, 4, 7, 18, 5 from mode is

(a) 4.39 (b) 4.14

(c) 4.70 (d) 5.24

Answer: b

Explanation:

Mean deviation from mode of following data 3, 10, 10, 4, 7, 18, 5

Here mode (Mo) = 10

Table =

x	Mode (Mo)	|d| = |x-Mo|
3	10	7
10	10	0
10	10	0
4	10	6
7	10	3
18	10	8
5	10	5
N= 7		Σ|d| = 29

M.D- $\frac{\sum|d|}{N} = \frac{29}{7} = 4.14$

Question 3

A M and Coefficient of variation of x is 10 and 40. What is the variance 30-2x

(a) 64 (b) 56

(c) 49 (d) 81

Answer: a

Explanation:

A.M of x = 10

C.v. of x = 40%

CV = $\frac{S.D.}{10} \times 100$

40= $\frac{S.D.}{10} \times 100$

S.D. = $\frac{40 \times 10}{100}$

S.D = 4

i.e. S.D of x=4

Here Let y = 30-2x

2x+y-30= 0

B=$\frac{Coeff\ of\ x}{Coeff\ of\ y} = \frac{-2}{1} = -2$

S.D of y = |b| of S.D of x

= |-2| × 4= 2×4 = 8

= Variance of y = $(8)^2$ = 64

Question 4

Which of the following is based on absolute deviation?

(a) Standard deviation (b) Mean deviation

(c) Range (d) Quartile deviation

Answer: b

Explanation:

M. D is known as absolute deviation

Question 5

When each value does not have equal importance then

(a) A M (b) G M

(c) H M (d) Weighted Average

Answer: d

Explanation:

When each value does not have equal importance then we used weighted Average.

Question 6

Following are the wages of 8 workers 82, 96, 52, 75, 70, 65, 50, 70. Find range and coefficient of range?

(a) 46, 32.70 (b) 43, 31.50

(c) 46, 31.50 (d) 43, 32.70

Answer: c

Explanation:

Here Smallest No (S) = 50

Largest No (L) = 96

Range = L - S

= 96-50

= 46

Coeff. of Range = $\frac{L-S}{L+S} \times 100$

$\frac{96-50}{960+50} \times 100$

$= \frac{46}{146} \times 100$

= 31.50

Question 7

The mean of 20 observation is 38. If two observation are taken as 84 and 36 instead of 48 and 63 find new means.

(a) 38.45 (b) 41.15
(c) 37.55 (d) 40.05

Answer: c

Explanation:

$\bar{X}$ = 38
No of observation (N) = 20
RightValues (R.V) = 48 + 63 = 111
Wrong Values (W.V) = 84 + 36 = 120
New (correct) mean = original mean + $\frac{R.V-W.V}{N}$
= $38+\frac{(111-120)}{20}$
$= 38 + \frac{(-9)}{20}$
$= 38 + 0.45$
$= 37.55$

Question 8

The 3rd decile for the numbers
15, 10, 20, 25, 18, 11, 9, 12 is

(a) 13 (b) 10.70
(c) 11.00 (d) 11.50

Answer: b

Explanation:

Write the terms in Ascending order 9, 10, 11, 12, 15, 18, 20, 25
Here N = 8
$D_3 = \left[\frac{3(N+1)}{10}\right]^{th}$
$\left[\frac{3(8+1)}{10}\right]^{th}$
$\left[\frac{27}{10}\right]^{th}$
2.70^{th} term
= 2^{th} term + 0.70 (3th term - 2th term)
=10 + 0.70 (11 - 10)
= 10 + 0.70 × 1
= 10 + 0.70
= 10.70

Question 9

Find the standard deviation and coefficient of variation for 1, 9, 8, 5, 7

(a) 2.828, 49.32 (b) 2.828, 47.13
(c) 2.828, 48.13 (d) 2.828, 50.13

Answer: c

Explanation:

Given data

1, 9, 8, 5, 7

Mean $(\bar{x})= \frac{\sum d^2}{N} = \sqrt{\frac{40}{5}} = \sqrt{8}$

$= 2\sqrt{2}$

$= .828$

$C.V = \frac{S.D}{AM} \times 100$

$\frac{2.828}{6} \times 100 = 47.13\%$

DEC 2022

Question 1

If Mean (X) is = 10 and mode (Z) is = 7, then find out the value of median (M)

a) 9 b) 17
c) 3 d) 4.33

Answer: Options (a)

Explanation:

Applying the relation between mean, median and mode formula,

Mode =3 Median −2 Mean

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

$= \frac{7+2\times10}{3}$

$= 27$

Median =9

Question 2

If the coefficient of variation and standard deviation are 30 and 12 respectively, then the arithmetic mean of the distribution is

a) 40 b) 36
c) 25 d) 19

Answer: Options (a)

Explanation:

C.V. – 30, S.D – 12

$$CV = 100 \times \frac{SD}{Mean}$$
$$30 = \frac{100 \times 12}{Mean}$$
$$Mean = \frac{1200}{30} = 40$$

Question 3

The relationship between two variables x and y is given by 4x-10 y =20. If the median value of the variable x is 10 then what is median value of variable y?

a) 1.0 b) 2.0
c) 3.0 d) 4.0

Answer: Options (b)

Explanation:

4x – 10y = 20
By Option b
4× 10 =- 10× 2 = 20
40 -20 = 20
= 20 = 2.0

Question 4

Which one of the following is not a method of measures of dispersion?

a) Quartile b) Mean deviation
c) Range d) Standard Deviation

Answer: Options (a)

Explanation:

In statistics, Quartile is not a measure of dispersion because it is the measure of central tendency. 2nd quartile is equal to median. Only range, mean deviation, standard deviation are the measure of dispersion.

Question 5

Mean deviation is minimum when deviation are taken from:

a) Mean b) Median
c) Mode d) Range

Answer: Options (b)

Explanation:

The mean deviation is least when it is taken from median (A standard result).

Question 6

If the first quartile is 56.50 and the third quartile is 77.50, then the coefficient of quartile deviation is

a) 638.09 b) 15.67

c) 63.80 d) 156.71

Answer: Options (b)

Explanation:

$Q_1 = 56.5$

$Q_3 = 77.5$

Coef. of QD = $\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

$\frac{77.5 - 56.5}{77.5 + 56.5} \times 100$

$\frac{21}{134} \times 100 = 15.67$

Question 7

The median of the observation 42, 72, 35, 92, 67, 85, 72, 81, 51, 56 is

a) 69.5 b) 72

c) 64 d) 61.5

Answer: Options (a)

Explanation:

42, 72, 35, 92, 67, 85, 72, 81, 51, 56

No' of observations (n) =10

first of all we arrange the observations in an ascending order

35, 42, 51, 56, 67, 72, 72, 81, 85, 92

Here observe that No' of observations (n) is even so

Median is average of $\frac{n}{2}$ th term and $(\frac{n}{2}+1)$ th term

Median $\frac{\frac{n}{2}th\ term + \left(\frac{n}{2}+1\right)th\ term}{2}$

$\frac{\frac{10}{2}th\ term + \left(\frac{10}{2}+1\right)th\ term}{2}$

$\frac{5th\ term + 6th\ term}{2}$

$= \frac{67 + 72}{2}$

$= \frac{139}{2}$

$= 69.5$

Question 8

If the sum of square of the values equals to 3390. Number of observation are 30 and Standard deviation is 7, what is th mean value of the above observations?

a) 14 b) 11

c) 8 d) 5

Answer: Options (c)

Explanation:

$\Sigma\sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$

$\Sigma\sqrt{\frac{\Sigma x^2}{n} - (x)^2}$

$7^2\frac{3390}{30} - (\bar{X})^2$

$49 = 113 - (\bar{X})^2$

$=(\bar{X})^2 = 113-49$

$(\bar{X})2 = 64$

$(\bar{X}) = 8$

Question 9

The mean of 50 observations is 36. If two observations 30 and 42 are to be excluded, then the mean of the remaining observation will be:

a) 36 b) 38

c) 48 d) 50

Answer: Options (a)

Explanation:

Sum of the 50 observations =36×50=1800

Two observations 30 and 42 are excluded

then sum of the remaining 48 observations =1800−[30+42]=1728 Therefore req. mean = 48 1728 =36

Question 10

The average age of 15 students in a class is 9 years. Out of them, the average age of 5 students is 13 years and that of 8 students is 5 years. What is the average of remaining 2 students?

a) 5 years b) 9 years

c) 10 years d) 15 years

Answer: Options (b)

Explanation:

with option b applying combined AM method

$$\frac{5 \times 13 + 8 \times 5 + 2 \times 15}{15}$$

Mean of 15 Student is 9

Question 11

If Arithmetic Mean and Geometric Mean between Two numbers are 5 and 4 respectively, then these numbers are

a) 2 & 3 b) 2 & 8

c) 4 & 6 d) 1 & 16

Answer: Options (b)

Explanation:

If the arithmetic mean is 5, therefore the sum of the two numbers is 10.

Let the two numbers be x and 10 – x

The geometric mean is 4

So, $\sqrt[2]{x(10-x)} = 4$

On squaring both sides, we get

X (10 –x) = 16

- ⇨ $10x - x^2 = 16$
- ⇨ $x^2 - 10x + 16 = 0$
- ⇨ $x^2 - 8x - 2x + 16 = 0$
- ⇨ $x(x-8) - 2(x - 8) = 0$
- ⇨ $(x-2)(x-8) = 0$
- ⇨ $x = 2 \; or \; x = 8$

So, the required numbers are 2 and 8

Question 12

If Arithmetic mean between two numbers is 5 and Geometric mean is 4 then what is the value of Harmonic mean?

a) 3.2 b) 3.4

c) 3.5 d) 3.6

Answer: Options (a)

Explanation:

We know If a and b are two positive numbers then,

Therefore, we can conclude the relationship between A.M., G.M. & H.M. is:

$$\boxed{\mathbf{G.M.} = \sqrt{\mathbf{A.M.} \times \mathbf{H.M.}}}$$

Now, substituting A.M. = 5 & G.M. = 4, we get

$4 = \sqrt{5 \times H.M.}$

Squaring both sides

$\implies (4)^2 = (\sqrt{5 \times H.M.})^2$

$\implies 16 = 5 \times H.M.$

$\implies H.M. = \frac{16}{5}$

$\implies \mathbf{H.M.} = \mathbf{3.2}$

Thus, **the Harmonic mean between the two numbers is** *3.2*.

Question 13

If the variance of given data is 12, and their mean value is 40, what is coefficient variation (CV)?

a) 5.66% b) 6.66%

c) 7.50% d) 8.65%

Answer: Options (d)

Explanation:

Coef. of $\sigma^2 = \frac{\sigma}{x} \times 100$

$= \frac{\sqrt{12}}{40} \times 100$

$= 8.65\%$