Statistics

Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Mean, median & mode

A-1. Find the A.M. of the series 1, 2, 4, 8, 16, ..., 2^n

(1) $\frac{2^{n+1}-1}{n+1}$ (2) $\frac{2^{n+2}-1}{n}$ (3) $\frac{2^n-1}{n+1}$ (4) $\frac{2^n-1}{n}$

A-2. The average weight of 9 men is x kg. After another men joins the group, the average increases by 5%. Still another man joins and average returns to old level of x kg. Which one of the following true?

(1) the 10^{th} & 11^{th} men weight same

(2) the 10^{th} man weight half as much as the 11^{th} man

(3) the 10^{th} man weight as much as the 11^{th} man

(4) None of these

A-3. N observations on a variable x are $x_i = A + iB$ for i = 1, 2, 3, ..., n where A, B are real constants. The mean of the observation is

(1) $A + B\frac{(n+1)}{2}$ (2) $nA + B\frac{(n+1)}{2}$ (3) $A + Bn\frac{(n+1)}{2}$ (4) $A + B\left(\frac{n}{2}\right)$

A-4. Find the median of values 10, 14, 11, 9, 8, 12, 6.

(1) 8 (2) 10 (3) 9 (4) 11

A-5. If a variable takes the discrete values $\alpha + 4$, $\alpha - \frac{7}{2}$, $\alpha - \frac{5}{2}$, $\alpha - 3$, $\alpha - 2$, $\alpha + \frac{1}{2}$ $\alpha - \frac{1}{2}$, $\alpha + 5$ ($\alpha > 0$), then the median is

(1) $\alpha - \frac{5}{4}$ (2) $\alpha - \frac{1}{2}$ (3) $\alpha - 2$ (4) $\alpha + \frac{5}{4}$

A-6. Find the mode of data 1, 2, 5, 3, 2, 3, 0, 5, 2.

(1) 3 (2) 1 (3) 5 (4) 2

A-7. Consider the following statements related to measure of central tendency of 50 positive numbers

1. Median is not influenced by extreme values in set of numbers
2. The harmonic mean is unreliable if one or more of the numbers is non-zero

which of the above statement is/are correct

(1) 1 only (2) 2 only (3) both 1 and 2 (4) neither 1 nor 2

A-8. $M(x_1, x_2, x_3 \ldots\ldots\ldots x_n)$ defines a measure of central tendency based on n values $x_1, x_2, x_3, \ldots\ldots\ldots x_n$ consider the following measured of central tendency

(1) Arithmetic mean (2) Median (3) Geometric mean

which of the above measure satisfie/ satisfies the property

$$\frac{M(x_1,x_2,x_3\ldots\ldots\ldots\ldots x_n)}{M(y_1,y_2,y_3\ldots\ldots\ldots\ldots y_n)} = M.\left(\frac{x_1}{y_1},\frac{x_2}{y_2},\frac{x_3}{y_3},\ldots\ldots,\frac{x_n}{y_n}\right)?$$

select the correct answer using the code below

(1) 1 only (2) 2 only (3) 3 only (4) 1 and 3

Statistics

A-9. If values a, b, c,..... j, p occurs with frequencies ${}^{10}C_0, {}^{10}C_1, {}^{10}C_2, \ldots, {}^{10}C_{10}$ then mode is
(1) a (2) e (3) f (4) k

A-10. The mean of 21 observations (all different) is 40. If each observations greater than the median are increased 21, then mean of observations will become
(1) 50 (2) 50.5 (3) 30 (4) 45

A-11. The mean of series $x_1, x_2, x_3, \ldots . x_n$ is $\bar{x}$, then mean of the series $x_i + 2i$, i = 1, 2, 3, . . . , n will be
(1) $\bar{x} + n$ (2) $\bar{x} + n + 1$ (3) $\bar{x} + 2$ (4) $\bar{x} + 2n$

A-12. If the difference between mean and mode is 63, the difference between mean and median is
(1) 189 (2) 21 (3) 31.5 (4) 48.5

A-13. Mean of variates 1.2.3, 2.3.4, ..., n(n + 1)(n + 2)
(1) $\frac{n(n+1)(n+2)}{4}$ (2) $\frac{(n+1)(n+2)(n+3)}{2}$ (3) $\frac{(n+1)(n+2)(n+3)}{4}$ (4) $\frac{n(n+1)(n+3)}{2}$

Section (B) : Range, coefficient of range, mean deviation and coefficient of mean deviaiton.

B-1. Range of data 7, 8, 2, 1, 3, 13, 18 is
(1) 10 (2) 15 (3) 17 (4) 11

B-2. Coefficient of range 5, 2, 3, 4, 6, 8, 10 is
(1) $\frac{2}{3}$ (2) $\frac{1}{3}$ (3) $\frac{3}{5}$ (4) $\frac{1}{2}$

B-3 The scores of a batsman in ten innings are : 38, 70, 48, 34, 42, 55, 63, 46, 54, 44. Find the mean deviation about median.
(1) $\frac{43}{5}$ (2) $\frac{44}{5}$ (3) $\frac{41}{5}$ (4) $\frac{42}{5}$

B-4. The mean deviation about median of variates 13, 14, 15, ... , 99, 100 is
(1) 1936 (2) 21.5 (3) 23.5 (4) 22

B-5 The mean deviation of an ungrouped data is 50. If each observation is increased by 2%, then the new mean deviation is
(1) 50 (2) 51 (3) 49 (4) 50.5

B-6. The mean deviation of an ungrouped data is 80. If each observation is decreased by 5%, then the new mean deviation is
(1) 76 (2) 77 (3) 78 (4) 79

B-7. The mean deviation from mean of the observations a, a + d, a + 2d, ... a + 2nd is
(1) $\frac{n(n+1)d^2}{3}$ (2) $\frac{n(n+1)}{2}d^2$ (3) $a + \frac{n(n+1)d^2}{2}$ (4) $\frac{n(n+1)\,|\,d\,|}{(2n+1)}$

B-8. Mean deviation from the mean for the observations – 1, 0, 4 is

(1) $\sqrt{\frac{14}{3}}$ (2) $\frac{2}{3}$ (3) 2 (4) 3

B-9. If $\bar{X}$ is the mean of x_1, x_2, x_3 ..... x_n. Then the algebraic sum of the deviations about mean $\bar{X}$ is

(1) 0 (2) $\frac{\bar{X}}{n}$ (3) $n\bar{X}$ (4) $(n-1)\bar{X}$

B-10. If the algebraic sum of deviations of 20 observation from 30 is 20, then the mean of the observation is

(1) 30 (2) 30.1 (3) 29 (4) 31.

Section (C) : Variance, Standard deviation and coefficient of variation.

C-1. Variance of first 20 natural number is

(1) $\frac{133}{4}$ (2) $\frac{379}{12}$ (3) $\frac{133}{2}$ (4) $\frac{399}{4}$

C-2. The mean & variance of 7 observations are 8, 16 respectively. If 5 of the observations are 2, 4, 10, 12, 14, then the LCM of remaining two observations is

(1) 16 (2) 24 (3) 20 (4) 14

C-3. If n = 10, $\bar{x} = \sqrt{12}$, $\sum x_2 = 1560$, then standard deviation σ is

(1) 12 (2) 13 (3) $\sqrt{166}$ (4) $\sqrt{12}$

C-4. The mean of distribution is 4 if coefficient of variation is 58%. Then standard deviation of distribution is

(1) 2.23 (2) 3.23 (3) 2.32 (4) 2.75

C-5. The sum of squares of deviations for 10 observations taken from mean 50 is 250. The co-efficient of variation is

(1) 50% (2) 10% (3) 40% (4) 30%

C-6. Standard deviation is independent of

(1) change of scale & origin (2) change of scale but not origin

(3) change of origin but not scale (4) neither change of scale non origin

C-7 What is standard deviation of the set of observations 32, 28, 29, 30, 31?

(1) 1.6 (2) $\sqrt{2}$ (3) 2 (4) None of these

C-8. If the standard deviation of x_1, x_2, ... x_n is 3.5, then the standard deviation of $-2x_1 - 3, -2x_2 - 3, \ldots -2x_n - 3$ is

(1) – 7 (2) – 4 (3) 7 (4) 1.75

C-9. The marks of some students were listed out of a maximum 100. The standard deviation of marks was found to be 9. Subsequently the marks raised to a maximum of 150 and standard deviation of new marks was calculeted. The new standard deviation

(1) 9 (2) 13.5 (3) –13.5 (4) –9

Exercise-2

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. Find the arithmetic mean of ${}_{2n+1}C_0$, ${}_{2n+1}C_1$, ...${}_{2n+1}C_n$.

(1) $\frac{2^{2n+2}}{n}$ (2) $\frac{2^{2n}}{n+1}$ (3) $\frac{2^{n+1}}{n+1}$ (4) None of these

2. A variable takes the values of 0, 1, 2, ... , n with frequencies proportional to the binomial coefficients ${}_nC_0$, ${}_nC_1$, ${}_nC_2$, ... , ${}_nC_n$, then mean of the distribution is

(1) $\frac{n(n+1)}{4}$ (2) $\frac{n}{2}$ (3) $\frac{n(n-1)}{2}$ (4) $\frac{n(n+1)}{2}$

3. Following is the record of goals scored by team A in football session

Numbers of goals scored	0	1	2	3	4
Numbers of match is	1	9	7	5	3

for team 'B' mean number of goals scored per match was 2 goals with standard deviation 1.25 . The team which is more consistant

(1) A (2) B

(3) A & B both are equal (4) neither A nor B

4. The mean of two samples of sizes 200 and 300 were found to be 25, 10 respectively. Their standarddeviations were 3 and 4 respectively. Find the variance of combined sample of size 500

(1) 70 (2) 60 (3) 67.2 (4) 80

5. The first of the two samples has 100 items with mean 15 and S.D. 3. If the whole group has 250 items with mean 15.6 and S.D. = $\sqrt{13.44}$ then S.D. of the second group is

(1) 5 (2) 4 (3) 6 (4) 3.52

6. The average marks of 10 students in a class was 60 with standard deviation 4. While the average marks of other 10 students was 40 with a standard deviation 6. If all the 20 students are taken together, their standard deviation will be

(1) 5.0 (2) 7.5 (3) 9.8 (4) 11.2

7. The mean and variance of 5 observations of an experiment are 4 and 5.2 respectively. From these observations three are 1, 2 and 6 and $\lambda = |x_1 - x_2| + 8$ where x_1 & x_2 are remaining observations. Then number of solution of equation $10 - x_2 - 2x = \lambda$ are

(1) 1 (2) 2 (3) 3 (4) 4

8. The mean and variance of 10 numbers were calculated as 11.3 and 3.3 respectively. It was subsequently found that one of the a number was misread as 10 instead of 12. How does the variance change.

(1) variance decreases (2) variance increases

(3) nothing can be said about variance (4) variance remains unchanged.

Comprehension # 1_ (Q. No. 9 to 11)

As median divides an arranged series into two equal parts, in similar way quartile divides an arranged series in 4 equal part. For ungrouped frequency distribution formula of finding i_{th} quartile =

$Q_i = \left\{i \cdot \left(\frac{N+1}{4}\right)\right\}^{th}$ term, i = 1, 2, 3.

Quartile deviation : half of difference between upper quartile & lower quartile.

$\Rightarrow$ Quartile deviation (Q.D.) = $\frac{1}{2}(Q_3 - Q_1)$ $\Rightarrow$ Coefficient of quartile deviation = $\frac{Q_3 - Q_1}{Q_3 + Q_1}$.

9. If 1, 2, 3, 4, 5, 6, 7, are numbers then Q_1 & Q_3 are respectively

(1) 2, 4 (2) 2, 6 (3) 4, 6 (4) 3, 5

10. Quartile deviation of the following numbers 10, 8, 12, 11, 14, 9, 6 is

(1) 2 (2) 10 (3) 1/2 (4) 1

11. Coefficient of quartile deviation of numbers 6, 8, 9, 10, 11, 12, 14 is

(1) 1/5 (2) 1/10 (3) 2/5 (4) 1/4

Comprehension # 2 (Q. No. 12 to 14)

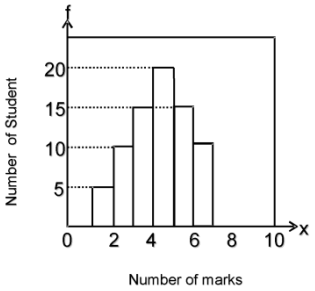
To analyse data using mean, median and mode, we need to use the most appropriate measure of central tendency. The mean is useful for predicting future results when there are no extreme values in the data set. The median may be more useful than the mean when there are extreme values in the data set as it is not affected by the extreme values. The median is most commonly quoted figure used to measure property prices as mean property price is affected by a few expensive properties that are not representative of the general property market. The mode is useful when the most common item or characteristic of a data set is required. The mode has applications in printing. It is important to print more of the most popular books.

12. For the data shown, the value of appropriate measure of central tendency is

No.of staff	1	2	4	5	3	2
Salary (In rupees)	15000	10000	7000	12000	90000	95000

(1) 95000 (2) 18350 (3) 90000 (4) 12000

13. For a normally distributed sample as shown, then most appropriate representative of data is



(1) Mean (2) Mode

(3) Median (4) any one of mean or median

14. Based upon collection of data of numbers of days it snows, rains or it is sunny in a month for three month December, January and February of last year, the weather forecast points that snow is likely to be in January. Which measure is used for this forecast ?

(1) Mean (2) Mode (3) Median (4) Range

PART - II : MISCELLANEOUS QUESTIONS

Statistics

Section (A) : ASSERTION/REASONING

DIRECTIONS :

Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

(1) Both the statements are true.

(2) Statement-I is true, but Statement-II is false.

(3) Statement-I is false, but Statement-II is true.

(4) Both the statements are false.

A-1. **Statement-1 :** If $\sum_{i=1}^{9}(x_i - 8)$ = 9 and $\sum_{i=1}^{9}(x_i - 8)^2$ = 45 then S.D. of $x_1, x_2, \ldots\ldots, x_9$ is 2.
Statement-2 : S.D. is independent of change of origin.

A-2. **Statement-1 :** Mean cannot be represented graphically.
Statement-2 : Mean may not coincide with anyone of the actual values.

Section (B) : MATCH THE COLUMN

B-1

	Column - I		**Column - II**
(1)	Better measure of central tendency for data 1, 7, 8, 9, 9 is	(p)	Mean
(2)	Which is not independent of change of scale ?	(q)	Median
(3)	Which is not dependent on change of origin ?	(r)	Mode
(4)	The value of range of data is always greater than or equal to	(s)	S.D.

B-2 Let $n \in N$.

	Column I		**Column II**
(1)	S.D. of 2, 4, 6, ... 2n ; $n \in N$	(p)	n
(2)	S.D. of 1, 3, 5, ..., 2n – 1 ; $n \in N$	(q)	$\frac{n+1}{2}$
(3)	Mean of 1,3,5, ...2n–1 ; $n \in N$	(r)	$\sqrt{\frac{n^2-1}{3}}$
(4)	Median of 1,3,5,.....,2n – 1	(s)	$\sqrt{\frac{n^2-1}{12}}$

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. If the daily earnings (in rupees) of 12 workers in a factory are 16, 11, 3, 7, 5, 28, 9, 31, 28, 43, 15 ,17, then which of the following is(are) true

(1) mean = 17.75 (2) median = 15.5

(3) mode = 28 (4) mean deviation about mean = $9.8\overline{3}$

C-2 If first sample of 25 variates has the mean 40 and standard deviation 5 and a second sample of 35 variates has the mean 45 and standard deviation 2, then which of the following is/are true

(1) mean of combined sample space = 42.917

(2) mean of combined sample space = 32.9

(3) standard deviation of combined sample space = 3.34

(4) standard deviation of combined sample space = 4.34

C-3. Which of the following is false :

(1) Algebraic sum of deviations of observation from their mean is zero

(2) If S.D. of x_i(i = 1, 2, 3, ... n) is σ then S.D. of hx_i is hσ

(3) Median is severely affected by fluctuations in extreme values

(4) Mean deviations of a given set of observations is least when taken about their median.

Exercise-3

Marked Questions may have for Revision Questions.

*** Marked Questions may have more than one correct option.**

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Consider the following statements

(i) Mode can be computed from histogram (ii) Median is not independent of change of scale

(iii) Variance is independent of change of origin and scale

Which of these is/are correct? **[AIEEE 2004, (3, –1), 225]**

(1) Only (i) (2) Only (ii) (3) Only (i) and (ii) (4) (i), (ii) and (iii)

2. In a series of 2n observations, half of them equal a and remaining half equal – a. If the S.D. of the observations is 2, then |a| equals **[AIEEE 2004, (3, –1), 225]**

(1) $\frac{1}{n}$ (2) $\sqrt{2}$ (3) 2 (4) $\frac{\sqrt{2}}{n}$

3. If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately **[AIEEE 2005, (3, –1), 225]**

(1) 20.5 (2) 22.0 (3) 24.0 (4) 25.5

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4. Let $x_1, x_2, ... x_n$ be n observations such that $\sum x_i^2$ = 400 and $\sum x_i = 80$. Then a possible value of n among the following is **[AIEEE 2005, (3, –1), 225]**

(1) 12 (2) 9 (3) 18 (4) 15

5. Suppose a population A has 100 observations 101, 102, ..., 200 and another population B has 100 observations 151, 152, ..., 250. If V_A and V_B represent the variances of the two populations respectively, then V_A/V_B is **[AIEEE 2006, (3, –1), 225]**

(1) 1 (2) 9/4 (3) 4/9 (4) 2/3

6. The average marks of boys in a class is 52 and that of girls is 42. The average marks of boys and girls combined is 50. The percentage of boys in the class is **[AIEEE 2007, (3, –1), 120]**

(1) 40% (2) 20% (3) 80% (4) 60%

7. The mean of the number a, b, 8, 5, 10 is 6 and the variance is 6.80. Then which one of the folowing gives possible values of a and b ? **[AIEEE 2008, (3, –1), 105]**

(1) a = 3, b = 4 (2) a = 0, b = 7 (3) a = 5, b = 2 (4) a = 1, b = 6

8. **Statement-I** The variance of first n even natural numbers is $\frac{n^2-1}{4}$ **[AIEEE 2009, (4, –1), 144]**

Statement-II The sum of first n natural numbers is $\frac{n(n+1)}{2}$ and the sum of squares of first n natural numbers is $\frac{n(n+1)(2n+1)}{6}$ **.**

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

9. If the mean deviation of numbers 1, 1 + d, 1 + 2d, ...,1 + 100d from their mean is 255, then the value of d is equal to- **[AIEEE 2009, (4, –1), 144]**

(1) 10.0 (2) 20.0 (3) 10.1 (4) 20.2

10. For two data sets, each of size 5, the variance are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is **[AIEEE 2010, (4, –1), 144**

(1) $\frac{11}{2}$ (2) 6 (3) $\frac{13}{2}$ (4) $\frac{5}{2}$

11. If the mean deviation about the median of the numbers a, 2a, ..., 50a is 50, then |a| equals : **[AIEEE 2011, (4, –1), 120]**

(1) 2 (2) 3 (3) 4 (4) 5

12. A scientist is weighing each of 30 fishes. Their mean weight worked out is 30 gm and a standard deviation of 2 gm. Later, it was found that the measuring scale was misaligned and always under reported every fish weight by 2 gm. The correct mean and standard deviation (in gm) of fishes are respectively :

[AIEEE 2011, (4, –1), 120]

(1) 32, 2 (2) 32, 4 (3) 28, 2 (4) 28, 4

13. Let x_1 , x_2 , ..., x_n be n observations, and let $\bar{x}$ be their arithmetic mean and σ^2 be the variance

Statement-1 : Variance of $2x_1$, $2x_2$, ..., $2x_n$ is $4\sigma^2$. **[AIEEE 2012, (4, –1), 120]**

Statement-2 : Arithmetic mean $2x_1$, $2x_2$, ..., $2x_n$ is $4\bar{x}$.

(1) Statement-1 is false, Statement-2 is true.

(2) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for Statement-1.

(3) Statement-1 is true, statement-2 is true; statement-2 is **not** a correct explanation for Statement-1.

(4) Statement-1 is true, statement-2 is false.

14. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given ? **[AIEEE - 2013, (4, –1),360]**

(1) mean (2) median (3) mode (4) variance

15. The variance of first 50 even natural number is **[AIEEE - 2014, (4, –1),360]**

(1) $\frac{833}{4}$ (2) 833 (3) 437 (4) $\frac{437}{4}$

16. The mean of the data set comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3, 4 and 5 are added to the data, then the mean of the resultant data, is **[JEE(Main) 2015, (4, – 1), 120]**

(1) 16.8 (2) 16.0 (3) 15.8 (4) 14.0

17. If the standard deviation of the numbers 2, 3, a and 11 is 3.5, then which of the following is true?

[JEE(Main) 2016, (4, – 1), 120]

(1) $3a^2 – 32a + 84 = 0$ (2) $3a^2 –34a + 91 = 0$ (3) $3a^2 –23a + 44 = 0$ (4) $3a^2 –26a + 55 = 0$

Statistics

Answers

EXERCISE - 1

PART- I

Section (A)

A-1.	(1)	**A-2.**	(4)	**A-3.**	(1)	**A-4.**	(2)	**A-5.**	(1)	**A-6.**	(4)	**A-7.**	(1)
A-8.	(3)	**A-9.**	(3)	**A-10.**	(1)	**A-11.**	(2)	**A-12.**	(2)	**A-13.**	(3)		

Section (B)

B-1.	(3)	**B-2.**	(1)	**B-3**	(1)	**B-4.**	(4)	**B-5**	(2)	**B-6.**	(1)	**B-7.**	(4)
B-8.	(3)	**B-9.**	(1)	**B-10.**	(4)								

Section (C)

C-1.	(1)	**C-2.**	(2)	**C-3.**	(1)	**C-4.**	(3)	**C-5.**	(2)	**C-6.**	(3)	**C-7**	(2)
C-8.	(3)	**C-9.**	(2)										

EXERCISE - 2

PART- I

1.	(2)	**2.**	(2)	**3.**	(1)	**4.**	(3)	**5.**	(2)	**6.**	(4)	**7.**	(1)
8.	(1)	**9.**	(2)	**10.**	(1)	**11.**	(1)	**12.**	(4)	**13.**	(1)	**14.**	(2)

PART- II

Section (A)

A-1. **(1)** **A-2.** **(1)**

Section (B)

B-1 (A) → (q, r) ; (B) → (p, q, r, s) ; (C) → (s) ; (D) → (s)

B-2 A → r ; B → r ; C → p ; D → p

Section (C)

C-1. (1,2,3,4) **C-2** (1,4) **C-3.** (2,3)

EXERCISE - 3

PART- I

1.	(3)	**2.**	(3)	**3.**	(3)	**4.**	(3)	**5.**	(1)	**6.**	(3)	**7.**	(1)
8.	(4)	**9.**	(3)	**10.**	(1)	**11.**	(3)	**12.**	(1)	**13.**	(4)	**14.**	(4)
15.	(2)	**16.**	(4)	**17.**	(1)								