# ST. LAWRENCE HIGH SCHOOL

## A JESUIT CHRISTIAN MINORITY INSTITUTION

### First Term Examination– 2019

**Sub: Statistics    Model Answer          Class: XI $A_1$, $A_2$, D      F. M. 70**

**Duration:3hrs 15 mints                                    Date: 9/08/2019**

Group A

1. Choose the correct option.                                    1X10=10

   a) Abscissa of the point of intersection of the less than and greater than ogives corresponds to
      Ans.iii) Median

   b) A frequency distribution of a variable can be represented by a frequency polygon when the variable is a

      Ans.iii) Both i) and ii)

   c) The range of a variable is affected by change of
      Ans. ii)Scale

   d) Colour of flower is

      Ans.ii) Attribute

   e) The A.M. of a variable x is 100. The A.M. of the variable 5x-10 is:
      Ans.iii) 490

   f) The sum of the deviations of $X_1$, $X_2$, $X_3$, .....$X_n$ from their arithmetic mean of X is

      Ans.  Zero

   g) If a variable assumes the values 1,2,3,4.....10 with frequencies 1,2,3......10 respectively then its arithmetic mean is
      Ans.            iii) 7                          iv) None of These

   h) The harmonic mean of the reciprocals of first seven positive integers is

      Ans ii)    $\frac{1}{4}$

   i) Proportion of females in a group of 20 persons is

      Ans.   iii)Discrete variable

j) The mean of first n odd positive integer is

   Ans.        iii) n

## Group B

2.  Answer the following.                                              1X8=8
a)  What is the GM of observations 5,1,0,2,4?    Ans. zero
b)  Write down one advantage of interview method. Ans. The chaqnce of non-response gets fairly diminished.
c)  A train ran at x km per hour from A to B and returned from B to A at y km per hour. What is the average speed?  ANs. 2xy/x+y
d)  Define frequency density. Ans. Class frequency/ class width
e)  What is body of a table. Ans. It contains all the numerical information
f)  If the relation between two variables x and y be 5x +7y =28 and and median of y be 3, then find out median of x? ANs. 7/5
g)  How do you find the class mark of a class interval? Ans. ½(Upper class boundary + lower class boundary)
h)  When do you use step diagram? Ans. To represent cumulative frequency of discrete data.

## Group C

3.  Answer the following.                                              2X4=8
   a)  Differentiate between Ordinal data and nominal data.  Ans. There is clear ordering in ordinal data  but there is no such ordering in nominal data
   b)  Define Secondary data with example.  Ans. Data comes from a  source other than  the researcher.
   c)  What is Cross-Sectional Data?   Ans. In case of Time series and spatial series data when each individual is divided into two or more subgroups.
   d)  The HM and GM of 2 positive observation are 12 and 18.Find their AM.   Ans. $X_1 X_2$= 18x18 , $2x_1 x_2 / x_{1+} x_2$ =12 or $X_1 + X_2$ =54   Therefore  54/2= 27

## Group D

4.  Answer the following.                                              3X8=24
   a)  Show that combined Harmonic Mean (H) lie between the harmonic mean of individual groups $H_1$ and $H_2$ respectively.  Ans.    $H = (n_1 + n_2) \div (\frac{n_1}{H_1} + \frac{n_2}{H_2})$

       Let $H_1 \le H_2$ we can show   $(n_1 + n_2) \div (\frac{n_1}{H_1} + \frac{n_2}{H_2}) \ge (n_1 + n_2) \div (\frac{n_1}{H_1} + \frac{n_2}{H_1}) \rightarrow H \ge H_1$

       Again  we can show $H \le H_2$ therefore $H_1 \le H \le H_2$

   b)  Write down the advantages of mail questionnaire method.

Ans. I) cost effective ii)the chance of interviewer bias is eliminated iii) people may feel less hesitant to answer few questions.

c) Compute the mean deviation about median of the values 3,5,9,1 and 2. Ans.    2.2

d) Show that Mean deviation about mean depends on only scale change.   Ans. Refer to page number 98 ( book-Introduction to statistics by Prashanta kumar Giri and Jiban Banerjee)

e) How will you draw a Histogram?   Ans. Class boundaries should be plotted along x axis. Frequency density along Y axis. Rectangular bars should be drawn on each class corresponding to their frequency density.  Each rectangle represents absolute frequency of each class.

f) Write the disadvantages of Direct Personal Observation Method?   Ans. I) Time consuming and costly ii)Many trained employees are required  iii) not suitable for large area.

g) What are the characteristics of a good table?  Ans. I) There should be parity in length and breadth of a table. Ii) Table number should be given for future reference.  Iii)The units of the data should mentioned in the stub and caption. Iv) data which are likely tobe compared should be placed as close as possible.

h) Derive the formula of Combined Geometric Mean.   Ans. $\prod_{i=1}^{n1} x1i = G_1^{n1}$   and $\prod_{i=1}^{n2} x2i$ $=G_2^{n2}$   , Combined geometric mean G= $(G_1^{n1} G_2^{n2})^{1/n_1+n_2}$

<div align="center">Group E</div>

5. Answer the following.

a) Describe different parts of a table. Ans-  Table number- title-caption-stub- body-source- footnote

b) If the values of a variable are in GP, then prove that AM,GM and HM of the values are also in GP.

Ans- AM= $\dfrac{a+ar+ar^2+\cdots\ldots+ar^{n-1}}{n}$ =a/n $\dfrac{r^n-1}{r-1}$

GM= $(a.ar.ar^2\ldots\ldots\ldots\ldots ar^{n-1})^{1/n}$= $(a^n)^{1/n}(r . r^2.r^3\ldots\ldots r^{n-1})^{1/n}$= a $[r^{(1+2+3\ldots+n)}]^{1/n}$= $ar^{n-1/2}$

HM= $\dfrac{n}{\frac{1}{a}+\frac{1}{ar}+1/ar^{2+}\cdots\ldots+1/ar^{n-1}}$ = $\dfrac{na}{\frac{(\frac{1}{r})^{n-1}}{\frac{1}{r}-1}}$ = na $\dfrac{r^{n-1}(r-1)}{r^n-1}$

$GM^2=a^2r^{n-1}$ , AM X HM= a/n $\dfrac{r^n-1}{r-1}$ x na $\dfrac{r^{n-1}(r-1)}{r^n-1}$ = $a^2r^{n-1}$

$GM^2$=AM X HM

c) Find the arithmetic mean of 7, 77, 777…… upto p-th term.

Ans. Sum= 7+77+777+….upto P terms

= 7[1+11+111+……+ upto P terms]

=7/9[ 9+99+999+…+upto P terms.]

= 7/9[ (10-1) +(100-1) +(1000-1)+……..upto P terms]

=7/9[ 10 +100+1000 –(1+1+1+....upto P terms]

=7/9[$10\frac{10^p-1}{10-1}$ - P] = 70/81($10^p$-1) – 7p/9

**Mean of x= 70/81p($10^p$-1) – 7/9**

d) If a variable x takes the values 1,2....r with $F_1$, $F_2$,....$F_r$ (=n) as the corresponding less than Type Cumulative Frequencies, then prove that

Mean of X = (r+1) - $\frac{1}{n}\sum_{i=1}^{r} F_i$

**Ans. Let the $F_1$,($F_2$- $F_1$), ($F_3$ –$F_2$)......($F_r$-$F_{r-1}$) as the frequencies corresponding to the values 1,2,3,....r**

$\sum_{i=1}^{n} xifi$= 1 $F_1$ + 2.($F_2$- $F_1$) + 3 ($F_3$ –$F_2$)+ .......+r($F_r$-$F_{r-1}$)

= $F_1$+ (2$F_2$-2$F_1$) + (3$F_3$ –3$F_2$) + ....+ (r$F_r$-r$F_{r-1}$)

= r$F_r$- ( $F_1$+ $F_2$ + $F_3$+...........$F_{r-1}$)

=(r+1)$F_r$ - $\sum_{i=1}^{n} Fi$= (r+1) n - $\sum_{i=1}^{n} Fi$          since $F_{r=}$ n

**Mean of x= $\frac{\sum xifi}{n}$ = (r+1) - $\frac{1}{n}\sum_{i=1}^{n} Fi$**