



Mathematical Sciences Department
Central Connecticut State University
New Britain, Connecticut

Syllabus for Statistics 104

Course No. : Stat 104-02, Tuesday & Thursdays, 9:30 am, Frank J. DiLoretto Hall, Room 309.

Conditions: Grade of C- or higher in Math 101, or exemption by CCSU Math Placement Exam (or MathStat)

Credit Hours: 3 Semester hours

Professor: Dr. George M. Murphy

Pleasant Valley Professionals, Etc!

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Office Hours: Faculty Computer Center (basement of Willard Hall), Tuesdays and Thursdays, from 11:00 am to Noon, and Tuesdays from Noon onward. Other times by appointment only.

Course description: Intuitive treatment of some fundamental concepts involved in collecting, presenting, and analyzing data. Topics include frequency distributions, graphical presentations, measures of relative position, measures of variability, probability, probability distributions (binomial and normal), sampling theory, regression and correlation. No credit given for students with credit for STAT 108, 200, 215, 314, or 315. [Skill area II].

Textbooks: *Discovering Statistics* by Daniel T. Larose, W.H.Freeman & Co., New York [brief edition] (*mandatory*)

A Microsoft Excel Companion for Business Statistics, 3rd Edition, by David Eldredge, SouthWestern-Thomson, Mason, Ohio (*highly recommended*).

Course Objective: To consider and appreciate the strengths, limitations and usefulness of general statistical methods used in the collection, presentation, analysis and interpretation of data. Lectures, demonstrations, and problem solving will be included. *This is a student work-intensive course.* You are expected to assume responsibility for reading and understanding chapters One through Nine in the primary text. Emphasis will be on problem solving. ALL of the ODD numbered problems in the chapters covered are ASSIGNED.

Attendance: Mandatory and directly related to final grades. Unexcused absences will be reflected by final grade reductions. Attendance will be taken at every session. The fiction that up to three (3) absences from any one course is acceptable, is just that- a fiction! (Not true !) There is no "official" acceptable number of absences before a student may expect to lose credit for non-participation. Final grades will be reduced significantly, (perhaps to beyond the point of course failure), if there are numbers of unexcused absences.

Evaluations: Your performance in the course will depend on how well your work compares with the rest of the class. A significant body of research indicates that the fairest approach is a comparison against one's fellow classmates. There will be five (5) exams, one per quarter, and a final summary exam. Your efforts on each of the five exams, and the one composite grade for turned-in homework assignments, will be converted to T Scores. [A T Score is a standardized score (using the probability distribution), based on the distribution of grades within a class on a particular examination, with the average (or mean score) set to 50, with the standard deviation set to 10 (67% of scores between 40 & 60)]. Your final grade for the course will depend on the average of your six T Scores, as shown in the table below.

T Score Average		Grade		T Score Average		Grade
59 and above (↗)	inclusive	A		42 to 44	inclusive	C
57 to 58	inclusive	A-		39 to 41	inclusive	C-
54 to 56	inclusive	B+		36 to 38	inclusive	D+
51 to 53	inclusive	B		33 to 35	inclusive	D
48 to 50	inclusive	B-		31 to 32	inclusive	D-
45 to 47	inclusive	C+		30 and below (↘)	inclusive	F

Test materials will be taken from the text, from assigned readings, from classroom lectures, video presentations, discussions and demonstrations, and from supplementary materials presented in class. You are responsible for all materials assigned here and all materials covered in class, including announcements and changes to the syllabus.

Make Up Exams: I do not give make-up exams. At my discretion, I may grant a make-up if there is a valid documented medical reason, and only if I am personally notified in advance. (A message on my answering machine just doesn't suffice!)

Homework: There will be three (3) instances of assigned homework to be turned in, evaluated, and graded.. The homework assignments will be summarized and count as one exam grade (see Evaluations paragraph, stated previously).

The turned in homework must comply with *each* and *every* element of the specified format, as detailed on the homework page (later on in this syllabus). Submitted homework that does not meet format requirements *will not be evaluated*, and will receive a zero grade until correctly submitted. It must be submitted, correctly, or course failure will occur. No exceptions will be granted.

Students with special needs: Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share. I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact Student Disability Services, room 241, Copernicus Hall if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

University policies:

1. You **must** take the final examination at the time specified in the course selection book (as repeated herein in this syllabus).
2. Cell phones and other communication devices must be turned off **at all times** during class.
3. In the event of a weather emergency which requires curtailment or cancellation of classes, listen to WTIC (1080 AM) or call 860.832.3333 for the "general snow message."

Resources Available: The Learning Center is located in rooms 241 and 242, Copernicus Hall. Free tutoring is available. A schedule for the hours of the Center's operation will be posted soon after the beginning of the semester. One might consider forming a study group with other students in your section. A list of private tutors for hire is available in the Math Department office, Room 107 Marcus White Hall, 832.2835.

** It is *strongly suggested* that students read the assigned materials prior to the date wherein it will be discussed in class.

Tentative Course Schedule

Week of	Subjects covered	Chapter
Aug. 30th	The nature of statistics	One
Sep. 6th	Describing data using Charts & Graphs	Two
Sep. 13th	Describing data using Charts & Graphs	Two
Sep. 20th	Describing data numerically	½ Three
**	First Quarter exam, Take home Sep. 23, turn in Sep. 26	1 to ½ Three
Sep. 27th	Describing data numerically (continued)	Three
Oct. 4th	Describing relationship between two variables	Four
Oct. 11th	Probability	½ Five
**	Second Quarter Exam, take home Oct 14, turn in Oct 19	½ 3 to ½ 5
Oct. 18th	Probability, (continued)	Five
****	Last day to drop course without approval, "W" will be entered	
Oct. 25th	Random Variables	Six
Nov. 1st	Normal distributions	Six
Nov. 8th	Sampling Distribution	Seven
**	Third Quarter exam, take home Nov 11th, turn in Nov. 16th	5 thru 7
Nov. 15th	Confidence Intervals	Eight
Nov. 22nd	Confidence Intervals, (continued)	Eight
**	Thanksgiving Recess: Nov 24 thru 28	
Nov. 29th	Hypothesis Testing	Nine
Dec 6th	Hypothesis Testing (continued) and review	Nine
**	Fourth Quarter exam take-home portion, delivered during last class day on Dec 9 th , to be returned on Final Exam day prior to the beginning of the in-class Review portion of the Final Exam.	Eight & Nine
TBA	11:00 am to 1:00 pm, Final Exam, in classroom, FD 309	

Philosophy of the Course: At the basic level of this course, Statistics is closely related to the process of analysis. Each problem has parameters that can be evaluated and used to shape the final solution, the questions that need to be answered. It is the *homework* where the processes are practiced, that help to reinforce correct procedures in the move toward the solutions of questions of interest. The approach to Statistics requires a structure that can be easily recognized, and has roots in what has been described as the Scientific Method: "*what do we know, what do we want to know, and how can we get there?*" This course will hopefully show a way to look at data, and to organize data in many different ways, depending on the answer required to solve the presented problem.

Trouble with the materials? If you are having difficulty with the materials in the course, **please tell me!..** If you do not tell me of your difficulty, how can I know to modify my instruction, so that you may better understand?. The professor is just a guide, it is the student himself (herself) who is responsible for the work, to apply the opportunities for knowledge that is put before them. I do offer tutorial assistance during my office hours, first come first served. If you do not tell me that you are having difficulty, I will assume that things are going well with you, and you do not need my help.

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The last day to withdraw from a course, without penalty, is **Monday, October 25th**. Approvals for withdrawal are not required; however, it is strongly recommended that students consult with their academic advisor prior to deciding to withdraw. Cessation of attendance, notice to the instructor, or phone calls to the enrollment center are not considered official notice of a student's intent to drop the course. After October 25th, withdrawals are allowed **only under extenuating circumstances** and require approval of the course instructor, department chair and the Dean of the School of Arts and Sciences. Poor academic performance is **not** considered an extenuating circumstance.

*** *Homework Parameters:--**

[a scientific calculator is required to accomplish the homework and the calculations in the exams].

..... **Each and every** homework assignment must meet **every one** of the characteristics listed below:

- ☞ **Plain, white paper, (No Lines!)** (standard sized Xerox/copy/inkjet/laser printer paper) (8.5 x 11 inches)
- ☞ printed in portrait orientation [longest dimension top to bottom] Type size, no smaller than 8 point type, nor no larger than 12 point type size Pages stapled together, in sequence, **Upper Right hand** corner..

☞ **On Each and Every page, TOP LEFT CORNER**, the following student identification must be found :--

Student's **family (last) name**, followed by a **comma**, then the **given (first) name**
 Next line, student's ID number (**University ID**)
 Next line, name of the course and section number [**Statistics 104-02**]
 Next line, date of submission of the homework assignment

skip the next two lines (blank)

Next line, number of the chapter, then page number, then the number of the problem to be solved (*i.e.*, Chapter 1, page 26, no.7)
 Then skip two blank lines before printing out the solution of the next problem.

As to how it might look as submitted, please **note the model below**:---↓

.....
Murphy, George M
030-88-0890
Statistics 104-02
15 October 2010

Ch. 1, page 26, no. 12 jsdf kgf,eror pekg glxcxvm iwqfu uikjfgl456 fdg99 23jd and so on.....

Ch. 2, page 87, no. 7 hdj fgklcj iw uroptn xz mcvxm vcxm ertp pvxcx Etc.....

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***** Submitted Homework that does not meet the all of requirements of the (above) specified format will not be evaluated or corrected, and will receive a zero grade until submitted correctly.**

You are responsible for understanding and abiding by the University's policy on academic integrity. Information on this policy may be found at <http://www.ccsu.edu/Academicintegrity/> This policy is rigorously enforced by the department of Mathematical Sciences.

Appendices

Appendix A relates to Creation of T scores

Appendix B relates to the Excel Statistical Functions

"You boil it with sawdust, and salt it with glue,
 And condense it with locus' and tape;...
 Still keeping one principal object in view,
 To preserve its symmetrical shape!"

TABLE XI. Table of T Scores*

PROPORTION	T SCORE	PROPORTION	T SCORE
.001	20	.540	51
.002	21	.579	52
.003	22	.618	53
.004	23	.655	54
.005	24	.692	55
.006	25	.726	56
.008	26	.758	57
.011	27	.788	58
.014	28	.816	59
.018	29	.841	60
.023	30	.864	61
.029	31	.885	62
.036	32	.903	63
.045	33	.919	64
.055	34	.933	65
.067	35	.945	66
.081	36	.955	67
.097	37	.964	68
.115	38	.971	69
.136	39	.977	70
.159	40	.982	71
.184	41	.986	72
.212	42	.989	73
.242	43	.992	74
.274	44	.994	75
.308	45	.995	76
.345	46	.996	77
.382	47	.997	78
.421	48	.998	79
.460	49	.999	80
.500	50		

* Table XI is modified from a table published by the Air Training Command in ATRC Manual 50-900-9 prepared under the direction of J. R. Berkshire.
 The proportions refer to the proportion of the total frequency below a given score plus $\frac{1}{2}$ the frequency of that score. T scores are read directly from the given proportions.

"T" score is a standard score with a \bar{x} of 50,
 and a σ of 10

APPENDIX B. EXCEL STATISTICAL FUNCTIONS

1. What Are the Statistical Functions? Excel includes hundreds of built-in functions. These are predefined formulas for performing frequently needed computations. Excel presents its functions in categories such as *Financial*, *Date & Time*, *Math & Trig*, and *Database*. One of the function categories is *Statistical*. The statistical category includes 80 statistical functions.

2. How Do the Statistical Functions and the Data Analysis Tools Differ? The statistical functions duplicate the capabilities of parts of the *Data Analysis Tools* discussed in Appendix A. However, there are differences in these two Excel features. The differences include the following.

- The results from the *Tools* usually are numbers, not formulas. Thus, a change in the input data analyzed by a *Tool* will not change the statistical results already computed by it. To get the new results the *Tool* will have to be initiated again through its dialog box. In contrast, the output from a *function* is a formula. Accordingly, whenever the input data for the *function* are changed, the numerical results computed by it are changed. (Note: Two of the *Data Analysis Tools*, MOVING AVERAGE and EXPONENTIAL SMOOTHING, are exceptions to this difference. These two tools do result in formulas, not numbers being entered into the worksheet. Also, the COVARIANCE tool results in formulas for some of its outputs, the variances for the input variables.)
- The output from a *Data Analysis Tool* is formatted and labeled whereas that from a *function* merely presents the numerical results. The user must provide labels and editing as needed

- A *Tool* generally provides the results that would be obtained from more than one function.
- *Tools* cannot be used in Excel formulas but statistical functions can.

3. How Do I Use the Statistical Functions? Access to the statistical functions is facilitated through Excel's INSERT FUNCTION feature. When you click the icon labeled with the symbol *fx* next to the *Formula box*, you will be presented with the *Insert function* dialog box (see Figure 1.6 of Chapter 1 or Figure 3.7 of Chapter 3). The label *Or select a category* identifies a drop-down list box. It presents a list of the names of Excel's function categories plus the three categories of *Most Recently Used*, *All* and *User Defined*. If you click on the category *Statistical*, the scrolling list at the bottom of the dialog box presents the 80 statistical functions.

To select one of the statistical functions, highlight the function name by clicking on it. A brief description of the function will be displayed at the bottom of the dialog box. Much greater detail about the selected function can be obtained by clicking on the *Help on this function* label in the bottom left corner of the dialog box. This action will activate *Microsoft Excel Help* window.

If you click on the command button labeled **OK**, the dialog box for the function will be displayed (see Figure 3.8 of Chapter 3 for an example). Generally, this dialog box will present one or more text boxes for keying the required values. Again *help* is available through the *Help on this function* label. Once the required text boxes are completed, click on the **OK** button and the completed function will be entered into the active cell of the worksheet. The F2 key on the keyboard may be pressed in order to edit the function within the cell if it is necessary.

4. For What Analyses Are the Statistical Functions Used? The presentation of the uses of the statistical functions is perhaps most helpful if it is by category of analysis. Accordingly, the following list of the 80 Excel statistical functions is by the type of statistical analysis each supports. The 15 categories include six descriptive statistics categories, four probability distribution categories, one hypothesis testing and confidence interval category, and four regression and correlation categories.

The order of presentation of these 15 categories is that of a typical business statistics textbook. Within each category the functions are presented in alphabetical order. The entry for each of the statistical functions provides its name and purpose. The use of many of these is demonstrated throughout this manual. Refer to the index to find the specific location for each function. You may find further description of the functions with examples of their use through the Excel *help* facility. To access it, select the INSERT FUNCTION icon (that labeled with *fx* next to the formula box), next select the category *Statistical* and then select the specific function of interest. Finally, click on the *Help on selected function* label in the lower left corner of the dialog box. The result will be a detailed *help* window.

DESCRIPTIVE STATISTICS—MEASURES OF LOCATION

AVERAGE—computes the arithmetic average (the usual mean)

AVERAGEA— computes the arithmetic average but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain text, the word FALSE or are empty are evaluated as if they contained the number zero. Cells that contain the word TRUE are evaluated as if they contained the number 1.

GEOMEAN—computes the geometric mean (used for ratios, rates of changes and so on)

HARMEAN—computes the harmonic mean (rarely used in business applications)

MEDIAN—computes the median

MODE—computes the mode

TRIMMEAN—computes the trimmed mean (removes unusually small and/or large values)

DESCRIPTIVE STATISTICS—MEASURES OF VARIABILITY

AVEDEV—computes the average of the absolute deviations about the mean (MAD)

DEVSQ—computes the sum of the squared deviations about the mean

STDEV—computes the sample standard deviation ($n - 1$ in the denominator)

STDEVA—computes the sample standard deviation but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain text, the word FALSE or are empty are evaluated as if they contained the number zero. Cells that contain the word TRUE are evaluated as if they contained the number 1.

STDEVP— computes the population standard deviation (N in the denominator)

STDEVPA— computes the population standard deviation but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain text, the word FALSE or are empty are evaluated as if they contained the number zero. Cells that contain the word TRUE are evaluated as if they contained the number 1.

VAR—computes the sample variance ($n - 1$ in the denominator)

VARA—computes the sample variance but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain **text**, the word **FALSE** or are **empty** are evaluated as if they contained the number **zero**. Cells that contain the word **TRUE** are evaluated as if they contained the number **1**.

VARP—computes the population variance (N in the denominator)

VARPA—computes the population variance but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain **text**, the word **FALSE** or are **empty** are evaluated as if they contained the number **zero**. Cells that contain the word **TRUE** are evaluated as if they contained the number **1**.

DESCRIPTIVE STATISTICS—MEASURES OF SHAPE AND POSITION

KURT—computes the coefficient of kurtosis

SKEW—computes the coefficient of skewness

STANDARDIZE—computes the standardized value or z-score for a number

DESCRIPTIVE STATISTICS—SPECIFIC VALUES

LARGE—determines the k^{th} largest value in a range (determines largest value if k is 1, the second largest if k is 2, and so on)

MAX—determines the maximum (largest) value in a range

MAXA— determines the maximum (largest) value in a range but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain **text**, the word **FALSE** or are **empty** are evaluated as if they contained the number **zero**. Cells that contain the word **TRUE** are evaluated as if they contained the number **1**.

MIN—determines the minimum (smallest) value in a range

MINA— determines the minimum (smallest) value in a range but includes cells that contain text and the logical values FALSE and TRUE, not just numerical values. Cells that contain **text**, the word **FALSE** or are **empty** are evaluated as if they contained the

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number zero. Cells that contain the word **TRUE** are evaluated as if they contained the number 1.

SMALL—determines the k^{th} smallest value in a range (determines smallest value if k is 1, the second smallest if k is 2, and so on)

DESCRIPTIVE STATISTICS—COUNTING

COUNT—counts the number of cells in a range that contain numeric values

COUNTA—counts the number of cells in a range that are not blank

COUNTBLANK—counts the number of cells in a range that are blank

COUNTIF—counts the number of cells in a range that are not blank and meet a specified criterion

FREQUENCY—determines the frequency distribution for data in a range

PERMUT—computes the number of permutations of n items taken k at a time (Excel also includes a combinations function, **COMBIN**, it is in the **Math & Trig** category)

DESCRIPTIVE STATISTICS—PERCENTILES AND RANKS

PERCENTILE—determines the k^{th} percentile value of the values in a range (determines 10th percentile value if k is 0.1, 20th percentile if k is 0.2, and so on)

PERCENTRANK—determines the percentage rank in a range for a specified value (this is the inverse of the **PERCENTILE** function)

QUARTILE—computes the minimum value, maximum value or one of the three quartile values for a range

RANK—determines the rank of a number in a range of numbers

DISTRIBUTIONS—DISCRETE PROBABILITY DISTRIBUTIONS

BINOMDIST—computes either the individual probability value or the cumulative probability value for a specified random variable value for the binomial probability distribution

HYPGEODIST— computes the individual probability value (but not the cumulative probability value) for a specified random variable value for the hypergeometric probability distribution

NEGBINOMDIST— computes the individual probability value (but not the cumulative probability value) for a specified random variable value for the negative binomial probability distribution

POISSON—computes either the individual probability value or the cumulative probability value for a specified random variable value for the Poisson probability distribution

PROB— computes either the individual probability value for a specified random variable value or the total probability for a specified range for the random variable for a given discrete probability distribution

DISTRIBUTIONS—EXPONENTIAL AND NORMAL PROBABILITY DISTRIBUTIONS

EXPONDIST— computes either the individual probability value or the cumulative probability value for a specified random variable value for the exponential probability distribution

NORMDIST—computes either the individual probability value or the cumulative probability value for a specified random variable value for the normal probability distribution

NORMINV—computes the random variable value for a specified probability value for the cumulative normal probability distribution

NORMSDIST—computes the cumulative probability value for a specified random variable value for the standard normal (mean of zero and standard deviation of one) probability distribution

NORMSINV—computes the random variable value for a specified probability value for the cumulative standard normal (mean of zero and standard deviation of one) probability distribution

DISTRIBUTIONS—DERIVED DISTRIBUTIONS

CHIDIST— computes the probability value for a specified random variable value for the chi-square distribution

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CHINV— computes the random variable value for a specified probability value for the chi-square distribution

FDIST—computes the probability value for a specified random variable value for the F distribution

FINV—computes the random variable value for a specified probability value for the F distribution

TDIST—computes the probability value for a specified random variable value for the t distribution

TINV—computes the random variable value for a specified probability value for the t distribution

DISTRIBUTIONS—OTHER CONTINUOUS PROBABILITY DISTRIBUTIONS

BETADIST—computes the probability value for a specified random variable value for the cumulative beta probability distribution

BETAINV— computes the random variable value for a specified probability value for the cumulative beta probability distribution

GAMMADIST— computes either the individual probability value or the cumulative probability value for a specified random variable value for the gamma probability distribution

GAMMAINV—computes the random variable value for a specified probability value for the cumulative gamma probability distribution

GAMMALN—computes the natural logarithm of the gamma function (not the gamma distribution)

LOGINV— computes the random variable value for a specified probability value for the cumulative lognormal probability distribution

LOGNORMDIST— computes either the individual probability value or the cumulative probability value for a specified random variable value for the lognormal probability distribution

WEIBULL—computes either the individual probability value or the cumulative probability value for a specified random variable value for the Weibull probability distribution

HYPOTHESIS TESTING AND CONFIDENCE INTERVALS

CHITEST—computes the p-value for the chi-square test of independence

CONFIDENCE—computes the sampling (or maximum) error (the half-width of the confidence interval) for a population mean using the z (standard normal) distribution

CRITBINOM—computes the critical value for hypothesis tests based on the binomial distribution

FISHER—computes the Fisher transformation for hypothesis tests

FISHERINV—computes the inverse of the Fisher transformation

FTEST—computes the p-value for the F test of the equivalence of two population variances

TTEST—computes the p-value for the t test of the equivalence of two population means for paired samples, for independent samples with equal variance or for independent samples with unequal variance

ZTEST—computes the p-value for the z (standard normal) test of one population mean with the population standard deviation either known or not known

REGRESSION AND CORRELATION—ASSOCIATION BETWEEN TWO VARIABLES

CORREL—computes the table of correlation coefficients (Pearson product moment correlation coefficients) for two ranges (this function is identical to **PEARSON**)

COVAR—computes the table of covariance values for two ranges

PEARSON—computes the table of correlation coefficients (Pearson product moment correlation coefficients) for two ranges (this function is identical to **CORREL**)

REGRESSION AND CORRELATION—SIMPLE LINEAR REGRESSION ANALYSIS

FORECAST—computes an estimated dependent variable value for a specified independent variable value based on a simple linear regression relationship

INTERCEPT—computes the value of the intercept for a simple linear regression

RSQ—computes the value for the coefficient of determination (the square of the correlation coefficient) for a simple linear regression

SLOPE—computes the value of the slope for a simple linear regression

STEYX—computes the standard error of the estimated y values for a simple linear regression

REGRESSION AND CORRELATION—MULTIPLE REGRESSION ANALYSIS

LINEST—performs a multiple (or simple) regression analysis and displays the regression coefficients and the additional regression outputs of the standard error for each of the regression coefficients, the coefficient of determination, the standard error of the estimated y values, the F statistic value and degrees of freedom, the sum of squares due to the regression and the sum of squares due to the error

TREND—computes estimated dependent variable values for specified independent variable values based on a multiple (or simple) regression relationship

REGRESSION AND CORRELATION—EXPONENTIAL REGRESSION ANALYSIS

GROWTH— computes estimated dependent variable values for specified independent variable values based on an exponential regression relationship

LOGEST—performs an exponential regression analysis (similar to **LINEST**, however the **LOGEST** relationship has the independent variables as exponents for the regression coefficients not multiplied times the coefficients as for the standard regression relationship used in **LINEST**)