Linear equations

Family

Linear Equations: Linear equation, an important concept in algebra was invented by Rane Descartes. Descartes was born in 1596 in France. He studied mathematics from the book of Culvius. Linear algebra was followed by the development of determinants in 1693 and Cramer presented his theory to solve systems of linear equations in 1750. Dependent and Independent Variables analysis started developing thereafter. Linear models formation was naturally a next step further for the solution of several real life issues. (A Brief History) Linear equation concept gave birth to the dependent and independent variables. Linear equation shows a relationship between two variables but we need to go one step further how the relationship between two variable forms. As we know solving any mathematical problem needs the statement of known variables to determine the values of unknown variables. Variables are those parameters that keep changing in any system under the study. Every single phenomenon in nature is made of several variables. More the variables, more difficult it becomes to model its behavior and predict the outcome from the incident. If these variables are segregated in dependent and independent variables, it becomes easier to develop a model and predict the outcome. Dependent and Independent Variables: Of two variables, one will be an independent variable and other one will be dependent variable. We will try to see the meaning of these two terms through some examples and how the understanding on this can solve many mathematical, scientific, and statistical problems in general. We all know rain and humidity (the water vapor in the air) has relation. Higher the humidity, higher is the chance of rain. Rain (R) is a dependent variable which depends upon the humidity (H) an independent variable. Mathematically, it can be represented as R is a function of H, or R= f (H) Further, it is a common

experience that clothes dry up fast when the humidity in the atmosphere is less. That means evaporation rate is faster when humidity is less in the air. Ponds, tanks etc., in the dry summer, evaporate faster compared to the wet rainy season when humidity is high. Evaporation is a dependent variable and humidity is an independent variable here and also the relationship is inverse or reciprocal. Mathematically, it can be written as E ? 1/H The use and understanding of dependent and independent variables help us do graphical analysis. Values of independent variables are drawn along X-axis, while values of dependent variables are plotted along the Y-axis. This helps us visualize the relation between two variables clearly. Dependent and Independent Variables in Science Science has been working toward the exploration of the nature for several centuries. Essentially, science tries to find the relationship between dependent and independent variables. For example, the Einstein gave the equation of E= m where c is the velocity of light and m is the mass of the matter. Energy produced is a dependent variable and mass is an independent variable. More the matter available, more the energy can be produced; however, relationship is not linear and energy produced is not proportionate but increases by the square of velocity of light. This algebraic presentation shows the relationship in the form of an algebraic equation that helps us understand its implications in larger scale. In fact Einstein’s equation opened the door for nuclear energy with its uses for the benefit and destruction both. Contribution of different mathematical branches in understanding the science and technology has been immense helping mankind to build a better life. (Dependent and Independent Variables) Linear Models: The understanding of the dependent and independent variables help formulate linear models. In actuality, real life

experience tells that there are hosts of independent variables, which influence dependent variable. Thus a need of formulating some mathematical model arises that can be used to measure the effect of these independent variables with some degree of inherent uncertainty. The response variable Y can be explained through the series of explanatory or independent variables such as X 1, X 2, X 3...X n. It can be represented through following linear model. Y= ? 0+? 1X 1+ ? 2X 2+ ? 3X 3+..... ? nX n+ € Where ? 0, ? 1, ? 2.... ? n are constants and € is an error, which speaks about uncertainties. X 1, X 2, X 3...X n are also known as explanatory variables. The coefficient ? 0, ? 1, ? 2.... ? n are known as parameters of the model. Such models have immense applicability in the field of weather forecast, understanding seasonal rainfalls, in industries to predict the revenue. Such models are also used for devising logistics, networking and myriad of other applications. (Sengupta, Jammalamadaka) Thus, math is crucial for the growth of not only science and technology but also has immense applicability in business and commerce. References: 1. A Brief History of Linear Algebra and Matrix Theory. 20 March 2011 . 2. Dependent and Independent Variables. 20 March 2011 . 3. Sengupta, Debasis; Sreenivasa Jammalamadaka. LINEAR MODELS. 20 March 2011 < http://www. worldscibooks. com/mathematics/4674. html>.