Theory of Variation Relating to the Classified Variables

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***Abstract*— Theory of variation has a great impact on every aspect of Mathematics and Technology. In this paper, relations among the variables or parameters are invented by classifying them and comparing the jointly proportional (variation) relation with the prime or main variable. This provides a simple key solution to achieve mathematical formulas under different situation.**

Keywords- Theory of variation, Variable or Parameter, Jointly proportional.

I. INTRODUCTION

The two variables be x and y, x is directly proportional to y, i.e., x varies directly as y, means that if x increases, y also increases and vice versa [1]-[5], then it is written in the form of $x \alpha y$, there is a non-zero constant k_1, such that, $x = k_1 y$ and the constant ratio $k_1 = y/x$,
k_1 is called the proportionality constant or constant of proportionality.
If an object travels at a constant speed (S), then the distance (D) traveled is proportional to the time spent (T) for travelling, and the speed (S) is the constant of proportionality.
We can express as $D \alpha T$ and $D = ST$
If a variable x is inversely proportional to y, i.e., x varies inversely as y, means that if x increases, y decreases and vice versa [1]-[5],
$x \alpha 1/y$ and $x = k_2/y$, where k_2 is the constant of proportionality.
For a specific amount of gas, pressure (P) is inversely proportional to volume (V) of the gas, i.e., $P \alpha 1/V$ and
$P = k_3/V$, where k_3 is the constant of proportionality

In jointly proportional or joint variation, a variable x varies directly (directly proportional) to the product of y and z, i.e., x varies jointly as y and z, this can be written as,

$x \alpha y$. (1)

$x \alpha z$. (2)

By combining equations (1) and (2), we get, $x \alpha yz$ and
$x = k_4 yz$, where k_4 is the constant of proportionality.
In the jointly proportional individual relation can be any form like below, where x varies directly as y and inversely as z,

$x \alpha y$. (3)

$x \alpha 1/z$. (4)

By combining equations (3) and (4), we obtain $x \alpha y/z$ and
$x = k_5 y/z$, where k_5 is the constant of proportionality.

For example, in a certain quantity of gas, Pressure (P) is inversely proportional to volume (V) and directly proportional to Temperature (T),

$P \alpha 1/V$. (5)

$P \alpha T$. (6)

By combining equations (5) and (6), we have $P \alpha T/V$, i.e.,
$P = k_6 T/V$, where k_6 is the constant of proportionality.
The resistance (R) of a wire varies directly as its length (L) and inversely as the square of its diameter (d),

So, $R \alpha L$. (7)

$R \alpha 1/d^2$. (8)

By combining equations (7) and (8), we get $R \alpha L/d^2$ and
$R = k_7 L/d^2$, where k_7 is the constant of proportionality.

In jointly proportional, we have relation among three or more variables, which are individually related to a particular one variable called prime variable, but we cannot find any separate relation among the other variables discarding the prime or main variable. In this paper, the proportional relations are obtained among the other variables which are proportionally related to a prime variable individually either directly or inversely, e.g., Three variables are x, y, z and amongst them x is a prime variable, they are related as:
$x \alpha y$ and $x \alpha 1/z$,

In the proposed theory, the relation between y and z is established, leaving behind x. This is a very predominant method and it is very much useful in the field of Mathematics and Technology. Since all the formulas are invented according to the variable's or parameter's relationship with each other basis, i.e., whether one variable (parameter or attribute) is directly proportional or inversely proportional to the other variables, like a man can be friend or foe to another man. Also to find solution for a problem, it is required to identify the parameters on which the solution depends on. Then we are searching the relationship among the parameters to assure some general mathematical formula. Finally the formula is invented according to the relationship of the parameters or variables and it is tested with real life situation, i.e., with available real data base obtained by some experiments.

II. METHODOLOGY and RESULT

In the proposed theory, the class or category of the variables are decided and are earmarked first. Therefore it is required to classify or subjective wise demarcation of the variables or parameters.

Theory-1: All the variables are examined in which class or subject they belong.

Three variables (parameters or attributes) are A, B, C and A is the prime or main variable who is proportionally related with all other variables. When all variables like A, B, C; or prime variable and any one variable out of two variables such as A and B or A and C fall under same class, then this Theory-1(A) and Theory-1(B) hold good, otherwise not.

Theory-1(A): Now if variables A, B, C are proportionally related likewise:

If A α B and A α C, i.e., A α BC,

The relation between B and C is guided by:

B α C, i.e., B is directly proportional to C.

Thus the other variables (B and C) are proportionally related in the same manner as they are individually proportionally related with the prime variable (A).

Theory-1(B): Now if variables A, B, C are proportionally related likewise:

If A α B and A α 1/C, i.e., A α B/C,

The relation between B and C is guided by:

B α 1/C, i.e., B is inversely proportional to C.

Therefore the other variables (B and C) are proportionally related in the same manner as they are individually proportionally related with the prime variable (A).

Example-1: If variables A, B, C are all males or females; or A and B are males, C is a female or vice versa, if A loves B and C, then B also loves C, Therefore the relation amongst A, B, C are written by the following equations:

If A α B and A α C, i.e., A α BC;

then B α C as per Theory-1(A).

Example-2: T is price, D is demand and P is production of a commodity, Since T, D, P belong to same class, i.e., same commodity matter.

If T α 1/D and T α 1/P, i.e., T α 1/DP;

then D α P as per Theory-1(B).

Example-3: W is weight, H is height, and A is age of a same class persons residing at a particular area within 30 years age group. Since W, H, P are belonging to same class,

If W α H and W α A, i.e., W α HA;

then H α A as per Theory-1(A).

Theory-2: All the variables are checked to examine in which class or subject they belong.

Three variables (parameters) are A, B, C and A is the prime or main variable who is proportionally related with all other variables. When all variables (say A, B, C) are belonging to different classes; or prime variable (say A) belongs to the opposite class of all other variables like B, C etc., and the other variables (say B and C) are falling under same class, then this Theory-2(A) and Theory-2(B) hold good, otherwise not.

Theory-2(A): Now if variables A, B, C are proportionally related likewise:

If A α B and A α C, i.e., A α BC,

The relation between B and C is guided by:

B α 1/C, i.e., B is inversely proportional to C.

Thus the other variables (B and C) are proportionally related in the opposite manner as they are individually proportionally related with the prime variable (A).

Theory-2(B): Now if variables A, B, C are proportionally related likewise:

If A α B and A α 1/C, i.e., A α B/C,

The relation between B and C is guided by:

B α C, i.e., B is directly proportional to C.

Therefore the other variables (B and C) are proportionally related in the opposite manner as they are individually proportionally related with the prime variable (A).

Example-4: Let us suppose A is a male, B and C are females or vice versa, here A belongs to opposite class of B and C, if A loves B and C both, but B does not love C at all. Therefore A, B, C are proportionally related by the equations:

If A α B and A α C, i.e., A α BC;

then B α 1/C, i.e., B is inversely proportional to C as per Theory-2(A).

Example-5: Bricks (B), Cement (C) and Sand (S) are required for a construction project. Since these three things B, C, S are belonging to three different classes. If bricks are required more, sand and cement also require more, but if sand is used more, obviously cement requirement is less. Thus the relations amongst B, C, S are expressed as:

If B α S and B α C, i.e., B α SC;

then S α 1/C as per Theory-2(A).

Example-6: For a certain quantity of particular gas, pressure, volume and temperature are P, V, T respectively which are belonging to different classes, now the proportional relations between P, V and T are:

If P α T and P α 1/V, i.e., P α T/V;

then V α T as per Theory-2(B).

Example-7: India (I) is a developing country, Russia (R) and USA (U) are developed country, so I is belonging to opposite class of R and U. Now India is a friend of both USA and Russia, but Russia and USA are not friend to each other from Indian context. This relation can be expressed as per Theory-2(A).

If I α R and I α U, i.e. I α RU; then R α 1/U

Again Bangladesh (B) is also a developing country, so India (I) and Bangladesh (I) are falling under same class. Bangladesh is also a friend to India. These relations between I, B, U are written like:

If I α B and I α U, i.e., I α BU; then B α U, i.e., Bangladesh (B) becomes friend to USA (U) as per Theory-1(A).

Since I α R, so B α R, i.e., Bangladesh (B) is also a friend to Russia (R) as per Theory-1(A).

III. CONCLUSION

This theory of variation amongst the variables or attributes are invented a new horizon in the field of Mathematics, Science, and Technology. In this paper the change of one variable or parameter can be identified immediately with respect to the other variables, i.e., the proportional relation among the variables, with knowing either individual relation with the prime variable or from jointly proportional relation among the variables by identifying the classes in which they belong. Since all things are undergoing change in the earth and universe, but the relations are not changing at all, it only depends on the class or category.

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