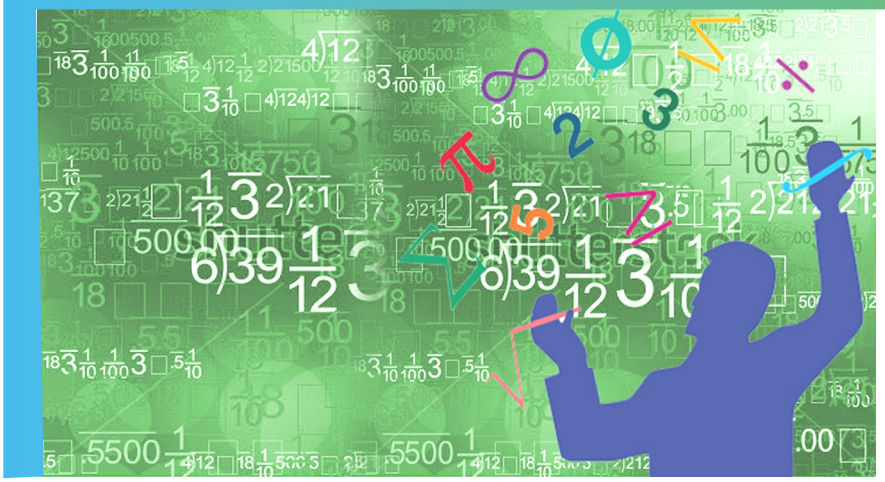
Mathematics: Resolution of day today Problems



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Civilization and culture are built upon the cumulative results of the attempts that humans have made to solve the problems faced from time immemorial. In trying to solve the problems that humans faced either as individuals or as groups using their knowledge, intelligence, experience, methods and equipments, they have been able to introduce new methodologies, experience, success, identify the background theories and conventions, and also develop new fields of knowledge. Due to this inherent skill of humans, today we have inherited civilizations rich in many areas such as religion, Science, Mathematics and Arts.

Problems were solved according to their nature, and to further develop the relevant areas more and more similar problems were solved. Solution of new problems of similar nature helped in this development. In this manner the problems of communication through language, receiving blessings, protection and salvation through religion, understanding the individual causes through science and problems of quantity, shape and space through mathematics have been resolved. But it is necessary to investigate the extent and the manner in which we have referred to and used the wealth of knowledge in order to solve the problem we are now faced. It is more important to investigate whether the field of mathematics which is an abstract subject is being used adequately and fruitfully to solve the day to day problems.

Mathematical applications providing solutions

If you give a copy of this Vidurava magazine to a friend in order to read this article the problem arises as to how he is going to locate the article in the magazine. The 'page number' given through the numbering notation will help him to determine whether he should turn the pages forwards or backwards from the page which is already opened. The mathematical understanding of the sequence of numbers will help him. Even though it is planned to print 5000 copies of the book, and if only 3000 copies have been printed so far, then we know that 2000 more copies have to be printed. It is because numbers are used to indicate the quantity and mathematical operations are carried out on these numbers as required, and a simple method has been developed to do this, that we are trained to solve the problem without hesitation .

But there are instances when mathematics alone cannot provide meaningful solutions in isolation. When finding out whether 5kg of sugar has more mass than 10g of sugar, the concepts pertaining to dimensions and units in physics, and the mathematical concepts associated with numbers have to be used in combination. Otherwise comparing the numerical values will not yield the correct solution. This very simple example explains that if the correct solution has to be obtained it is necessary to use consistently and correctly the mathematical concepts along with the other scientific and social concepts.

Therefore in the simplest situation of using numbers to indicate quantity and also using numerals as labels in order to arrive at the correct solution it is necessary to be aware of the associated norms, standards and interpretations. When investigating the fever of a child, if a reading of 101.5°F was obtained, to understand that it is a high value causing problems, it is necessary to have known that the normal healthy

temperature should be 98.4°F. When examining the health of a person the medical reports providing the values for a particular substance present, the rates, concentrations etc. are analysed and a decision is talees as to whether these values fall within the range of standards and indicative of sound health depending on his age and weight. Here it is clear that to minimize the health problems it is immensely useful if the simple knowledge of mathematics can be used to analyse them.

Solutions with mathematical explanations

In order to free one self of obesity which is detrimental to health it is seen that people show an interest to control their intake of food and engage in exercise. If one is to calculate the amount of calories contained in the food consumed and the calories that should be expended by exercise, then it should be possible to control it without resorting to costly medical advice.

If you know the relationship between the octane number and the composition of fuel, then to decide whether you should use octane 92 or 95 for your vehicle would be easier. This knowledge of notations relating to proportions will be useful to you even when making gold jewellery according to you requirements, and it would be beneficial if you have some understanding that gold is categorized on 24, 22 or 18 carat gold depending on the proportions of the metals gold, silver and copper. You will be able to advise the gold smith to make the gold jewellery to suit the cost and requirement if you possess the scientific knowledge of physics and chemistry. For example by increasing the proportion of copper the malleability can be increased, and the brightness can be increased by increasing the proportion of silver a long with it, if you possess the mathematical knowledge of proportions.

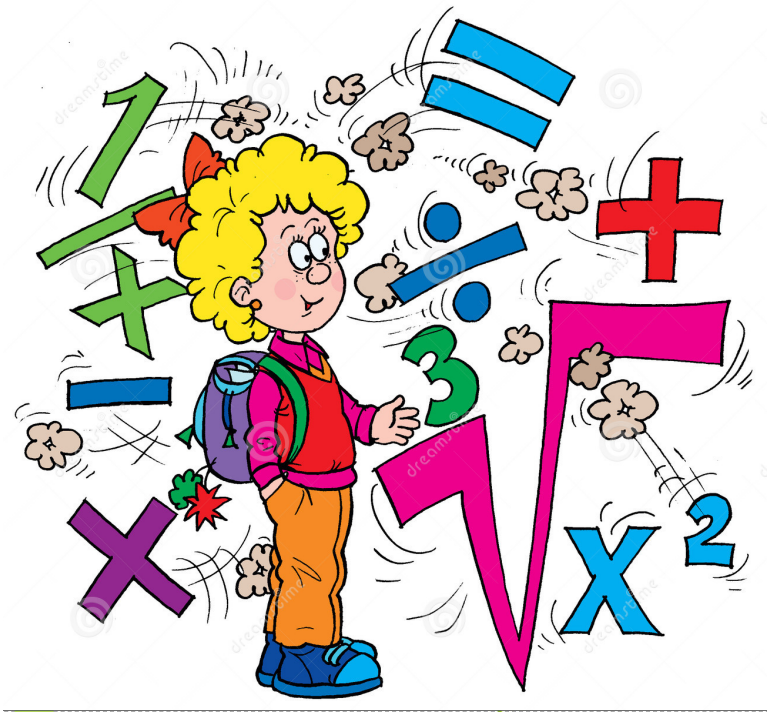
There exists useful meaning even in mathematical applications with geometrical basis. Imagine that a vesak lantern designed as *'Atapattama'* has been made during the vesak season. Can you say what the eight frames are in this particular lantern? If the *'Atapattama'* is made using 6 frames which are squares, then it will not be strong and firm. The *'Atapattama'* has to be made by making eight triangular frames first and then joining these up as required. It is possible to make the triangular frames to be steadier and firmer than the square frame. Thus through correct understanding the messages embodied even in mathematical terms, it is possible to find a solution to a *'Atapattama'* that is shaky.

Abstract mathematics and the day to day world

In the process of the wide development in the field of mathematics from simple mathematics and Euclidean geometry, which are the corner stones of modern advanced mathematics comprising a variety of forms, mathematicians have made many discoveries and found solutions to problems in ordinary life. These discoveries and solutions are of a higher level than necessary for provision of solutions to problems, and can be thought of as belonging to a wealth of abstract knowledge. It is not unreasonable to consider the problems of day to day life and mathematical problems as different. The day to day world is practically experienced and perceived by the senses, and the mathematical world is built on the basis of abstract concepts that are clearly conceptually different from each other. This is because we understand the two worlds is a different manner, and what is important to us of the two worlds is different. However, the finding of solutions to day to day problems and to mathematical problems are processes that cannot be matched and that itself may evade the path to the solution.

In the day to day world null is considered as something that is non existent with no meaning. In this mathematical world $\sqrt{-1}$ is denoted as i and is considered real. It is identified as an imaginary number,

and even though imaginary it is an important number in the mathematical world. Similarly, in the mathematical world there are the geometrical entities such as the point and the straight line. Even though the point and the straight line have been deviced with their characteristic features, they exist in the mathematical world and not in the day to day world. The point with its characteristic of having no width or breadth do not belong to the world of general sensory perception.



The existence of concepts which are not perceived by senses, and their very abstract nature, qualifies mathematics to be considered as a universal language. Radio astronomers believe that it may be possible to use the mathematical language to communicate even with living beings of outer space who may possess a different organ system because mathematics is based on natural laws which are associated with quantity, shape and space - the characteristics that intelligent beings and the universe may be able to grasp and is composed of abstract concepts. Radio astronomers of the Green Bank National Radio Observatory in West Virginia have aimed two giant disc antennas at the two stars Tau Ceti and Epsilon Eridant for the past several years, and are waiting to receive a message of electromagnetic waves based on this mathematical language.

Solution of problems using mathematical language skills

In order to successfully use this mathematical language, firstly one has to know its vocabulary and the grammar. The grammar is none other than mathematical logic and the system of mathematical laws. The vocabulary is the system of mathematical symbols. To denote the numbers digits are used, for the unknown numbers letters named algebraic terms are used; for mathematical operations of addition, subtraction , multiplication and division symbols such as **+, -, ×, ÷** are used; to denote equality and unequality symbols such as =, ≠, <, > are used; to denote intersection and union symbols **∈** And **∪** are used ; to denote square root and infinity the symbols √‾ , ∞ equations and so on are used. This vocabulary of mathematics is composed of a limited number of mathematical symbols, some of which are as follows. Your ability to solve the problems associated with day to day life will be enhanced to the same extent as the skills you possess to manipulate the mathematical language based on this mathematical grammar and vocabulary. We would not have claimed ownership to this civilization if not for the development of intelligent technologies and physical laws which are by - products of mathematical research. Therefore it is justifiable that the current trend of mathematics which has developed along several branches should not be distanced from the problems of ordinary life considering it to be an abstract subject perceived only by mathematicians. The wiser thing to do is to focus attention on the possibilities of finding solutions directly or indirectly by using mathematics, as indicated below. Even if the mathematical skills relevant to the subject of mathematics in the secondary school only have been acquired, it will be sufficient to find solutions for day to day problems that discipline of mathematics can solve.

Application of various mathematical solutions

The architect who designs the plan of your house which has according to your requirements the kitchen, bedrooms, living rooms, bathrooms, verandahs etc. solves this day to day professional problems using arithmetic and geometry. Not only him but also the masons and the carpenters who get involved in constructing the house

according to the plan, regularly use the measurements of plane geometry introduced by the ancient Egyptian mathematicians. Also your discussions with the house builder would be more meaningful and successful to the extent that you get informed about the relevant mathematical applications according to the time, and may be your ability to spend to build a house according to your requirements

When dealing with the mason or the carpenter and even when supplying the raw materials for building it will be possible to save time and money only if you are not hesitant to use at least to a certain extent the mathematical knowledge regarding estimates of the relevant resources.

In planning massive projects of the state, which affect our life style, the planners and the officers who calculate and determine physical, financial and human resources will have to obtain their solutions through many mathematical operations. It would be possible to enjoy the social benefits accruing from these massive projects more meaningfully according to the skills acquired through the practice and experience of carrying out the relevant mathematical operations in estimating the cost and benefits. The logical selection of the super highway, and the comparison of factors such as fuel and fees, is a search for a solution to a mathematical problem. A scientific civil society which offers proposals for the development of a country, will succeed only if there are citizens experienced in mathematically analyzing, presenting the facts in a logical manner, and are not hesitant to make the required calculations.

The laboratory technician who analyses the urine sample given by you for a medical examination examines the sample and calculates the relevant values and writes them down by carrying out a large number of varied types of calculations during his daily professional life. For this purpose he may be aided by tables, graphs, calculators and computer programmes. If he is skilled in mathematics and in the use of these aids, then his service will be more accurate and efficient. However since there is a probability for reports to be inaccurate due to various reasons, it is your responsibility to examine the accuracy to the best of your ability.

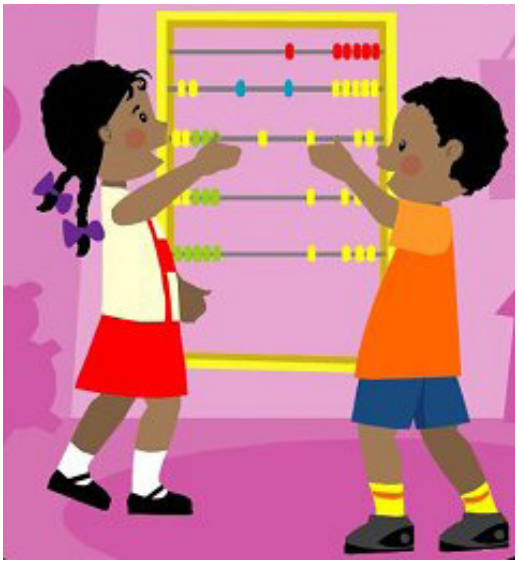
If you have an interest in the date contained in your medical report and the range of values expected for a healthy person you will be motivated to make a comparative study of the value variations from the previous reports and understand them. Then you will also be able to compare the treatments you receive with the reports. The person who possesses the required mathematical knowledge will naturaly be led to do so. If it become necessary to get medical advice within a short time, after showing the current medical reports, then it would be very convenient and helpful to the doctor, especially, if you are able to present how the values in the past reports have varied with time in a summary form or using graphs . Let us consider the medical test determination where the estimated glomerules filtration rates (e-GFR) are determined in order to find out about kidney function. There are many methods of obtaining the e-GFR value that are followed in Sri Lankan laboratories. It is calculated using an equation consisting of four variables as given below.

e GFR = 186 × (serum creatinine) -1.154 × age -0.203 (if ethnically black 1.21) (if female × 0.742)

It may be difficult to understand the mathematics of this, calculation but it is clear that the relevant value is dependent on four variables, the serum creatinine value, age, ethnic type and the gender of the patient. Even a person with a G.C.E. (O/L) knowledge of mathematics with a knowledge of negative indices will be able to logically understand that with the increases in the serum creatinine value and age, the e-GFR value will increase. By studying the reports it is possible to of find out that for a chronic kidney patient the

result obtained by application of the equation is valid and a e-GFR value of more than 60ml for a healthy person, the e-GFR value obtained by applying the equation may be a little less. However such an understanding is possible with practice and experience of analysing this type of information associated with mathematics, and using the equations with confidence and without fear. This will give you the ability not only to understand the information in the medical reports but also the ability to assess the validity of the medical reports. Due to the reason of not paying sufficient attention to situations such as this where application of mathematics should be close to one's day to day life a communication barrier between the doctor and the patient exists and it is necessary to remove this barrier.

It is the simple arithmatic designed by the ancient Phoenicians and the Indus valley civilization that helps to formulate the country's annual budget report which determines our daily life style including the daily meal and also helps us to check the accuracy of the bills we have paid in a shopping complex for purchasing the day to day requirements although there are calculators which make this arithmetic to be done easily, in practical situations you will not be able to do it unless you have the practice and experience of doing the arithmetic yourself. There are the entrepreneurs and consumers who use mathematics to arrive at correct and profitable decisions to make investments. People who are accustomed to using mathematical knowledge in their day to day life are capable of making



the correct assessments regarding the payment they should make for goods and services. It is because of the reluctance to use mathematical methods such as simple arithmetic, probability and statistics that people get confused. This is due to their inability to arrive at correct decisions regarding the acceptance or rejection of various proposals, based on analysis and calculation of true benefits arising from various forms of discounts, insurance schemes and lease systems.

Mathematical process of arriving at solutions

Even a person who knows nothing about cookery can say whether a curry has too much or too little salt. Likewise there are situations when even if a person cannot make the entire calculation, if he understands how the calculation is done he might be able to infer the expected answer. However even that will not be possible until he exammes logically the way the calculation is done.

However if you are willing and prepared to try to solve the problem mathematically, the first step is to translate after analyzing the problem given in the normal language into the mathematical language. On analysis of the problem using your knowledge of mathematics you will be able to guess the likely theories, and laws that need to be used. Then you will be able to arrive at a solution by carrying out the required mathematical operations using the relevant mathematical symbols and formulae. If the solution is successful then you can accept it. If not you must attempt to do it applying some other laws. Sometimes the existing mathematical theories may not be adequate to solve the problem. It is in situation like this that the mathematicians come up with new theories to solve problem.

It is due to the development of science and technology in the fields of Physics, Chemistry and Biology resulting as by – products of mathematical research that the present human civilization and culture in which you and I exist have come into being. Even though we are still unaware of the nature of mathematical research that was carried out, the technology for the construction of Sri Lanka's reservoirs (tanks) and Dagabas, textile technology of India and the printing technology of China serve as historical evidence for the application of mathematical methods in solving the day to day requirements of people. Therefore you should not hesitate or delay in making mathematics your assistant to solve the day to day problems.

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