Course: Introduction to Mathematics

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Instructor: Memoona Nawaz

Class: Bs. Persian-I

Department of

Urdu & Oriental Language

Introduction to Mathematics

BS PERSIAN

Introduction:

- Mathematics accelerates the social, economical and technological growth of a nation.
- The world of today demands more and more mathematical knowledge on the part of its people.
- So, it is necessary to prepare the child with a strong base of mathematical knowledge .

Etymology:

The term "Mathematics" is derived from two Greek words:

'Manthanein' means 'learning'

'Techne' means 'an art (or) technique'

Hence Mathematics means the art of learning related to disciplines (or) facilities.

What is Mathematics?

- **The dictionary** meaning of Mathematics is that,
  "It is the science of number (or) space"
  (OR)
  "The science of measurement, quantity and magnitude"

- According to **"New English Dictionary"**
  "Mathematics – in a strict sense – is the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relations"

Hence, we can conclude that,
Mathematics is a systematized, organized and exact branch of science. Also, Mathematics is the science of quantity, measurement and spatial relations.

Mathematics- in Words of Different Authors:

-Kant:
       "Mathematics is the indispensable instrument of all physical resources."

-C.F.Gauss:
       "Mathematics is the queen of science and Arithmetic is the queen of all Mathematics."

-Bacon:
       "Mathematics is the gateway and key to all science."

-Benjamin Franklin:
       "What science can there be more noble, more excellent, more useful for men, more admirable, high and demonstrative than that of Mathematics?"

-Lindsay:

"Mathematics is the language of physical sciences and certainly no more marvelous language was created by the mind of man."

-Desecrates:

"Mathematics is the science of order and measure."

-Aristotle :

"Mathematics is the study of quantity."

-Bertrand Russell:

"Mathematics is a subject identical with logic".

Meaning and Definition of Mathematics:

- Mathematics is a systematized, organized and exact branch of science.

- Mathematic deals with quantitative facts, relationships as well as with problems involving space and form.

- It is a logical study of shape, arrangement and quantity.

- Mathematics is not to be considered only as ' number work' (or) 'computation', but it is more about forming generalizations, seeing relationships and developing logical thinking & reasoning.

- Mathematics should be shown as a way of thinking, an art (or) form of beauty and as human achievement.

- **The National Policy on Education** (1986) states,
        "Mathematics should be visualized as the vehicle to train a child to think, reason, analyses and to articulate logically."

- Mathematics helps in solving problems of life that needs numeration and calculation.

- It provides opportunity for the intellectual gymnastic of the man's inherent powers.

- It is an exact science and involves high cognitive abilities and powers.

Nature of Mathematics:

1) Mathematics is a science of Discovery

   ➤According to **A.N.Whitehead**,
   "Every child should experience the joy of discovery."

   ➤Today discovery techniques are making spectacular progress.

   ➤They are being applied in two fields: in pure number relationships and in everyday problems

2) Mathematics is an intellectual game

➢ Mathematics is mainly a matter of puzzles, paradoxes and problem solving – a sort of healthy mental exercise.

3) Mathematics deals with the art of drawing Conclusions

➢According to **Benjamin Pierce**,
"Mathematic is the science that draws necessary conclusions."

➢In Mathematics, the conclusions are certain and definite.

➢ Can proceed from simple to complex ones.

4) Mathematics is a tool subject

➢ Mathematics is a powerful and incisive tool of wide applicability.

➢ As **Howard. J. Fehr** says,
  "If Mathematics had not been useful, it would long ago have disappeared from our school curriculum as required study."

5) Mathematics involves an intuitive method

➢ The first step in the learning of any mathematical subject is the development of intuition.

➢Intuition when applied to Mathematics involves the concretization of an idea not get stated in the form of some sort of operations (or) examples.

➢Intuition is to anticipate what will happen next and what to do about it.

6) Mathematics is the science of precision & accuracy

➢Mathematics is known as an exact science because of its precision.

➢In Mathematics, the results are either right (or) wrong, accepted (or) rejected. There is no midway possible between right and wrong.

7)Mathematics is the subject of logical sequence

➢Mathematics learning always proceeds from simple to complex and from concrete to abstract.

➢Dependence on earlier knowledge is particularly great.

8)Mathematics requires the application of rules and concept to new situations

➢ The study of Mathematics requires the learners to apply the skill acquired to new situations.

➢ The students can always verify the validity of mathematical rules and relationships by applying them to novel situations.

9) Mathematics deals with generalization and classification

> When the pupil evolves his own definitions, concept and theorems, he is making generalizations.

> Mathematics teacher should take care to make the final generalization into a rule .

10) Mathematics is an abstract Science

> Mathematical concepts are abstract in the sense that they cannot be seen (or) felt in the physical world.

E.g.: Euclid's lines are supposed to have no width, and its points have no size. No such objects can be found in the physical world.

Mathematical language and symbolism

- There is no proper terminology for talking about Mathematics.
- E.g.:- The distinction between a number and a numeral could head the list.
- In Mathematics, we express lengthy statements in a very brief form by using various symbols.
- The process of speaking of the mathematical language runs as follows:

An abstraction process, followed by a symbolization process, followed again by the learning of the use of symbols.

- "." is used to denote decimal points, also the multiplication.
- Long periods of tracing with patience and endurance are needed to make the students feel at home with this language.
- Some of the important and familiar symbols used in Mathematics are given below :
- $>$ – greater than
- $<$ – less than
- $\equiv$ – congruency
- $\sqrt{}$ – Square root
- Σ – Summation
- $+$ – addition
- $-$ – subtraction
- $\times$ – Multiplication
- $/$ – Division
- $\%$ – percentage

Teaching Mathematics

- **Inductive method:-**
    Inductive method is the way of proving any universal truth by showing that, if it is for any particular case, then it is true for the next case in the same serial order.

    Example from daily life : a child eats green apple and feels sour taste. On the next also, he takes another green apple and feels the same. So, he concludes that, "green apples are sour."

    Example from teaching Mathematics :to establish the formula :
    $$(a + b)^2 = a^2 + b^2 + 2ab.$$

•Deductive method:-

Deductive method is the one in which first we have to accept the pre – constructed form as well established truth and then we have to check it for particular problems.

Example from daily life : a child may tell that, he should never eat the green apples because they are sour. Afterwards he may verify this fact by tasting green apples.

Example from teaching Mathematics : Student may be told about the formula of the area of a rectangle.

i.e.) Area = Length x Breadth.

Then they are asked to apply it in finding the areas of different rectangles.

Applications of Mathematics in
Daily life
and
Real World
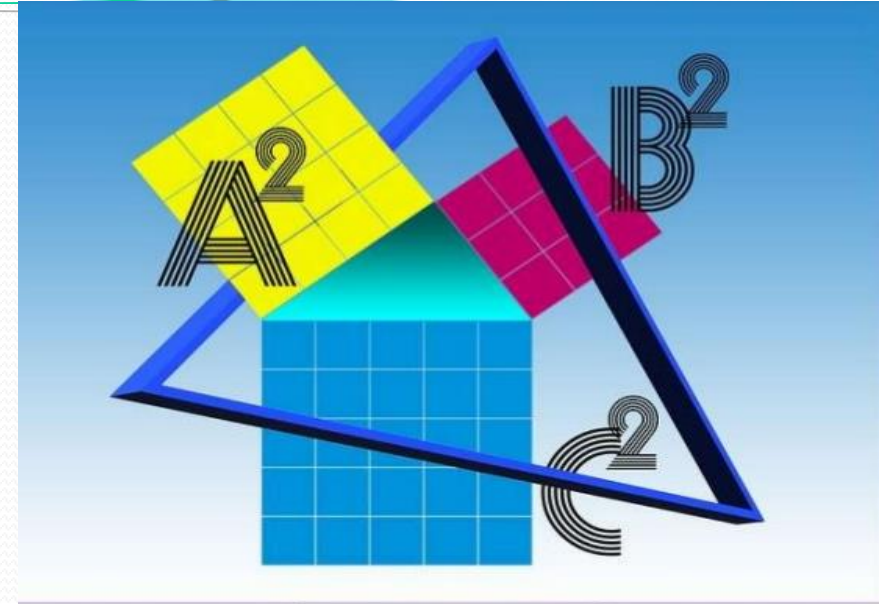
APPLICATIONS
OF
MATHEMATICS

At Home

Setting an alarm and hitting snooze, they may quickly need to calculate the new time they will arise.

Or they might step on a bathroom scale and decide that they'll skip those extra calories at lunch.

People on medication need to understand different dosages, whether in grams or milliliters.

Recipes call for ounces and cups and teaspoons --all measurements, all math.

And decorators need to know that the dimensions of their furnishings and rugs will match the area of their rooms.

In Travel

Travelers often consider their miles-per-gallon when fueling up for daily trips, but they might need to calculate anew when faced with obstructionist detours and consider the cost in miles, time and money.

Air travelers need to know departure times and arrival schedules. They also need to know the weight of their luggage unless they want to risk some hefty baggage surcharges.

Once on board, they might enjoy some common aviation-related math such as speed, altitude and flying time.

At School and Work

Students can't avoid math – most take it every day. However, even in history and English classes they may need to know a little math. Whether looking at time expanses of decades, centuries or eras or calculating how they'll bring that B in English to an A, they'll need some basic math skills.

Jobs in business and finance may require sophisticated knowledge of how to read profit and earning statements or how to decipher graph analyses. However, even hourly earners will need to know if their working hours times their rate of pay accurately reflects their paychecks.

At the Store

Whether buying coffee or a car, basic principles of math are in play.

Purchasing decisions require some understanding of budgets and the cost and affordability of items from groceries to houses.

Short-term decisions may mean only needing to know cash-at-hand, but bigger purchases may require knowledge of interest rates and amortization charts.

Finding a mortgage may be much different than

Chatting on the cell phone

Chatting on the cell phone is the way of communicating for most people nowadays. It's easy, accessible and cost effective. Every one has a cell phone and it requires a basic knowledge of skill and math. You need to know numbers and how they work, and with today's technology you can do basically everything on your cell phone, from talking and faxing to surfing the Internet.

In the kitchen

Baking and cooking requires some mathematical skill as well. Every ingredient has to be measured and sometimes you need to multiply or divide to get the exact amount you need. Whatever you do in the kitchen requires math. Even just using the stove is basic math skills in action

Gardening

Even doing something as mundane as gardening requires a basic math skill. If you need to plant or sow new seeds or seedlings you need to make a row or count them out or even make holes. So even without thinking you are doing math. Measuring skills is always needed, and calculations of the essence when doing something new in the garden.

Arts

When doing any form of art you are using math. Whether you're a sculptor, a painter, a dancer or even just doing a collage for fun, you will need to be able to measure, count and apply basic math to it. Every form of art is co-dependant upon math skills.

Keeping a diary

Keeping a diary has become an essential part of our daily lives. We run from place to place and appointment to appointment. Making appointments and having a time schedule that works for you requires math. Without a diary we will crash and burn. Some people even have to make appointments to take some time out. Math is a much needed skill in today's life.

Planning an outing

Every outing you plan needs your math skill. Whether you go to the beach or the zoo is irrelevant. You will plan your way there and you will use your time wisely, math is your guide that will assist you and help you. When driving you need fuel, oil and water, without it your car will break down. All of these require math.

Banking

Can you imagine going to the bank and not having any idea what you need to do or how to manage your finances. This will cause a huge disaster in your life, and you will be bankrupt within hours.

Planning dinner parties

How about that inevitable dinner party or cocktail that you have to host. Planning is essential, how many guests are attending, what foods are you serving, the ambience of the place where you want to host it and so many other essentials all requiring multiplication, division and subtraction

Decorating your home

Whether you are painting, doing the flooring or just acquiring new furniture, you need math to make your sums add up. Everything you do inside or outside of your home needs math skills. From accessories to a new swimming pool and putting in new lighting

Statistics

Every basic thing we use in life consist of history. That means statistics. Taking into account the past and the future, and keeping record of what has been done. Without statistics we won't know what worked and what didn't. It helps us to find balance and structure.