***Unit 9: Recreational programme in learning Mathematics***

*Mathematics* Recreational activities and Mathematics Quiz – importance and Organization. *Problems: fear* and failure, disappointing curriculum, crude assessment – inadequate teacher preparation- Music Mathematics.

# UNIT -9 RECREATIONAL PROGRAMMES IN LEARNING MATHEMATICS

## RECREATIONAL MATHEMATICS:

Recreational mathematics is a term for mathematics carried out for recreation (entertainment) rather than as a strictly research and application-based professional activity. Although it is not necessarily limited to being an endeavour for amateurs, it often involves mathematical puzzles and games.

Many topics in this field require no knowledge of advanced mathematics, and recreational mathematics often appeals to children and untrained adults, inspiring their further study of the subject

Some of the more well-known topics in recreational mathematics are magic squares, fractals, logic puzzles and mathematical chess problems, but this area of mathematics includes the aesthetics and culture of mathematics, peculiar or amusing stories and coincidences about mathematics, and the personal lives of mathematicians.

## MATHEMATICS QUIZ

1. According to National policy of education 1986 has enforced that one of the main purpose of Teaching is to develop in children Mathematical attitude and mathematical.....discipline.

2. There is an axiom saying that "children of today are the artists of tomorrow". The Architect qualities can only be developed when the students are given various opportunities of learning and also should know the achievements and land marks of various branches of knowledge so the school should provide such activities to gain knowledge of all branches of mathematics or all branches of knowledge.

3. According in Kothari commission (1964-66). The destiny of nation is shaped in or through class room activities.

4. The National mathematics study committee report also stresses the need for teaching maths is to make children to think creatively to act creatively and to do creatively.

5. These things can be achieved by teaching mathematics more as a process than as a product and the very purpose of teaching mathematics is to provide to the children facts, concepts, making children to develop carefulness in making statements. To develop in them observation skill to develop in them a sense of inter relatedness, for this more direct teaching may not help the children so, that extended activities like mathematics Quiz (or) Brain storming sessions help the children to look at the situation in more mathematical way and to think relevantly about the situation.

6. Mathematics Quiz is a small test administered to know the students' knowledge or it is a short duration test used to know the student's knowledge and understanding in the field of Mathematics.

7. Mathematics Quiz is one of the activities with the help of which a mathematics teacher can motivate and encourage the children to become truthful, active, and alert and to arose in him/her critical thinking importantly frankness straight forwardness.

8. The mathematics quiz will go a long way in shaping and molding the personality of child towards mathematics.

9. Mathematics quiz is a means to bring a path in the mind a way of habit of reasoning or thinking.

## II. Importance of Mathematics Quiz:

1. A Mathematics Quiz is a co-curricular activity it is a activity very much different from the usual class room activities. The class room activities are also called as controlled activities, the mathematics Quiz is an uncontrolled activity. It helps the children to develop the discipline on their own, towards mathematics.
2. Mathematics Quiz plays a vital role in seeking voluntary participation from the children.
3. Mathematics Quiz will be easy for those children who have the habit of wide reading.
4. Mathematics Quiz helps the children to gain perfect, authentic, accurate information.
5. Mathematics Quiz develops competitiveness among children.
6. It helps the children to enhance their knowledge.
7. It develops mathematical attitude in the children.
8. The children will cautions before making statements in Mathematics Quiz.

## III. Objectives of Mathematics Quiz:

1. To develop critical thinking among children.
2. To make the children to learn mathematical attitude.
3. To develop the skill of answering precisely.
4. To make the children to think and answer quickly.
5. To consolidate and rapid revision of mathematical facts.
6. To develop a situation for children to understand and to answer immediately.
7. To exercise the practice of brief answering in the limited time.
8. To get equipped with useful and important facts.
9. To motivate the children to win prizes.
10. To faster creative instincts among children.
11. To make children to get an awareness about the contribution of mathematics and latest discoveries.

**Organising mathematics Quiz:** Organising mathematics Quiz and Execution of the same is a complex and challenging task. It requires a skill on the part of Teachers (or) the Quiz maker. The

whole program must be well planned in advance. To conduct the Mathematics Quiz successfully the following points has to be kept in mind. They are:

1. To conduct the Quiz we have to select the participants or we can say the volunteer on whom Quiz has to be conducted selected is random and has a criteria.

**2. <u>Duration of the Quiz: (Time)</u>**

It must be about 90 mints, with in this time we have to have as many rounds as possible; it depends on the number of rounds and also types of rounds.

3**. <u>Groups:</u>** There must be only 3 or 4 groups, minimum number of students has to be selected, and the questions of one round should not be repeated in any round.

**4. <u>Instruction</u>**: Instruction has to be given to all teams well in advance before starting each round. What they have to do? How they have to do? When they will gain marks? When they lose marks? Etc.

**5. <u>Rounds in the Quiz:</u>** In Mathematics Quiz there will be usually six rounds. They will be as follows.

**I Round:** In this round the Questions are asked to test the knowledge of mathematics.

**II Round:** In this round the Questions are asked to test the understanding of mathematics.

**III Round:** To test their transfer of learning Mathematical concepts and principles.

**IV Round:** Visual Round, to know their visual ability.

**V Round:** Buzzer round, the rapidness (or) Quickness in answering is also counted.

**VI Round:** Motor skill Round means shows their quickness in assembling things.

The Quiz has to be conducted with a moderator under moderator there will be four teams, moderator pose questions on the teams. There will be a time keeper. There will be a scorer with which we can conduct the Quiz. The score taken by each round. After announcing the final scores, who has got more marks gets the prize. Buy this the mathematics Quiz will be concluded.

## PROBLEMS OF LEARNING MATHEMATICS AT THE SCHOOL STAGE

Any analysis of mathematics education in our schools will identify a range of issues as problematic. We structure our understanding of these issues around the following four problems which we deem to be the core areas of concern:

- A sense of fear and failure regarding mathematics among a majority of children,
- A curriculum that disappoints both a talented minority as well as the non-participating majority at the same time,
- Crude methods of assessment that encourage perception of mathematics as mechanical computation, and
- Lack of teacher preparation and support in the teaching of mathematics.

Each of these can and need to be expanded on, since they concern the curricular framework in essential ways.

## FEAR AND FAILURE

If any subject area of study evokes wide emotional comment, it is mathematics. While no one educated in Tamil would profess (or at the least, not without a sense of shame) ignorance of any Tirukkural, it is quite the social norm for anyone to proudly declare that (s)he never could learn mathematics.

While these may be adult attitudes, among children (who are compelled to pass mathematics examinations) there is often fear and anxiety. Mathematics anxiety and 'math phobia' are terms that are used in popular literature. In the Indian context, there is a special dimension to such anxiety. With the universalisation of elementary education made a national priority, and elementary education a legal right, at this historic juncture, a serious attempt must be made to look into every aspect that alienates children in school and contributes towards their non-participation, eventually leading to their dropping out of the system. If any subject taught in school plays a significant role in alienating children and causing them to stop attending school, perhaps mathematics, which inspires so much dread, must take a big part of the blame.

Such fear is closely linked to a sense of failure. By Class III or IV, many children start seeing themselves as unable to cope with the demands made by mathematics. In high school, among children who fail only in one or two subjects in year-end examinations and hence are detained, the maximum numbers fail in mathematics. This statistic pursues us right through to Class X, which is when the Indian state issues a certificate of education to a student.

The largest numbers of Board Exam failures also happen in mathematics. There are many perceptive studies and analyses on what causes fear of mathematics in schools. Central among them is the cumulative nature of mathematics. If you struggle with decimals, then you will struggle with percentages; if you struggle with percentages, then you will struggle with algebra and other mathematics subjects as well.

The other principal reason is said to be the predominance of symbolic language. When symbols are manipulated without understanding, after a point, boredom and bewilderment dominate for many children, and dissociation develops. Failure in mathematics could be read through social indicators as well.

Structural problems in Indian education, reflecting structures of social discrimination, by way of class, caste and gender, contribute further to failure (and perceived failure) in mathematics education as well. Prevalent social attitudes which see girls as incapable of mathematics, or which, for centuries, have associated formal computational abilities with the upper castes deepen such failure by way of creating self-fulfilling expectations.

A special mention must be made of problems created by the language used in textbooks, especially at the elementary level. For a vast majority of Indian children, the language of mathematics learnt in school is far removed from their everyday speech, and especially forbidding. This becomes a major force of alienation in its own right.

## DISAPPOINTING CURRICULUM

Any mathematics curriculum that emphasises procedure and knowledge of formulas over understanding is bound to enhance anxiety. The prevalent practice of school mathematics goes further: a silent majority give up early on, remaining content to fail in mathematics, or at best, to see it through, maintaining a minimal level of achievement. For these children, what the curriculum offers is a store of mathematical facts, borrowed temporarily while preparing for tests.

On the other hand, it is widely acknowledged that more than in any other content discipline, mathematics is the subject that also sees great motivation and talent even at an early age in a small number of children. These are children who take to quantisation and algebra easily and carry on with great facility. What the curriculum offers for such children is also intense disappointment.

By not offering conceptual depth, by not challenging them, the curriculum settles for minimal use of their motivation. Learning procedures may be easy for them, but their understanding and capacity for reasoning remain under exercised.

## CRUDE ASSESSMENT

We talked of fear and failure. While what happens in class may alienate, it never evokes panic, as does the examination. Most of the problems cited above relate to the tyranny of procedure and memorization of formulas in school mathematics, and the central reason for the ascendancy of procedure is the nature of assessment and evaluation.

Tests are designed (only) for assessing a student's knowledge of procedure and memory of formulas and facts, and given the criticality of examination performance in school life, concept learning is replaced by procedural memory. Those children who cannot do such replacement successfully experience panic, and suffer failure.

While mathematics is the major ground for formal problem solving in school, it is also the only arena where children see little room for play in answering questions. Every question in mathematics is seen to have one unique answer, and either you know it or you don't.

In Language, Social Studies, or even in Science, you may try and demonstrate partial knowledge, but (as the students see it), there is no scope for doing so in mathematics. Obviously, such a perception is easily coupled to anxiety.

Amazingly, while there has been a great deal of research in mathematics education and some of it has led to changes in pedagogy and curriculum, the area that has seen little change in our schools over a hundred years or more is evaluation procedures in mathematics. It is not accidental that even a quarterly examination in Class VII is not very different in style from a Board examination in Class X, and the same pattern dominates even the end-of chapter exercises given in textbooks. It is always application of some piece of information given in the text to solve a specific problem that tests use of formalism. Such antiquated and crude methods of assessment have to be thoroughly overhauled if any basic change is to be brought about.

## INADEQUATE TEACHER PREPARATION

More so than any other content discipline, mathematics education relies very heavily on the preparation that the teacher has, in her own understanding of mathematics, of the nature of mathematics, and in her bag of pedagogic techniques.

Textbook-centred pedagogy dulls the teacher's own mathematics activity. At two ends of the spectrum, mathematics teaching poses special problems. At the primary level, most teachers assume that they know all the mathematics needed, and in the absence of any specific pedagogic training, simply try and uncritically reproduce the techniques they experienced in their school days.

Often this ends up perpetuating problems across time and space. At the secondary and higher secondary level, some teachers face a different situation. The syllabi have considerably changed since their school days and in the absence of systematic and continuing education programmes for teachers, their fundamentals in many concept areas are not strong.

This encourages reliance on 'notes' available in the market, offering little breadth or depth for the students. While inadequate teacher preparation and support acts negatively on all of school mathematics, at the primary stage, its main consequence is this: mathematics pedagogy rarely resonates with the findings of children's psychology.

At the upper primary stage, when the language of abstractions is formalised in algebra, inadequate teacher preparation reflects as inability to link formal mathematics with experiential learning. Later on, it reflects as incapacity to offer connections within mathematics or across subject areas to applications in the sciences, thus depriving students of important motivation and appreciation.

**MATH & MUSIC**

Math and music have always been considered closely connected in many ways. • It is widely believed that students who do well in music also excel in math. • Let's take a look at some of the basic components of music and see what math has to do with them.

**RHYTHM IS TO MUSIC AS NUMBERS ARE TO MATH**

- Rhythm measures time
  - ✓ Measure is the space between two bar lines on the staff that represents the division of time by which air and movement of music are regulated
  - ✓ When you play a few different notes together or even repeat the same note on an instrument, you create something called rhythm.

- Music is made up of sound.
  - ✓ Sound is made from repeating sound waves.
  - ✓ The musical pitch of each note has a corresponding frequency measured physically in hz (hertz) or cycles per second.
  - ✓ There are some important mathematical relationships between the notes played in music and the frequency of those notes.

Pythagoras

• The Greek octave had a mere five notes. • Pythagoras pointed out that each note was a fraction of a string. • Example: Lets say you had a string that played an A. The next note is 4/5 the length (or 5/4 the frequency) which is approximately a C. The rest of the octave has the fractions 3/4 (approximately D), 2/3 (approximately E), and 3/5 (approximately F), before you run into 1/2 which is the octave A

Ratios

• Pythagoras was excited by the idea that these ratios were made up of the numbers 1,2,3,4, and 5. • Why? • Pythagoras imagined a "music of the spheres" that was created by the universe.

• The 18th century music of J. S. Bach, has mathematical undertones, so does the 20th century music of Philip Glass.

Golden Ratio and Fibonacci

• It is believed that some composers wrote their music using the golden ratio and the Fibonacci numbers to assist them • Golden Ratio: 1.6180339887 • Fibonacci Numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21

**How is Music related to Math?**

Mathematics is involved in some way in every field of study known to mankind. In fact, it could be argued that mathematics is involved in some way in everything that exists everywhere, or even everything that is imagined to exist in any conceivable reality. Any possible or imagined situation that has any relationship whatsoever to space, time, or thought would also involve mathematics.

Music is a field of study that has an obvious relationship to mathematics. Music is, to many people, a nonverbal form of communication, that reaches past the human intellect directly into the soul. However, music is not really created by mankind, but only discovered, manipulated and reorganized by mankind. In reality, music is first and foremost a phenomena of nature, a result of the principles of physics and mathematics.

The math / music concepts explored include:

- Fractions / rhythm
- Sets and intersecting sets / keys and related keys
- The relationship between ratios, fractions, and decimals / frequency and interval
- Roots and powers / equal temperament tuning

Frequency and Wave Length:

As shown by the University of New South Wales and the Peabody Conservatory of Music, every pitch has a distinct frequency. This means that every note has a specific wavelength. Mathematicians are able to graph these waves, creating visual, numeric representations of sound.

**Duration:**

A music metronome marking indicates how many beats occur per minute. For instance, if the metronome marking indicates sixty beats per minute, then every beat has the duration of one second. This means that all rests and notes in music involve mathematical divisions and multiplications of time duration. Specific note types indicate these divisions and multiplications. For example, the duration of a whole note lasts four times as long as a quarter note.

**Counting**

Musicians count beats as they perform as this ensures that they will give the correct duration of time to each rest and pitch. Counting beats also identifies precisely where the person is in the music. For example, if a conductor tells an orchestra to start "at the middle of the bar" this can be ambiguous, since some music uses multiple time signatures and complex, overlapping rhythms. If the conductor can explain with numbers where he is in the music based on counting procedures (e.g., "on beat four"), then he has eliminated this ambiguity.

**Engineering**

The University of New South Wales shows that musical acoustics involves how sound waves bounce off surfaces in the environment. Engineers thus examine the precise angles at which sound waves will hit architectural surfaces in order to get the clearest and most efficient sound production.

**Instrument Production**

In order to achieve a uniform pitch and establish playing standards, instrument and reed manufacturers have to make sure that instruments and reeds have the same basic dimensions. This means that they have to make specific calculations to keep instruments and reeds the same shape and size. For example, oboe players want the length of their reeds to be about 72 mm, since reed length affects pitch.

**Theory and Harmony**

Since the time of Pythagoras, music developed as a relationship between ratios of frequencies. For example, doubling the frequency of any pitch will give a pitch exactly one octave higher than the original pitch. Human ears hear these ratios as harmony. Over thousands of years, changes in the treatment of what ratios make up a scale have changed what sounds "in tune." If it weren't for these changes, musicians wouldn't be able to transpose well or have scales that start on different pitches sound the same. Musicians also wouldn't have the modern 12-tone row, where mathematical addition and subtraction is the basis of every scale degree, since treatment of pitch ratios is what determines how many notes are in a scale. Math thus is the foundation for much of music theory and harmony.

**Mathematics on Music**

Notation is a method of writing down music so that it can be performed vocally and instrumentally. It is a kind of code that allows other people to interpret music. These symbols tells us three basic things about music; how long or short is the sound (duration), how high or low is the sound (pitch), and how should the music be played (expression).

The words we say and the notes we sing have specific duration. Duration refers to how long tone and silence last. Some sound duration are short while others are long. Duration is determined by the kind of notes and rests used. In relation to mathematics, fractions and whole numbers can tell how this duration works.

**Time Signatures and Rhythm**

The most fundamental use of mathematics in Western music is its application in rhythm. Nearly all Western music operates within time signatures, or pulses that are grouped into sections. Most commonly, these sections (called "measures") come in groups of two, three or four, but can come in groups of five or seven or complex sub- groupings of smaller numbers. The choice of time signature determines the feel of the pulse and rhythmical lilt of the music.

Within the measures, the timing of the notes is measured by notation that dictates rhythm in terms of symbols that denote, essentially, fractions. When a musician reads rhythms, he knows how long to hold each note and rest by calculating what fraction of the whole measure that note or rest is indicated to last.

**Counting and Conducting**

In multi-player ensembles, musicians must count and calculate the number of measures and beats during which they don't play in order to stay in time with the rest of the ensemble. In very large ensembles, a conductor helps keep track of the numbers of measures by waving his baton (stick) in a repetitive numerical pattern according to the time signature with each pattern representing one measure.

**Intervals and Chords**

Mathematics plays an important role in the analysis of melody and harmony in music. When music theorists search for and discern patterns in how pitch is used in music, the relationship of different pitches to one another is discussed in terms of intervals and scale degree numbers. This allows theorists to keep track of trends and apply knowledge of patterns to new compositions.

**Contemporary Music**

Contemporary and very recent Western music uses mathematics in what is perhaps the most complex manner. Prominent art composers of the 20th century created new musical forms based in mathematics. The most famous of these forms is 12-tone music, a system of composition wherein each of the pitches of the Western scale are assigned numbers and a mathematical matrix is written to determine the order of the notes in a composition.