6.6 Factors Influencing the Learning of Mathematics

6.6.1 Motivation

Motivation is a potential to direct behaviour that is built into the system that controls emotion. This potential may be manifested in cognition, emotion and/or behaviour.

Three basic factors are related to motivation.

1. Need 2. Drive 3. Motive

Need refers to lack of something, absence of something, non availability of something which is essential or desirable, whereas drive is the force which impels the individual to initiate to action to meet his/her needs.

Motive refers to a thought or feeling which generates a drive in the individual and this drive in turn will impel the individual towards action to meet his need.

Hence motivation can be defined as the process of installing appropriate motives, which are likely to facilitate corresponding drives, which in turn are likely to initiate action towards meeting the needs.

The factors affecting motivation while learning mathematics are:

- level of aspiration
- reward and punishment,
- social motives, and
- competition

How to motivate the students to learn mathematics?

The students can be motivated to learn mathematics by emphasizing the need for achievement.Training in behaviour on

- how to take moderate risks
- how to develop self confidence in one's ability to solve long range problems
- how to be challenged by difficult tasks
- how to look for feedback in one's long range performance

Would help the individuals develop a need for high achievement.

To develop motivational functions to revitalize the students for learning of mathematics, mathematics teachers should

- guard against monotony and boredom,
- increase the general level of alertness and responsiveness
- be sensitive to individual differences in learning.
- be resourceful in classroom teaching,
- maintain a conducive classroom climate for effective learning,
- employ a variety of teaching techniques ensuring student involvement and attention.
- set before the students specific learning objectives
- replace their long time goals by immediate goals
- encourage students to improve the self concept

Finally teacher's personality plays a vital role in motivation. If the teacher is impressive, pleasing with effective communication skills he/she can easily motivate his/her students.

Basic principles of motivation those are applicable to learning of mathematics are,

❖ *The environment can be used to focus the student's attention on what needs to be learned.*

Teachers who create warm and accepting yet business-like atmospheres will promote persistent effort and favorable attitudes toward learning. Interesting visual aids motivate learners by capturing their attention and curiosity.

❖ *Incentives motivate learning.*

Incentives include privileges and receiving praise from the teacher. In a learning situation, self-motivation without rewards will not succeed. Students must find satisfaction in learning based on the understanding that the goals are useful to them or, less commonly, based on the pure enjoyment of exploring new things.

❖ *Internal motivation is long lasting and more self-directive than is external motivation, which must be repeatedly reinforced by praise or concrete rewards.*

Some students have little capacity for internal motivation and must be guided and reinforced constantly. The use of incentives is based on the principle that learning occurs more effectively when the student experiences feelings of satisfaction. Caution should be exercised in using external rewards when they are not absolutely necessary.

Learning is most effective when the learner is ready to learn, that is, when one wants to know something.

Sometimes the student's readiness to learn comes with time, and the teacher's role is to encourage its development. If a student is not *ready to learn,* he or she may not be reliable in following instructions and therefore must be supervised and have the instructions repeated.

- *Motivation is enhanced by the way in which the instructional material is organized.*

  In general, the best organized material makes the information meaningful to the learner. One method of organization includes relating new tasks to those already known. Other ways to relay meaning are to determine whether the persons being taught understand the final outcome desired and instruct them to compare and contrast ideas.

None of the techniques will produce sustained motivation unless the goals are realistic for the learner. The basic learning principle involved is that *success is more predictably motivating than is failure.*

Students develop interest, pay attention, highly-motivated to learn mathematics, and develop a positive attitude towards mathematics provided students are assisted in defining goals which may increase the probability that they will understand them and want to reach them. To identify realistic goals, teachers must be skilled in assessing students readiness or a students' progress toward goals.

- *Because learning requires change in beliefs and behavior, it normally produces a mild level of anxiety.*

  This is useful in motivating the individual. However, severe anxiety is incapacitating. A high degree of stress is inherent in some educational situations. If anxiety is severe, the individual's perception of what is going on around him or her is limited. Teachers must be able to identify anxiety and understand its effect on learning. They also have a responsibility to avoid causing severe anxiety in learners by setting ambiguous or unrealistically high goals for them.

- *It is important to help each student set goals and to provide informative feedback regarding progress toward the goals.*

  Setting a goal demonstrates an intention to achieve and activates learning from one day to the next. It also directs the student's activities toward the goal and offers an opportunity to experience success.

- *Both affiliation and approval are strong motivators.*

  People seek others with whom to compare their abilities, opinions, and emotions. Affiliation can also result in direct anxiety reduction by the social acceptance and the mere presence of others. However, these motivators can also lead to conformity, competition, and other behaviors that may seem as negative.

- *Many behaviors result from a combination of motives.*

Motivational factors and strategies

Motivation is so necessary for learning that strategies should be planned to organize a continuous and interactive motivational dynamics for maximum effectiveness. The general principles of motivation are interrelated. A single teaching action can use many of them simultaneously.

Time	*Motivational Factors*	*Motivational Strategies*
Beginning: When learner starts learning	**Attitudes:** attitudes toward the environment, teacher, subject matter, and self **Needs:** the basic need within the learner at the time of learning	Make the conditions that surround the subject positive. – Positively confront the possibly erroneous beliefs, expectations, and assumptions that may underlie a negative learner attitude. – Reduce or remove components of the learning environment that lead to failure or fear. – Plan activities to allow learners to meet esteem needs
During: When learner is involved in main content of the learning process.	**Stimulation:** the stimulation processes affecting learner during the learning experience. **Affect:** the emotional experience of the learner while learning.	– Change style and content of the learning activity. – Make learner reaction and involvement essential parts of the learning process, that is, problem solving, role playing, stimulation.

Time	*Motivational Factors*	*Motivational Strategies*
		– Use learner concerns to organize content and to develop themes and teaching procedures. – Use a group cooperation goal to maximize learner involvement and sharing.
Ending: When learner is completing the learning process.	**Competence**: The competence value for the learner that is a result of the learning behaviors.	– Provide consistent feedback regarding mastery of learning.
	Reinforcement: The reinforcement value attached to the learning experience, for the learner	– Acknowledge and affirm the learners' responsibility in completing the learning task. – When learning has natural consequences, allow them to be congruently evident. – Provide artificial reinforcement when it contributes to successful learning, and provide closure with a positive ending.

6.6.3 Perception

Learning refers to a relatively permanent change in behavior that is a result of past experience or practice. Perception is a general term referring to the awareness of objects, qualities, or events stimulating the sense organs; it also refers to a personal experience of the world. Perception is a meaningful predation of a sensation. A large part of our learning is accompanied by perception.

The meaning we attach to what we sense is called perception. Perception is an organizing process. In perception we organize, integrate and recognize the various patterns of stimuli. Learning of mathematics and Perception are intertwined. Perception in learning of mathematics is basically

a pattern-recognition process coupled with some functional consequences for the system which performs such pattern-recognition.

Without perception the higher level cognitive process such as imagination, thinking, reasoning and problem solving will not function. Perception furnishes the experience that promotes understanding and reflective thinking. Perceptions are modified by the activities themselves by trial and error methods. It is enhanced by needs motivations and value systems. Hence, field trips, laboratory work are important supplements to teaching and learning of mathematics.

Knowledge of factors which may affect the perpetual process of learning mathematics is very important to the mathematics teacher because perception is the basis of all learning. There are several factors that may affect the students' ability to perceive. They are

1. basic needs
2. goals and values
3. self concept
4. time and opportunity
5. element of threat and
6. insight

True learning requires an understanding of how each of these factors may affect all of the others and the knowledge of how a change in any one of them may affect all the others. It is a major responsibility of the mathematics teacher to organize demonstrations and explanations and direct practice so that the student has better opportunities to understand the interrelationship of the many kinds of experiences that have been perceived. Pointing out the relationships as they occur, providing a secure and non threatening environment to learn mathematical concepts and helping the student acquire and maintain a favourable self concept are key steps which may foster the ability to perceive the mathematical patterns.

6.6.5 Attitude

Attitudes are defined as predispositions to react in a certain way to an object or experience. They are learned and they influence our actions. Attitudes are viewed to consist of the three components: affect, cognition, and behaviour. Attitudes consist of evaluative dimensions based on the three components in combination or on their own. The affective component consists of physiological reactions and verbal statements of feelings; cognitive evaluations can be perceptual responses or verbal statements of

beliefs; and overt actions and verbal reports of behaviour represent the behavioural component.

As the modern society has become increasingly dependent upon technology, science and research, mathematics has become critical in the preparation of students for future careers and progress of the nation. Research shows that attitude towards mathematics is extremely important in the achievement and participation of students in mathematics.

Recognizing the importance of attitudes, there is an increasing awareness of the need to examine attitudes and consider possible methods of involvement. The development of a positive attitude towards the subject matter is probably one of the most prevalent goals.

Attitudes influence success and persistence in the study of mathematics.

Students who have positive feelings about mathematics exert more effort, spend more time on mathematics tasks, and are more effective learners than students with poor attitudes.

6.6.6 Aptitude

Human efficiency is not as easily defined as that of a machine and it is not easily measured. Generally speaking, however, we consider one person as more efficient than another, if he accomplishes more in the same time. The working efficiency of an individual varies with a number of factors, the most important of which are (i) his aptitude for the task involved, (ii) adequacy of his training for the job and (iii) his mindset and conditions of work. Like intelligence, aptitude is measured in terms of individual differences. In a given type of work, there are those who learn rapidly and achieve a high level of skill and those who are slow to learn and whose achievement is low. The former are said to have good aptitude for the work in question.

An aptitude is a set of characteristics regarded as symptomatic of an individual's ability to acquire with competence (usually specified) knowledge, skill or set of responses such as the ability to speak a language, to produce music etc. In referring to a person's aptitude for mathematics, or art or carpentry we are looking to the future. His aptitude is however, a present condition, a pattern of traits deemed to be indicative of his potentialities for the future. However, in this definition there is no indication as to whether the 'condition' or 'set of characteristics' is acquired or inborn. We want the facts about an individual's aptitude as they are at present; characteristics now indicative of his future potentialities, whether he was born that way or

acquired certain enduring dispositions in his earlier childhood, or matured under circumstances which have radically altered his original capacities. An individual's potentialities at the period of development are quite certainly the product of interaction between conditions both innate and environmental. Hence aptitudes are probably inherited because they cannot appear unless the environment is conducive, i.e. unless the opportunity is provided. Very often some training, often a good deal of it, is necessary too, before an aptitude reveals itself in performance. While appraising an individual's aptitude, we must take him as he is, and not as he might have been.

Aptitude, moreover, connotes more than *potential ability* in performance, it implies *fitness* and *suitability* for the activities in question. One does not deem self-suited for a work for which he has distaste or an occupation that offers no challenge to one's interest. When appraising aptitude we are on the alert for symptoms of ability to acquire genuine absorption in the work as well as satisfactory level of competence. A person with an aptitude for a job will show enthusiasm and necessary drive towards the job in hand.

Aptitude is differentiated from skill and proficiency. Skill means the ability to perform a given act with ease and precision. Proficiency has much the same meaning except that it is more comprehensive, for it includes not only skill in certain types of motor and manual activities, but also in other type of activities as shown by the extent of one's competence in language, book keeping, mathematics etc. On the other hand, when we speak of a person's aptitude for a given task, we mean the capacity to acquire proficiency under appropriate conditions, that is, his potentialities at present, as revealed by his performance on the selected tests that have predictive value. Such tests are known as *aptitude tests.*

Mathematics Aptitude consists of the following tests:

- *Visual Matching*

  This measures the student's ability to demonstrate visual discrimination.

- *Analysis-Synthesis*

  This measures the student's ability to use learning, reasoning, and generalizing skills in solving logic puzzles.

- *Oral Vocabulary*

  This measures the student's ability to provide synonyms and antonyms for a list of presented words.

- *Concept Formation*

  This measures the student's ability to utilize nonverbal problem solving strategies and categorical reasoning.

6.7 Divergent Thinking in Mathematics

Creative production is often characterized by the divergent nature of human thought and action. Divergence is usually indicated by the ability to generate many, or more complex or complicated, ideas from one idea or from simple ideas or triggers. Divergent Thinking is thinking outwards instead of inward. It is the ability to develop original and unique ideas and then come up with a problem solution or achieve an objective.

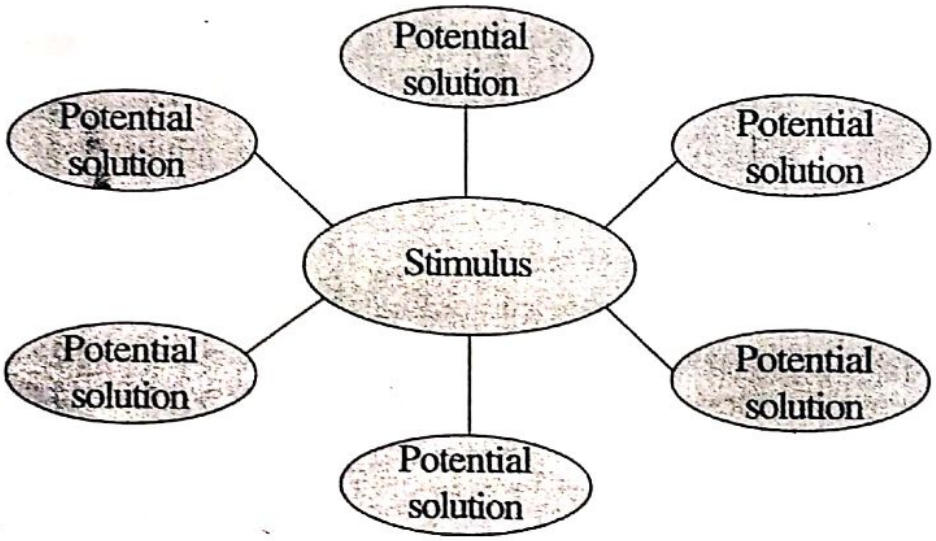

Fig.6.1: Divergent Thinking

Traditionally the eight elements below are ones commonly thought of as inherent elements of divergent thinking.

- **Fluency** - The ability to generate a *number of ideas* so that there is an increase of possible solutions or related products.
- **Flexibility** - The ability to produce different *categories or perceptions* whereby there are a *variety* of different ideas about the same problem or thing.
- **Elaboration** - The ability to *add to, embellish, or build off of* an idea or product.
- **Originality** - The ability to *create fresh, unique, unusual, totally new, or extremely different* ideas or products
- **Complexity** - The ability to conceptualize *difficult, intricate, many layered or multifaceted* ideas or products.

- **Risk-taking** - The willingness to be *courageous, adventuresome, daring* – trying new things or taking risks in order to stand apart.
- **Imagination** - The ability to *dream up, invent,* or to see, to think, to conceptualize new ideas or products to be ingenious.
- **Curiosity** - The trait of exhibiting *probing behaviors,* asking and posing questions, searching, being able to look deeper into ideas, and the wanting to know more about something.

6.8 Creative Thinking in Mathematics

Creativity is an attitude of mind which is encouraged by openness of thinking, willingness to work with conflicting ideas and not to have the solutions immediately, eagerness to learn, an appreciation of the working of the unconscious and a preparedness to play with an imagination and by a readiness to stand back and question the obvious. By providing the environment where the students have full freedom of thought, able to recognize their experiences independent of external restraint is conducive for promoting creative thinking. Creativity in teaching breeds creativity in learning. Creativity is defined as involving the ability to produce work that is both novel (original, unexpected) and appropriate. Creative thinking enhances problem solving ability and it provides as a tool of learning process. There are different stages in creative thinking such a separation, incubation, illumination and verification.

What is common in a lot of school mathematics problems is that they are supposed to have only one solution. Pehkonen (1995) defined this type of problem as a closed problem. He suggested that these particular problems, which do not allow divergent thinking, are not able to enhance the quality of education, even after the introduction of new approaches. If the goal of mathematics teaching is to realize an individual's potential of mathematical creativity, it is necessary to break the habit of "knowledge delivery" from the teacher to the student, which is the conventional teacher-oriented teaching method. Mathematics teaching should be focused on the development of creative thinking where students are free to try their own original possible solutions. It means avoiding the traditional teaching method that emphasizes 'convergent thinking,' in which a student memorizes existing mathematical rules and theorems and then applies them to problems with great adroitness in order to find one exclusive solution.

Since these closed problems do not encourage students to adopt divergent thinking and reasoning, it is necessary to introduce new contexts

that allow the students to respond positively and participate actively in the learning process. They are

6.8.1 Brainstorming

It is a creative problem solving technique which is used to record maximum possible number of ideas on a defined subject. This brainstorming sequence includes sensing the problem, fact finding, ideation, and evaluation of ideas and planning for implementation.

6.8.2 Self-directed Learning

It is a systematic process in which the students take up the responsibility in collaboration with others for diagnosing their own learning needs formulating learning objectives planning and engaging in a sequence of learning experience.

6.8.3 Discovery Learning

This helps the learner to achieve his own understanding of mathematics by successfully solving a carefully structured sequence of problems. Here the student discovers the knowledge independently by experimentation in exploration instead of being directly presented with a content to be learnt.

6.8.4 Guided Discovery

Here the students are not acquainted with facts rather they are made to investigate or discover the facts. The teacher only provides suitable direction to produce independent solutions to problems.

6.8.5 Encouraging Intrinsic Motivation

Creativity is developed through higher levels of intrinsic motivation. The strategies which may influence intrinsic motivation are challenge, freedom, resources and supervisory encouragement.

6.8.6 No Over Controlling

Instead of dictating the activities they should engage in, the teachers let the students select their interests and support their inclinations.

6.8.7 Fostering Flexible and Playful Thinking

Creative thinkers are flexible and play with the problems which give rise to a paradox. The considerations here are

- Being open to alternate solutions

- Practicing creativity by regularly engaging the students in activities that encourage flexible thinking
- Using multiple senses when seeking solutions by thinking in terms of the five basic senses, the kinaesthetic sense and visualizing how the solution must look.
- Playing the roles of explorer, artist, judge and lawyer

6.8.8 Questioning

The questions that elicit many answers can be put whole teaching mathematics at any level in the classroom. The students should be confronted with open ended and divergent questions.

6.8.9 Encouraging Lateral Thinking

Lateral thinking requires the students to deviate from the conventional style of vertical thinking. It involves the flexibility of being able to change ones perception of the situation to insight full situations.

7.4 Identification of the Gifted and Enrichment Programmes for the Gifted

The identification of the mathematically gifted is as important as nurturing their mental abilities and skills to acquire a high level mathematical thinking and reasoning.

The unique characteristics exhibited by the gifted students will help the teacher in identifying them. However, the teacher has to carefully follow their academic and other performance consistently for a long time before he identifies them as gifted.

The following points should be taken into account while classifying the students as mathematically gifted or mathematically weak.

- Opinion of other subject teachers.
- Students' score on mathematics aptitude test, mathematics achievements test and intelligence test.
- Students' past performance in mathematics in the previous classes.

- Students' score on inventories like Interest in mathematics, Attitude towards mathematics.
- The report of a properly planned interview.

7.4.1 Characteristics of the Mathematically Gifted

The Secondary School Curriculum Committee gives the following general and special characteristics which mark the mathematically gifted.

General characteristics

- Has excellent memory, good vocabulary, broad attention span, and high reading ability.
- Makes associations readily and retains them indefinitely.
- Recognizes similarities and differences quickly.
- Has a relatively mature sense of values.
- Pursues interest with tremendous energy and drive.
- Uses his spare time productively.

Special Characteristics

- Frequently impatient with drill and details that he thinks are not important.
- May be reading mathematics books years ahead of his age.
- Recognizes patterns readily and enjoys speculating on generalizations.
- Prefers to think on higher levels of abstraction.
- Classifies particular cases as special cases of more general situations with relative ease.
- Follows a long chain of reasoning, frequently anticipating and contributing.
- Frequently asks profound questions.

7.4.2 Enrichment Programme for the Gifted

The gifted children have tremendous energy with a lot of determination to realise the goals. If not directed properly, this reservoir of energy may go waste and sometimes may create serious problems for the individual and society. The idea of giving special attention to the gifted children by arranging separate classes or sections is not practicable as the number of such students in a particular school, class and subject may be very small. Moreover this amounts to special treatment to a few at the cost of many and looks undemocratic. The other alternative is to collect all of them at one place in a

district or region. Among average companions he will remain at the top without much effort and will not face any competition. When collected at one place in an ideal school brought into the company and competition with classmates of their own level and are placed under the charge of selected and really competent teachers, they will be able to do their best. Such a school will be residential where all round development of these students may be ensured. These schools can also be equipped adequately to cater to their various and special educational needs. A truly academic inspiring scholarly and dedicated atmosphere can alsobe created.

For providing additional learning opportunities, under the enrichment programmes, the following two channels are suggested.

- *Differentiated curriculum for the gifted*
  - A curriculum which is more challenging can be devised for the gifted students.
  - Such curriculum should contain more advanced topics and challenging tasks.
  - The differentiated curriculum should provide opportunities for the students to explore, investigate, critically analyse, reason out and discover mathematical ideas and facts independently.
  - A parallel track curriculum (*Example*: 'A' level and 'O' level) will provide the necessary flexibility.
- *Enrichment within the existing curriculum.*
  - Under the second scheme, attempts may be made to provide enrichment programmes and opportunities within the existing curriculum.

The following steps may do greater justice to them.

- A differential curriculum providing an enriched syllabus to motivate the mathematically gifted students.
- Differential assignments such as multiple level and contract type assignment which are challenging and stimulating.
- Opportunities for independent and original work demanding extensive reading, use of cyber resources and so on.
- More scientific and sophisticated evaluation tools to assess the performance of the students, so that the evaluation is reliable and valid.
- Adopting teaching methods such as Project method, Analytic method, Heuristic method, Discovery method and Problem Solving method, so that the learning process involves participation and independent thinking.

- More time can be allotted for independent study through projects, seminar and assignments.
- As the gifted students do not require drill and practice, routine problems can be avoided. Instead challenging and thought provoking problems should be presented to them.
- Mathematically gifted students should be trained to take up mathematically challenging tasks such as organising mathematics exhibition, preparing models, presenting papers, solving puzzles, writing articles and so on.
- They can be encouraged to participate in panel discussion on topics in mathematics and quiz competition in mathematics.
- In solving mathematical problems, the gifted students can be encouraged to try and use alternate methods of attack and any such attempt should be appreciated and recognised by the teachers.
- The gifted students can be involved in the supervised study and tutorial classes for the slow learners in mathematics.
- The gifted students can be made responsible for organising the school mathematics club and its activities.

The gifted students can be encouraged to participate in National Talent Test such as National Talent Search Scheme conducted by NCERT and Mathematical Olympiads such as International Mathematical Olympiad (IMO), the Mathematical Olympiad Programme organised by National Board of Higher Mathematics (NBHM) of the Department of Atomic Energy etc. Such participation will provide ample opportunities for the students to quench their thirst for knowledge and face real mathematical challenges.

National Talent Search Examination

Frequently Asked Questions

1.	**GENERAL**	
i.	What is this scheme about?	This scheme is aimed at identification of talented students and awarding them scholarship to pursue their further studies and nurture them.
ii.	How old is this scheme?	The scheme is almost as old as NCERT; In 1963 the scheme was introduced as National Science Talent Search Scheme.
Iii	How long successful candidates will be getting scholarship?	The awardees studying in Sciences, Social Sciences, Humanities, Languages Commerce, vocational studies and fine arts are eligible to receive scholarship up to Ph.D. level whereas the awardees studying professional courses in medicines, engineering, technology, management and law, are eligible to receive the scholarship up to second degree level.
iv.	How talented students are identified?	Talented students are identified through two- tier examination process.
v	What is this two -tier examination scheme?	This is a scheme in which exam is conducted in two stages.
vi.	Who conduct first level examination?	NTS Stage-one is conducted by states and union territories. The purpose of this exam is to screen the number of candidates for Second level exam to be conducted by NCERT.
vii	Who conducts this second level examination?	National Council of Educational Research and Training (NCERT) conducts this examination.
viii	What is the criterion for selection to stage-II examination?	There is quota earmarked for all the states/ UTs. The state quota is computed on the basis of the student's enrolment at secondary level with a minimum of 10 for union territory and 25 for a state.
ix	When can one appear for NTS Stage-I Examination?	Currently NTS Scheme is open to the students who are presently studying in **Class X.**
x	Does this scheme available for other classes also?	No.
xi	How many scholarships are awarded every year?	Every year about 1000 scholarships are awarded.
xii	Is there any reservation for scholarships?	Yes, there is a provision of reservation for SC and ST candidates based on national norms of 15 percent and 7.5 percent

		respectively only those candidates who obtain minimum qualifying marks under these categories are eligible for scholarship.
Xiii	Does the scheme have provision of reservation for physically challenged students?	Yes, there is a provision of 3 percent reservation for physically challenged students.
2	**SELECTION PROCEDURE**	
i.	Can my son/daughter who is studying in India write the NTSE stage 2 Exam directly?	No, In order to appear for stage II exam the candidate name must be recommended by the State/UT to which he/she belongs.
Ii	Who can appear in this exam?	All students studying in Class X in any type of recognized school including, Kendriya Vidyalayas, Sainik Schools, Military Schools will be eligible to appear at the State Level Examination from the State in which the school is located.
Iii	Are there any eligibility conditions for appearing in the screening examination like qualifying percentage of marks in the previous year annual examination etc.?	Eligibility criteria for stage I varies from state to state. The State/UT may impose any eligibility condition for appearing in stage I examination.
3	**STATE LEVEL EXAMINATION (STAGE 1 EXAM)**	
i.	When will the notification be given?	For stage I examination, advertisement is released in the month of July- August.
ii.	Where can I get the application for Stage 1?	You need to contact Liaison Officer of your State/UT. Addresses of Liaison Officers are placed on the NCERT i.e. (www.ncert.nic.in)
iii	Do all the states/UTs conduct stage I exam every year?	Yes, each state/UT conducts its own stage I examination.
Iv	When is stage I examination held?	The state level screening examination is normally conducted in all the states/UTs on second Sunday of November except in Nagaland, Andaman and Nicobar Is. Meghalaya and Mizoram, where it is conducted on second Saturday of November every year until and unless some special circumstances occur.
v.	When to appear for Stage 1 NTSE?	One can appear for Stage I examination in the month of November for which you need to apply in the month of July-September (as per advertisement of each State/UT.)
vi	Should we apply through school or directly?	You need to submit your application after getting it duly signed by the

		Principal of the school before the due date as advertised/circulated by your state/UT.
vii.	How can I apply for stage I examination?	If you are a student of class X of a recognized school then you need to look for advertisement or circular in the school by the respective State/UT Government for the above said examination and act as per the requirement given in the state advertisement/circular.
viii.	If I have some other queries related to stage I examination, then whom should I approach?	In case of any other information /query about the details of the state level examination you may approach the Liaison Officers of your state/UT. **NCERT does not entertain stage I applications**
ix.	Can we send our application directly to NCERT?	No, you are advised to submit your application to your Liaison Officer of State/UT.
x	What will be the medium of examination at stage I?	The medium of the examination shall be as announced by the State/UT.
xi.	Is there any fee for appearing in stage I examination?	You need to check from state advertisement/circular. Each State/UT has its own rules with respect to charging of fee.
xii	What is the scheme of examination at Stage I?	Stage I Examination normally has three parts: Part I Mental Ability Test (MAT), Part II Language Test, Part III Scholastic Aptitude Test (SAT)
xiii	When state level examination results are are announced?	The results of State Level Talent Search Examination is declared generally in the months of January/February by the States/UT.
xiv	Are marks scored in stage I examination added to the stage II exam conducted by NCERT?	No.
xv	In case of any query/complaint/clarification with regard to State Level NTS Exam whom shall I contact?	You may correspond only with the state examination agencies (Liaison Officer).
4.	**NATIONAL LEVEL EXAMINATION (STAGE II EXAM)**	
i.	Is there any fee for appearing in the National Level Examination?	No, such fees is charged for appearing in NTS Stage II examination.
ii.	Who can appear for NTSE stage II examination?	Only the students selected by the states/UTs on the basis of their screening examination shall be eligible to appear in the NTSE stage-II to be conducted by the NCERT.
iii.	When stage II exam is	NTSE Stage II examination is conducted

	conducted?	on the second Sunday of May each year (unless otherwise notified).
iv.	I have cleared stage I examination, Do I have to fill and submit another form for stage II examination?	No, you need not fill and send any form for stage II examination.
v.	Whom should I contact for my Roll Number for stage II examination?	There is no need to contact anyone The NCERT will convey the Roll Number, the venue and the time for the national level examination to all such candidates directly through speed post.
vi.	My son/daughter is studying abroad; can he/she appear for NTS Examination?	Any student of Indian nationality studying abroad at the class X level can appear, provided she/he has secured 60 % marks in the previous examination, will have to appear in the NTS examination center in India at her/his own cost. Such candidate may send the filled in application request through head of the institution where he/she is studying along with an attested copy of class IX. Such requests can be made to Head Educational Survey Division, NCERT, New Delhi-16 within stipulated time. Such candidates are exempted from stage I examination and are permitted to directly appear for stage II examination. The NCERT shall allot roll numbers to such eligible candidates. If such a candidate is selected, the scholarship shall be paid for pursuing studies in India only.
vii	What will be the syllabus for NTS Stage II examination?	There is no prescribed syllabus for the NTS Stage II examination; However, the standard of items shall be conforming to the secondary level.
viii	How many papers will be there in stage II? How many questions will be asked in these papers? What will be the time limit for these papers?	For stage II NTS examination, there are three papers, Mental Ability Test (MAT) of 50 questions , (45 minutes), Language Test of 50 questions (45 minutes) and Scholastic Aptitude Test of 100 questions (90 minutes)
ix	Is there a negative marking?	Yes, there is negative marking. For each wrong answer 1/3 marks will be deducted and no marks will be deducted for unattempted questions.
x	Language Test is conducted in how many languages?	In Stage II NTSE Language Test is conducted in Hindi and English. Candidates need to choose either Hindi or English.
xi	Is language Test a qualifying	Yes, Language Test is qualifying in

	Test?	nature. That means marks scored in language test will not be counted for final merit.
xii	Do candidates get separate answer sheet to mark answers?	Yes, in all the three papers OMR answer sheets are provided.
xiii	I am from Assam, will I be getting question booklet for SAT and MAT in Asamiya?	Yes, you will be provided with question booklet in Asamiya language. The tests are also available in Asamiya, Bangla, English, Gujarati, Hindi, Kannada, Marathi, Malyalam, Odia, Punjabi, Tamil, Telugu and Urdu.
xiv	Whom should we contact for seeking information about second stage roll number and venue of exam?	There is no need to contact anybody. NCERT will directly send you roll numbers for Stage II NTS Exam by speed post. The letter will also indicate venue of examination along with other details.
xv	I have shifted to new location after my stage I exam, how will I get my roll number?	In case there is any change of address prior to the national level exam, it shall be obligatory on the part of the candidate to communicate the same to the state examining authority, which in turn shall inform NCERT.
xvi	Do we have center in all the state capitals in the country?	There are 36 centers across the country. Normally the candidates belonging to a particular state shall be allotted the center in the same state for the National Level Examination.
xvii	After my stage I examination, my family had shifted to another state, in that case I want to opt for center in my present state, for that whom should I request?	Only in exceptional cases under special circumstances like the transfer of the parents of the candidates, the center for examination may be changed on a written request received by the NCERT within 15 days of the issue of the Admission Card and 10 days prior to examination. It is not obligatory for NCERT to provide change of center in any case. However in such case Test Booklet in English Medium will be provided to candidates.
xviii	Is there any interview in the examination schedule?	There is no interview. Selection is based on the performance of written test in MAT and SAT and obtaining minimum marks in all the papers Language Test.
Xix	When results are declared?	Normally results are declared in the month of August.
Xx	How will I come to know about results?	Results will be uploaded on NCERT website. Only the selected candidates shall be informed by letters sent through speed post.
xxi	Is there any provision of rechecking or retotalling?	NTSE stage II examination is computer processed. NCERT takes extreme care in

		result processing. There is no provision for rechecking and retotalling. Al the OMR answer sheets are placed on web portal to maintain the transparency, candidates can see only their OMR answer sheets.

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MATHEMATICAL OLYMPIAD

History of mathematical Olympiad:

A mathematical Olympiad problem solving competition open to all 'athletes' the aim of the competition is to test innate problem solving skills. It is created in 1977 by Dr.George lenchner, an internationally knows mathematics educator, mathematics O

The main international mathematical Olympiad is the international mathematical Olympiad (IMO), a competition held annually since 1959.

Objectives of Mathematical Olympiad:

1. To stimulate Enthusiasm and love and interest for mathematics.
2. To introduce important mathematical concepts.
3. To teach major strategies for problem solving.
4. To develop mathematical flexibility in solving problem.
5. To strengthen mathematical instruction
6. To foster mathematical creativity and ingenuity.
7. To provide for the satisfaction, Joy and Thrill of meeting challenges.

Organization of the mathematics Olympiad programme in India:

The mathematical Olympiad programme in India leading in participation in the IMO is currently being organized by the "Homi Bhabha" center for science education (HBCSE) on behalf of the national board of higher mathematics (NBHM) and founded by the department of Atomic Energy (DAE).

The correct office bearers in charge of the programmes are:

- National Co-ordinate-Delhi
- HBCSE Director – Mumbai
- Member Secretary, NBHM – Mumbai
- Scientists' In-charge-Bangalore.

Procedure for Participation:

There is a three-step procedure in order to represent India of IMO.

1. Regional Mathematical Olympiad (RMO):

In India, CBSE & Navodaya Vidyalaya samiti are designated and also 21 different regions in country are designated. All school students' classes XI & XII are eligible to appear in RMO Exam held b/w September and the December.

2. Indian National Mathematical Olympiad (INMO):

INMO is held on 1st Sunday of Feb. each year at center of each region. INMO is open only to those selected through RMO from their respective regions or through RMO conducted by CBSE or NVS.

3. International Mathematical Olympiad Training Camp (IMOTC)

The awardees of INMO are invited to a month – long training camp held in May, June. Each year at HBCSE Mumbai. Training facility from all over the country imparts problem solving skills along necessary theoretical background to the awardees.

Syllabus for Mathematical Olympiads:

There is no prescribed syllabus for mathematical Olympiads. The topics are taken from pre-college mathematics. The areas covered are Arithmetic of Integers, Geometry, Quadratic equations and expressions, Trigonometry, co-ordinate Geometry etc., the major areas from which problems are chosen are number theory, Geometry, Algebra & combinatory etc. The difficulty level increases from RMO to INMO to IMO.

Importance of Mathematics Olympiad

1. It Provide opportunity for gifted children.
2. It develops competitive spirit.
3. It identifies gifted children.
4. Encourage and award gifted children.
5. Expose children to regional, national and international levels.
6. To help children to know their capabilities.
7. To nurture their talents.
8. To enhance their critical and problem-solving skills.

Example problems for Mathematical Olympiad:

1. Let a, b, c be +Ve real numbers, such that abc=1 prove that (a-1+1/b) (b-1+1/c) (c-1+1/a) < 1
2. Deter mine all functions f; R-R such that f (x-f(y)) = f(f(y))+x+(y)+f(x)-1 for all real numbers xy
3. Find all primes pand q such that, p2+7pq+q2 is square of an integer.
4. Find all real values of (a) for which the equation $x4-2ax^2+x+a^2-a=0$ has all its roots real.
5. Let ABC be a in which AB = BC and CAB= 90^0 suppose M and N are points on the hypothectic On use BC such that BM+CN=MN, Prove that MAN=45^0
6. Special Programmes in Teaching Mathematics

1. Defects in the present day Teaching Mathematics in schools and their possible Remedies.

It should be frankly admitted that the present-day teaching of Mathematics is far from being satisfactory.

Everybody has a complaint against the teaching of mathematics. It is dull, boring, difficult and useless from the point of view of the learner. “It is too remote from life to the student”. The teachers complain of excessive work load and lack of facilities in the form of aids and equipment.

Defects and possible Remedies:

1. Teacher’s Qualification:

It is a common defect in our educational set-up that most of the subject teachers are not adequately qualified in the subject concerned, without proper qualification and proper training. They fail to do justice to the subject. An adequate, high qualification of the teacher develops self-confidence in him and serves as a source of inspiration to his students. The teacher must be

nature in his subject. He must possess real knowledge of and insight on to the processes of mathematics and their effective teaching.

2. Teachers Borden:

Teacher cannot adopt and prepare for, effective methods, as he has no spare time. His burden does not allow him time to remove individual difficulties. It should be lightened to enable him to show his originality and initiative.

3. Teachers Salary:

Mathematics or other teacher economic position is not good. He remains worried, and a worried teacher cannot give his best to the learners. He is a frustrated, discontented and half-hearted worker. In these hard days, he must be suitably paid.

4. Teacher's Attitude:

Teacher does not have genuine love for his mathematics subjects and profession. He lacks faith in the utility of the mathematics subject, and therefore, cannot create interest among the students. A teacher's love for his Job and subject should also be ascertained before giving him his duty.

5. Lack of purpose:

The students do not recognize the purposes behind the study of the topics of mathematics. The particular and general aims of every topic should be emphasized effectively. If the work lacks purpose, it is the teacher's duty to make it purposeful. The purpose should be attractive to stimulate the students to work hard. This misconception should be up rooted from the minds of the parents and pupils that most of the mathematics taught in the schools is not purposeful.

6. Lack of Equipment:

There is a serious lack of mathematical apparatus in the schools. Without equipment, the subject becomes abstracts. The establishment of a mathematical laboratory will remove this defect.

7. Method of Teaching:

The powers of thinking, understanding and retention are not thus developed in the students. If the pupils do not show any interest in the subject (maths) if can be created not by blind memorizing, but by shifting the methods. The authorities run after showy results which are obtainable only through cramming. They have no appreciation for good mathematical teaching. The remedy necessitates a fundamental change in value and methods.

8. Large classes:

It is a general defect. No individual attention cannot be paid. It becomes difficult for the teacher to establish close contacts with the students. Teacher cannot easily Judge the capacities of the individuals. This defect can be removed only by limiting the number of students in each class up to a maximum of Thirty-five.

9. Text – Books:

The traditional style of the syllabus also affects text-books adversely. The illustrations and problems give in the text-books are divorced from actual life. The mathematics text-book material is made available in a readymade form which goes against thinking, discovery and originality. Text books should give possibilities of correlation, application in practical life, use of

aids, activities, projects etc., concerning every topic in mathematics. The arrangement of the subject matter should both and laboratories.

10. Libraries and Laboratories.

11. **Examinations.**

12. Syllabus

13. Mathematical Language.

14. Rigor in study etc.

Even after removing the above mentioned defects completely there will be a scope for improvement