

**Essential Standard Operating Procedure
(SOP) Required for Affiliation with CBSE
Mathematics Laboratory**



CENTRAL BOARD OF SECONDARY EDUCATION

1. Introduction:

Mathematics has to be learned by doing and not by rote memorization. This requires a suitable place for performing the activities. A well-equipped mathematics laboratory motivates the students and creates an environment to learn mathematics by doing. The need for a mathematics laboratory is mentioned in the *National Curriculum Framework for Elementary and Secondary Education (1988)* and has also been endorsed in the *National Curriculum Framework for School Education (2000)*.

A mathematics laboratory is an activity-centered approach to learning and a child is placed in a problem-solving situation through self-exploration and discovery. Some of the ways in which a mathematics laboratory can contribute to the learning of the subject are as follows:

- It provides an opportunity to understand and internalize basic mathematical concepts through concrete objects and situations.
- It enables the students to verify or discover several geometrical properties and facts using models or paper cutting and folding techniques.
- It enables the students to draw graphs and do analyses based on their calculations
- The laboratory provides an opportunity to exhibit the relatedness of mathematical concepts with everyday life.
- The laboratory promotes collaborative learning among students which further assimilates the concepts more effectively.
- It enables the teacher to demonstrate, explain and reinforce abstract mathematical concepts/ideas by using concrete objects, models, charts, graphs, pictures, posters, etc.
- It enables the students to verify various identities and formulae used in Algebra and
- Mensuration through activities, 3-d models of solid figures, and illustrative audio-visual aids.

2. Curricular Expectations:

The study of Mathematics is expected to fulfil the following curricular expectations:

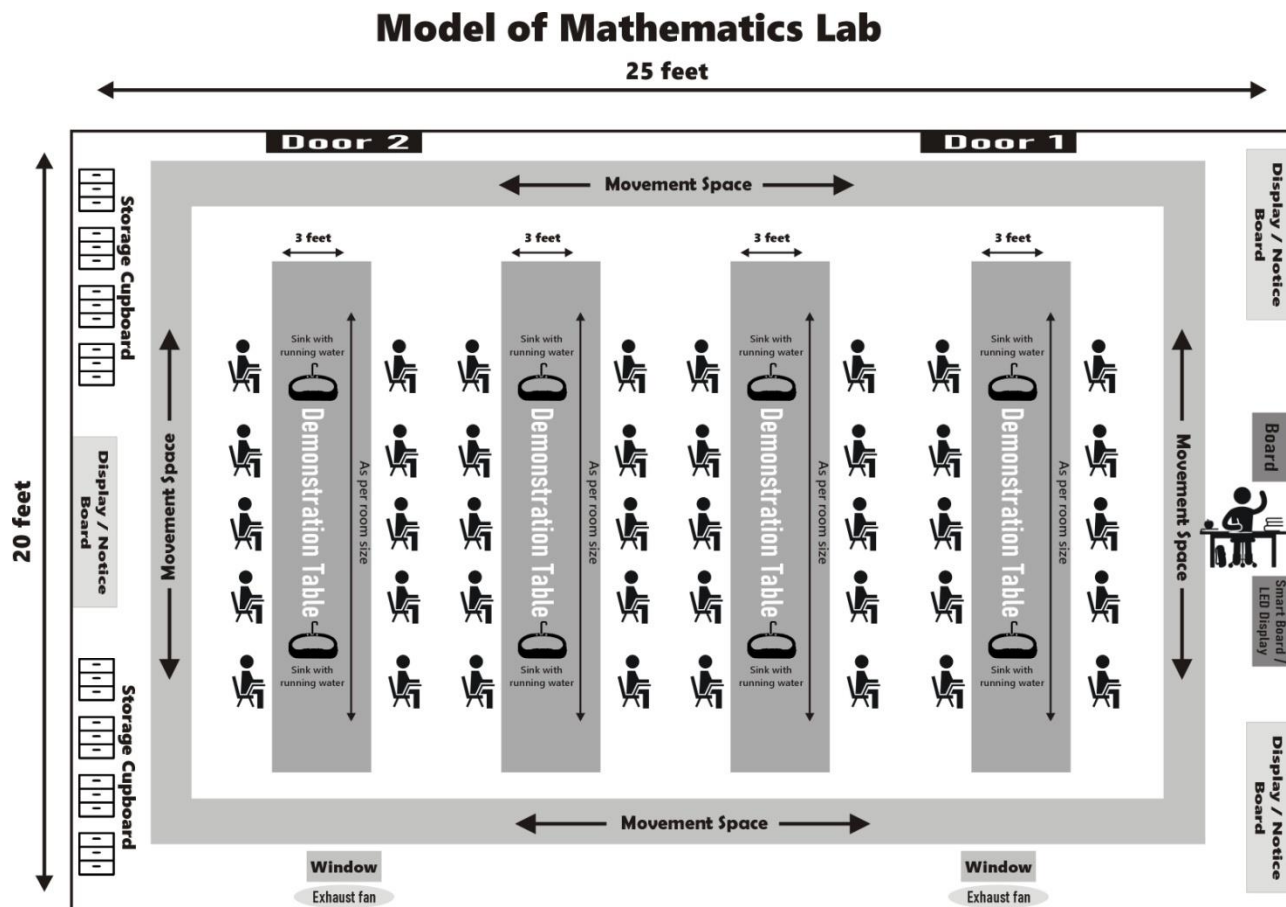
i.	To provide readily accessible rich manipulative materials to focus on “learning by doing”.
ii.	To develop an attitude of inquiry.
iii.	To remove the phobia of mathematics education and develop a positive attitude towards the subject.
iv.	To develop much-needed confidence in students.
v.	To generate interest in the subject.
vi.	To make the students divergent thinkers.
vii.	To provide individualized remedial instructions, and reinforcement of concepts through demonstration.
viii.	To emphasize conceptual understanding rather than rote memorization (NEP 2020).
ix.	To make learning Holistic, Integrated, Enjoyable, and Engaging (NEP 2020).

3. Pedagogy of Mathematics as recommended by National Education Policy 1986 and 2020

1. The National Policy on Education (NPE, 1986) stated that “Mathematics should be visualized as the vehicle to train a child to think, reason, analyze and to articulate logically”.
2. National Education Policy (NEP, 2020) recognized importance of mathematics and mathematical thinking in upcoming research-oriented fields such as artificial intelligence, machine learning and data science.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Mathematics Laboratory in schools. The present SOP also illustrates adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempts to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

4. Model Layout of Mathematics Lab



5. Infrastructure needed for Mathematics Laboratory:

Recommendations for infrastructure and equipments:

S.NO	Category	Requirement
1	Physical Infrastructure	<ul style="list-style-type: none"> Minimum Lab. Room Size 500 Sq.ft.
2	Storage	<ul style="list-style-type: none"> Display board blackboard (half plane & halfgraph) Racks Almirah for storage
3	Teaching facility	<ul style="list-style-type: none"> Preferably an intelligent board with an internet Facility or white / green board.
4	Demonstration Table	<ul style="list-style-type: none"> There should be proper demonstration table. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher. 40 seating facilities (lab stools)
5	Stencils	<ul style="list-style-type: none"> For drawing mathematical shapes.
6	Measuring tape 15 meters	2
7	Magnetic graph coordinate board with marker	1
8	Fraction concept instruments	1
9	Circle concept kit	1
10	Hardwood geometrical solids Hardwood geometrical solids	1
11	Volume relationship sets	1
12	Geometrical shapes 5x10 cm colored	12
13	Clinometer	2
14	Platonic solids and square prism and pyramids	1
15	Mensuration kits	1
16	Probability kit	1
17	Measuring jugs and beakers	1
18	Triangle kit	1
19	Standard time indicator	1
20	Scissors, one-meter wooden scale	2
21	Geometrical instruments comprising the compass, divider, scale set square & protractor.	1
22	Student Abacus (Wooden)	1
23	Standard Time Indicator	1
24	Physical Balance	1
25	Geo Board-Circle (Wooden)	1

24	Mathematical charts	<ul style="list-style-type: none"> • Measurement scales, conic sections, Venn diagram, number system, time management, trigonometry
25	Different types of papers	<ul style="list-style-type: none"> • Isometric sheet • squared dotted sheet • graph paper etc.
26	Pair of dice	<ul style="list-style-type: none"> • Probability kit (Dice, playing cards, coins of different colours)
27	Recreational games and puzzles	<ul style="list-style-type: none"> • Tangrams, sudoku • Tambola • Integer board
28	Unit cubes	1
29	Kit for primary classes 3 to 5	<ul style="list-style-type: none"> • Fraction kit, Decimal kit • Fake money kit, Rangometry, • Training clock, Sau rang ki khoj • Tessellation kit, Dienes blocks (Rubber) • Maan cards four digit / six digit • Decimal maan cards
30	Classes 6-8:	<ul style="list-style-type: none"> • Probability kit • Fraction kit • Triangle kit • Integer board
31	Classes 9-10	<ul style="list-style-type: none"> • Probability kit • Mensuration kit • Measuring jug set. (7)
32	Photo display of Indian Mathematicians	<ul style="list-style-type: none"> • Famous Mathematician portraits/posters
33	Models on Mathematics	Pythagorus theorem, π diagram $(a+b)(a-b) = a^2-b^2$ $(a-b)^2=a^2+b^2-2ab$ $(a+b)^2=a^2+b^2+2ab$ Abacus and beads, Multipurpose mathematical kit etc.
34	Physical Balance & Electrical Balance	<ul style="list-style-type: none"> • 1 each
35	L.E.D.	<ul style="list-style-type: none"> • Preferably roof mounted
36	Geometry box	<ul style="list-style-type: none"> • 05 for demo by teachers
37	Thermometer	<ul style="list-style-type: none"> • 1
38	Sextant	<ul style="list-style-type: none"> • 8

6. Safety Guidelines:

b) List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- Periodical checking of electrical fittings/ insulations for replacement and repairs
- Display of do's and don'ts in the laboratory at prominent places.
- Safe and secure storage of all equipment.
- Proper labelling and upkeep of equipment.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Careful supervision of students while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.
- Proper location of the laboratories.

c) General work procedure for students

- When entering a laboratory, avoid touching equipment, electrical and electronic devices, or other materials until you are instructed to do so.
- The students should be careful when doing electricity experiments.
- He/she should not touch any wires if his/her hands are wet, even for low voltage equipment.
- Follow all written and verbal instructions carefully given by the teacher/ instructor.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, breakage or injury, report to the teacher instantly: stay calm.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet/ socket.
- Wash your hands with liquid soap and water on leaving the laboratory.