

**IMPACT OF MANIPULATIVE MATERIALS IN TEACHING MATHEMATICS  
AT PRIMARY LEVEL**

**A  
THESIS  
BY  
BABITA THAPA**

**IN PARTIAL FULLFILLMET OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF EDUCATION**

**SUBMITTED TO  
DEPARTMENT OF MATHEMATICS EDUCATION  
CENTRAL DEPARTMENT OF EDUCATION  
UNIVERSITY CAMPUS,  
TRIBHUVAN UNIVERSITY  
KIRTIPUR, KATHMANDU, NEPAL**

**2016**



त्रिभुवन विश्वविद्यालय  
शिक्षा शास्त्र संकाय  
शिक्षा शास्त्र केन्द्रीय विभाग  
TRIBHUVAN UNIVERSITY  
FACULTY OF EDUCATION  
CENTRAL DEPT. OF EDUCATION

विश्वविद्यालय क्याम्पस  
कीर्तिपुर, काठमाडौं, नेपाल  
फोन नं.: ४३३१३३७  
UNIVERSITY CAMPUS  
Kirtipur, Kathmandu, Nepal  
Tel. No.: 4331337

Ref .

Date:.....

**Letter of Approval**

Thesis

By

Babita Thapa

Entitled

**“Impact of Manipulative Materials in Teaching Mathematics at Primary Level”** has been approved in partial fulfillment of the requirement for the Degree of Master of Education.

**Committee for the Viva-Voice**

**Signature**

Ass. Prof. Laxmi Narayan Yadav  
(Chairman)

.....

Prof.Dr. Hari Prasad Upadhaya  
( Member )

.....

Mr. Abatar Subedi  
(Member)

.....

Date:.....



त्रिभुवन विश्वविद्यालय  
शिक्षा शास्त्र संकाय  
शिक्षा शास्त्र केन्द्रीय विभाग  
TRIBHUVAN UNIVERSITY  
FACULTY OF EDUCATION  
CENTRAL DEPT. OF EDUCATION

विश्वविद्यालय क्याम्पस  
कीर्तिपुर, काठमाडौं, नेपाल  
फोन नं.: ४३३१३३७  
UNIVERSITY CAMPUS  
Kirtipur, Kathmandu, Nepal  
Tel. No.: 4331337

Ref .

Date:.....

Letter of Certificate

This is to certify that Mrs. Babita Thapa, a student of academic year 2068/69 with campus Roll No 359/2068, Thesis number-1103, T.U Registration No 9-2-241-396-2007 and Exam symbol number 281499 (059) has completed this thesis under my supervision during the period prescribed by the rules and regulation of Tribhuvan University, Nepal. The thesis entitled **“Impact of Manipulative Materials in Teaching Mathematics at Primary Level”** embodies the results of her investigation conducted under the Department of Mathematics Education, University Campus, Tribhuvan University, Kirtipur, and Kathmandu. I recommend and forward that this thesis be submitted for the evaluation to award the degree of Master of Education.

.....

(Mr. Abatar Subedi)  
Supervisor

.....

(Ass. Prof. Laxmi Narayan Yadav)  
Head

Date:.....

## TABLE OF CONTENT

Letter of Approval	I
Letter of Certificate	II
Acknowledgement	III
Abstracts	IV
Acronyms	V
<b>CHAPTERS</b>	
<b>I. INTRODUCTION</b>	<b>1 - 6</b>
Background of the study	1
Statement of problem	3
Significant of the study	4
Objective of the study	5
Research hypothesis	5
Statistical hypothesis	5
Delimitation of the study	5
Operation definition of term	6
<b>II. REVIEW OF RELETED LITERATURE</b>	<b>7 - 10</b>
<b>III. METHOD AND PROCEDURE</b>	<b>11 - 18</b>
Research Design	11
Experimental and control group	12
Control process in the experiment	12
Population of the study	13
Sample of the study	14
Tools	14

Item analysis of the test	15
Reliability and validity of the test	15
Data collection procedure	16
Data analysis procedure	16
<b>IV. ANALYSIS AND INTERPRETATION</b>	<b>19 - 24</b>
Comparison between mean achievement score of pre test and post test on both group	19
Comparative bar graph of mean achievement score of test and post test data	21pre
Response of teacher and student about manipulative materials in teaching mathematics	23
<b>V. SUMMARY, FINDING, CONCLUSION, RECOMMENDATION AND SUGGESTION</b>	<b>25 - 27</b>
Summary of the study	25
Finding of the study	26
Conclusion of the study	26
Recommendation of the study	27
Suggestion of the study	27
<b>Reference</b>	<b>28-29</b>
<b>Appendix A-K</b>	<b>30-63</b>

## ACKNOWLEDGEMENTS

I am very much indebted to my thesis supervisor Mr. AbatarSubedi, Lecture, Department of Mathematics Education, Central Department of Education, T.U. Kirtipur, Kathmandu, for his painstaking efforts in providing me with scholarly guidance and constant encouragement to complete this research report in time.

I would like to express my sincere appreciation to Assot.Prof.. Laxmi Narayan Yadav , Head, Department of Mathematics Education, Central Department of Education, Prof . Dr. Hari Prasad Upadhyay, prof. Dr Hira Bahadur Maharjan, Prof. Dr Min Bahadur Shrestha, Mr Bed Prasad Dhakal, Mr Deepak Mainali, Mr. LoknathBhattarai and other respected teachers of Department of Mathematics Education For their constant inspiration and co-operation. I would like to express my thanks to all hedteachers, teacher and students of the concern school for their co-operation.

Finally , I would like to express my thanks to my friends Dharma Raj Bhandari, LaxmiAdhikari, Prakash Adhikari, Rabin NepalIshworKhanal,AmritPoudel and Munapoudel for providing me their valuable time, experience and inspiration in completing this thesis. Lastly I express my thanks to my family for their co-operation and support in completing my study.

BabitaThapa

---

## ABSTRACTS

There are many problems in the field of teaching learning process. Most of the teacher and students think mathematics is difficult for teaching and learning. Mathematics teacher face many problem while giving clear concept to the students. It is clear that the use of manipulative materials helps to understand easily in teaching mathematics. It makes easy to teaching and learning activities and it can be use the facilitate teaching and motive students for clear teaching. Manipulative materials are related to sensory organs and they provide the visual and the sensory experience to the students. So, the researcher planed to study the impact of manipulative materials in teaching mathematics at primary level. The objectives of this study were to compare the achievement of mathematics of the grade V student taught by using manipulative materials and without using manipulative materials and to explore the feelings of student and their activities in the class while teaching them by using manipulative materials.

For this study pre-test, post-test, non-equivalent group design was adopted. Fifty-five students of two schools were selected at Chitwan district. Both groups were taught by researcher herself on the selected topics 'perimeter, area and volume' with and without using manipulative materials respectively. The experimental group and control group were determine by tossing a coin. Pre-test was administered before the experiment started. The experiment runs for the duration 1 month. After 1 month a post-test was administered on both groups and then mean, standard deviation and variance was calculated. On the performing t-test, the null hypothesis was rejected. Finally the researcher conclude that the achievement of students of experimental group is better than the achievement of control group. So, mathematics teaching by using manipulative materials causes better achievement than teaching without using manipulative materials at primary level.

## **ACRONYMS**

**SJJHSS:-**Shree Jan Jiwan Higher Secondary School

**SJKHSS :-**Shree Jan Kalyan Higher Secondary School

**SKSS:-**Shree Krishnanagar Secondary school

**EG :-**Experimental Group

**CG :-**Control Group



## Chapter 1

### INTRODUCTION

#### Background of the Study

Mathematics is the clear way of understanding various aspect related to real life of the human being. It helps to improve level of confidence. Mathematics has become essential in development of science, engineering and technology. Mathematics is a portion of educational curriculum; moreover it is necessary for advanced level education. So every student should study it and gain better achievement.

According to the mathematics dictionary “Text book is a material to study which deals with definite subject of learn systematically arrange things, intended for a use at a specified level of instruction and it is used as a given course”. Hilbert defined “mathematics is nothing more than a game played according to certain simple rules with meaningless marks on paper. According to oxford dictionary” Mathematics is the science of number and space”.

From the above definitions mathematics and life are related to each other like a relation between nail and mussels in human body. It is essential for daily life as well as for higher study in the field of science and technology. Its aim to transfer the attitudes, ideas, skills and knowledge of people in the community dislike mathematics, more so as they get older and many who find great difficulty with what, in reality, is very simple(Dienes, 1971). The common attitude is to get through the examination after which no further though is given to mathematics. Aryal mention the about situation, To some student mathematics is a collection of meaningless symbols, to other rules and to still other tricks and jargon.

Mathematics is central part of the school curriculum not only in Nepal but also entire world. Every society has observed mathematics is basics need of human civilization.

Mathematics has started as the infancy level from the beginning of human civilization.

Manipulative materials means physical things such as protector, Rural Rectangular box, cone cylinder made with wood and paper, circle board, geo board, fraction pieces, patterns blocks, geometric solids that can makes abstract ideas and symbols, more meaning full and understandable to students. By using manipulating materials, we can make clear way of understanding and performance on mathematical tasks. Manipulative materials support in learning of Arithmetic and geometrics contexts.

There are different types of materials, which support the teaching in the class. Among them manipulative materials play vital role for teaching learning process. Manipulative materials that are designed to be touched or handled by the students, which developed there perceptual skills, psychomotor skills etc. are called manipulative materials. According to the oxford dictionary “Manipulative materials those materials which skill fully used by hand”.

Manipulative materials are solids materials that involve mathematics concept several senses that can be touched and moved around by the students. Each students needs materials to manipulative independently demonstration by teachers or by one student are not sufficient. When student actively involved in manipulative materials demonstration and working with manipulative materials improved performance of mathematical task.

The National council of teachers of mathematics(NCTM,1989) slandered stress important of having students use of manipulative materials. Research indicates that lesson using manipulative materials have a higher achievements then doing lesson without search materials.

In the context of Nepal, the manipulative materials are not used in the teaching profession. So easy subject become hard to understand for the students, in this regard it plays important role for the clear understanding for all level of students The study using manipulative materials in teaching Perimeter, Area and Volume has not been used, so in present situation it is very necessary to use manipulative materials in teaching perimeter, Area and Volume.

### **Statement of Problem**

Mathematics is one of the important disciplines with boarder application in all over the world. This story is mainly concerned with the impact of manipulative materials in teaching mathematics at Class V. Most of the school of Nepal is still using the traditional methods characterized by mastery of subject matter, through drill, repetition and memorization. In order to make the mathematic teaching practical and life oriented, the teacher is expected to follow learning by practical works and she should also use the manipulative materials properly. This study was concerned on the following researchable question:

- Does the use of manipulative materials yield better achievement of students that without using manipulative materials?
- How do they feel when they are taught with using manipulative materials and without using manipulative materials?

### **Significance of the Study**

Mathematics is an essential part of school curriculum. So it is taught as compulsory subject at all level of school education. Manipulative materials play an important role in making learning meaningful and help people to over comes their difficulties. Especially at basic level, the mathematics teacher should use the manipulative materials while teaching on concept of perimeter, area, capacity and volume. Most of the mathematics teacher teaches traditional way

and without the using of materials. So, the rate of dropout and failures of student in school are increasing in mathematics.

The main significances of this study are as follows:

- This study would help those persons who are looking forward to get better result in mathematics at basic level.
- This study would help to find out the impact of manipulative materials in teaching mathematics
- This study would help to get knowledge about using manipulative materials in teaching mathematics at primary level.

### **Objective of Study**

The objective of this study were as follows:

- To compare the achievement of mathematics of the grade V student taught by using manipulative materials and without using manipulative materials.
- To explore the feelings of student and their activities in the class while teaching them by using manipulative materials.

### **Research Hypothesis**

This research aim to achieve student performance by using manipulative materials is higher than thatof without using manipulative materials in teaching mathematics. However this research goes to carry on the bridge to cross over the present problems.

### **Statistical Hypothesis**

$H_0 : \mu_1 = \mu_2$  (Null Hypothesis)

$H_1 : \mu_1 \neq \mu_2$  (Alternative Hypothesis)

Where  $\mu_1$  and  $\mu_2$  are the mean achievement score of the student by using manipulative materials for Experimental groups and without using manipulative materials for Control group.

### **Delimitation of the Study**

This study was delimited under the following aspect:

- Only two public schools were included in this study.
- The content was limited to this study were perimeter, area and volume of grade V.
- The experimental class was taken for one month.

### **Operational Definition of Term:**

Some terms related to this study were defined as follows:

#### ***Manipulative Materials:***

In this study, The manipulative materials means tan gram, geo-board, rubber band, protector, ruler made with wood and paper. This material will be used to Perimeter, Area and Volume

#### ***Public Schools:***

Public school was those schools which receive the government grant for the salary of teacher and other purpose.

#### ***Experimental Group:***

A group of students who was exposed to the regular manipulative materials in teaching mathematics at class V.

#### ***Control Group:***

A group of student who was taught without using manipulative materials in teaching mathematics at class V

#### ***Impact :***

The impact in this study is defined in term of the magnitude of the score obtained by experimental and control groups in the mathematics achievement test.

## Chapter II

### REVIEW OF RELATED LITERATURE

It is essential to review the related literature to compare the study, which provides the strong knowledge about the related topics. Number of books, research reports, papers and other booklet can be found with curriculum teaching materials, method and so on.

Manipulative materials play a vital role in an education programmed as learning based on primary and sensory experiences and also materials provides visual and sensory experience for the students.

The main purpose of review of related literature is to find out what works have been done in the area of the research study undertaken. Therefore the following review of literature guidelines for using manipulative materials in teaching mathematics at primary level and fulfill the objectives of this study.

Thomas (1981) Wrote on the Manipulative materials in mathematical concept “It should not be surprising that current research has established a substantial relationship between the use of manipulative materials and students' achievement in the mathematics classroom. Learning theorists have suggested for some time that children's' concepts evolve through direct interaction with the environment, and materials provide a vehicle through which this can happen.”

Lesh(1979) has suggested that manipulative materials can be effectively used as an intermediary between the real world and the mathematical world. He contends that such use would tend to promote problem-solving ability by providing a vehicle through which children can model real-world situations. The use of manipulative materials (concrete models) in this manner is thought to be more abstract than the actual situation yet less

abstract than the formal symbols. Figure 8-2 illustrates the revised model. It should be noted that this expanded use departs from the more traditional classroom technique wherein manipulative have been used to teach children how to calculate using the four arithmetic operations.

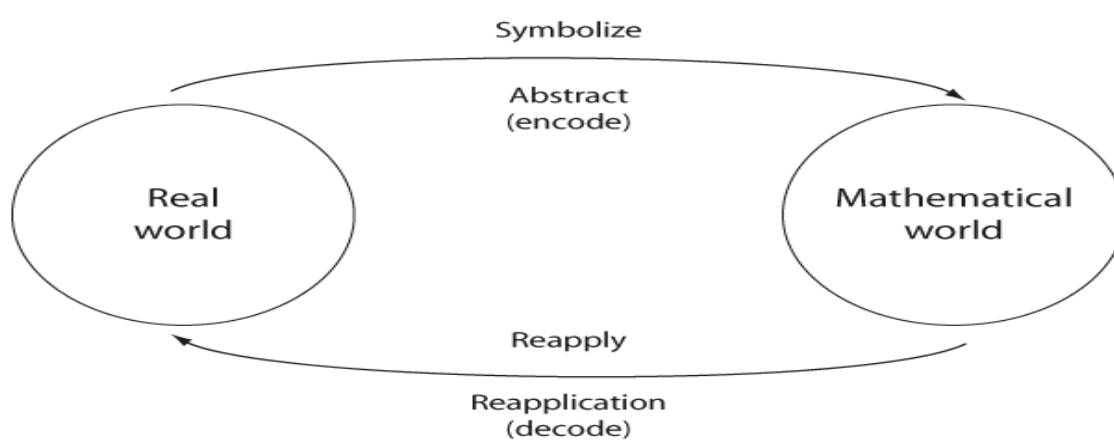


Figure 8-1

A relationship between the real and mathematical worlds

**Source:** Lesh (1979), *The Role of Manipulative Materials in The Learning of mathematical concept*

Evelyn j.Sowel, Teaching mathematics using manipulative materials has long history. In the nineteenth century Pestalozzi advocated their use, and manipulative materials were included in the activity curricula of the 1930s. the mid-1960s began another period of emphasis on using concrete objects and pictorial representation in mathematics instruction.

During the 1960s and 1970s, researcher compared, in a number of educational settings, outcomes of mathematics instruction with concrete or pictorial materials to outcomes of instruction without such materials. Their result were often mixed. Finding in some comparisons favored the group using materials, whereas in other comparisons the control group achieved comparable or better result.

Kennedy (1986) Stated: “Manipulative materials objects that appeal to several senses and that can be touched, moved about rearrange and otherwise handled by children. These materials allows students to discover different mathematical function by the use of manipulative materials, student can understand abstract mathematical concept and can memorize long time”.

Amatya(1978) conducted a study on “a study of effectiveness of teaching mathematics with and without the use instructional materials” with the aim to find out whether instructional materials were helpful to develop the mathematical concept and to measure the difference in concept development among students from Lalitpurnagarpanchayat were selected by systematic sampling and the experiment was conducted four weeks duration. It was conclude that the mean difference was significant at 0.05 levels. The conclusion was that the performance of the students taught with the use of instructional materials was significantly improve when compared with the performance of the students taught without use of instructional materials.

Gautam (2005) conducted a styudy on “Effectiveness of instructional materials in teaching mensuration at secondary level” to explore the effectiveness of instructional materials in teaching mensuration of secondary level and to ompare the mathematics achievement of boys and girls in mensuration. Fot the study, two public school of rupendehi district were selected randomly. Twenty eight student of class ten including different socio-economic status and different castes were selected purposively with the equal number of boys and girlson the basis of their pre-test scores. A pre-test and pos -test equivalent groupdesign was adopted for the purpose of study. Experimental and control groups were determined by tossing a coin. Researcher taught both the group, but use treatment to the experimental group fifteen days.



He constructed and applied achievement test on both group. The t-test and f-test were applied for comparing the achievement of two groups and for comparing the variance of two groups respectively. He concluded that experimental group performed better than the control group. It was also found the boys and girls of experimental group equally benefited in understanding the concept of mensuration when taught by using instructional materials.

Thapa (2006) conducted a study on “impact of instructional materials in teaching mathematics at primary level school of Lumjung district.” With the aim of the investigating impact of instructional materials in teaching mathematics at primary level. He selected the ten secondary school randomly for Lamjung district. Researcher compared the result of class five between the school using instructional materials and school not using instructional materials. He used mean, standard deviation and variance to compare their results. Finally researcher found that achievement of school teaching with instructional materials was higher than the achievement of schools teaching without instructional materials.

Baral (2005) did a research “effective of instructional materials in teaching geometry at primary level” with the aims to be find outn the effectiveness of instructional materials in teaching geometry at primary level. He conclude that the achievement of the student of experimental group better than the achievement of the control group. So, the study indicated that geometry teaching by using different instructional materials yielded better achievement than the teaching without using instructional materials.

From the analyzing and receiving above study, the researcher arrives at the conclusion that the research study would be fruitful to find the higher achievement of primary level (Grade-V) students in mathematics teaching with using manipulative materials than without using manipulatives materials. All these study are concern with the learners of Nepalese context.

The present study differ from those of existing researcher's in the sense that it deals with the effectiveness of particular materials, the widely use manipulatives materials in teaching mathematics.

### **Chapter III**

## RESEARCH METHOD AND PROCEDURE

This chapter deals with the procedure of the study, which is carryout to archive the objective of the study, the method applied in this study is discussed in the following section: Design of this study, Population sampling, data collection procedure, data analysis procedure using manipulative materials in teaching mathematics. So this chapter clearly mentions how the study is completed for the fulfillment of the objectives.

### Research Design

The pre-test, post-test and non equivalent group design was adopted for the purpose of this study. The independent variable was the treatment and the dependent variable was achievement of students. The design of the study was illustrated in following table.

**Table 1**  
**Design of the Study**

Group	Pre-test	Treatment	Post-test
Experimental (E)	T <sub>1</sub>	Using materials (+)	T <sub>2</sub>
Control (C)	T <sub>2</sub>	(-)	T <sub>2</sub>

E = Experimental group which was taught by using manipulative materials.

C = Control group which was taught by without using manipulative materials.

T<sub>1</sub>= Pre-test given to the experimental group and control group

T<sub>2</sub>= Post-test given to the experimental and control group

X= Treatment using by manipulative materials

- = Traditional method

For the research purpose, similar categories government school with respect to facilities, size of class, academic achievement, teacher qualification, teacher experiences etc has been choose for the experimental and control group.

### **Experimental and Control Group**

Two public school were homogenous as nearly as possible by selecting school of similar status with respect to the number of students of grade V. SJJHSS, Madi-11 Chitwan and SJKHSS MadiChitwan were selected for this study. In comparison of both schools we found that their social status, financial status, students knowledge level and parents education are almost same. To avoid the selection bias researcher determined the experimental and control group by tossing a coin, from which students of grade V of SJJHSS was taken as experimental group and students of grade V of SJKHSS was taken as control group. In experimental groups school there were 30 students and there were 25 students in control groupsschool. The researcher took all 30 students in experimental group from SJJHSS and 25 student in control group from SJKHSS.

### **Control Process in the Experiment**

On this research comparative methodology was used for testing the effectiveness of independent variables over dependent variable. This research tried to know the effect of independent variable 'materials; over the dependent variable 'achievement' keeping that all other independent variable as silence except manipulative materials. The achievement result has been effected by those variables, like parent education, socio-economic condition, teacher qualification, text book, school condition, teaching method etc.

The intervening variable such as parental education and socio-economic condition, teacher's qualification, school condition were almost the same in the both groups. Those students who were more extras due to his parent education not to include in this research and those

students of whose socio-economic condition were high also excluded from this research. The researcher found these intervening variables by using interview among the whole student on the case of teacher qualification both group, so teacher qualification does not effect for the achievement score of the student. All students were likely from farmer and poor economic condition. Hence in both groups of the students were from equal economic condition. Textbook may be the intervening variable for the student achievement, but the researcher followed the same book for the both group, so it did not have the impact for the achievement. The same teaching method applied on both group during the research period. Hence the researcher keeps all these intervening variables as silent except instructional materials. The main object of this research was to find the impact of manipulative materials.

The researcher selected all students of SJJHSS and all students of SJKHSS .Then researcher formed two groups on the basis of tossing a coin. One was considered as the experimental group (SJJHSS) and another group was as control groups(SJKHSS). There was 30 student in SJJHSS and 25 student in SJKHSS.

### **Population of Study**

The population of the study was selected all student of grade V of Madi Municipality, Chitwan.

### **Sample of Study**

The researcher selected only two public school Shree Jan Jiwan Higher Secondary School Madi Chitwan and Shree Janakalyan Higher Secondary School, Madi, Chitwan. There is thirty student of Ja. Ji. H.Ma.Vi and twenty five students at in Ja.Ka.HMa.Vi at grade V. In these school the researcher found that the mathematics teachers has not used manipulatives materials during the period of mathematics at primary level. So researcher selected these school.

The researcher selected Ja.Ji.H. Ma. Vi. for experimental group and Ja.Ka.H.Ma.Vi. for control group after tossing a coin randomly. After the conducting in the class all student considered for the experimental group in Ja. Ji.H. Ma. Vi. And all student for the control group in Ja.Ka.H. Ma. Vi. for the study.

### **Tools**

The instrument of this study was achievement test, class observation, which is details in below:

#### **Achievement Test**

An achievement test prepared by the researcher was the main tool for the data collection of the study which was the type of instrument to be used depending upon the objective of the study. The researcher had constructed two achievement tests one for pre-test and another for post-test, which contained 20 objective questions with one marks and 6 subjective each questions with 5 marks.

#### **Observation Note**

In the experimental period, the researcher made focus groups and collected information about use of manipulative materials and also researcher had noted students participation, performance, regularity, homework, interaction in the classroom and interested in the subject matter which reflect the impact of manipulative materials in teaching mathematics at primary level. After maintaining diary researcher described the students feelings, interaction on the subject matter with teacher and their knowledge level.

#### **Item Analysis of the Test**

For the item analysis of the test paper researcher made twenty-six items in which 20 items was very short type and 6 was subjective type question. Researcher administrate to 20 student of grade V of Shree Krishnanagar Secondary School(SKSS) madichitwan which was not included

in the sample. The correct answer was marked with '1' and the incorrect answer was marked with '0'. The test items were analyzed to examine their power to separate the more from less capable students in performing the test task. This was done by calculating the response of the 27% of students who scored high and 27% of students who scored low. So the researcher took six upper and six lower scores students out of 20 students. The table of item analysis is given in Appendix A and B.

The item having p-value 0.30 to 0.70 and D-value having 0.20 to 0.80 were accepted. The other items were rejected and modified. The difficulty level of p-value and discrimination index D-value are defined by formula Appendix G

### **Reliability and Validity of the Test**

Each tool and instrument must be reliable and valid otherwise the collected data used by these tools couldn't be true. For the reliability of the test, pilot test will be administered to 20 students of grade V of Shree Krishnanagar Secondary School Madi, Chitwan. The reliability of the tools and instruments was established by using split-half method. She had scored each student's marks and she pointed the number of students who responded to the odd and even questions then she calculated the reliability coefficient was 0.98 for both pre-test and post-test.

### **Threats to validity of the study**

There are two main categories of validity that are concerned with research; they are internal and external validity. Internal validity is most concerned with strength and control of a research design and its ability to determine causal relationship between dependent and independent variables (Campbell and Stanely, 2012). In this study the researcher controls the different factors that affect the treatment of experimental and control groups. Researcher

controlled those student whose parental education and financial status are very high and also controlled those students who took tuition class regularly.

External validity consist of a determination whether the result of the experiment and generalized to an entire population from which the sample was drawn in the study. Threats to external validity can create significant result during and experiment(Campbell and Stanely). In this study researcher brought those school which socio-economic status were almost same. On the case of teacher qualification, researcher himself had taught the both school. In the case of socio-economic status all student were likely from framer and poor financial background. Text book may be the intervening the variable for the student achievement but the researcher use the same book and same content for both groups. So it did not impact the achievement. Hence the researcher keeps al these variable as silent except using manipulative materials.

### **Data Collection Procedure**

Required data collections from achievement test, class observation, class teaching. First of all the researcher went to both schools. She metthe head teacher and subject teacher then she gavethe request letter to the headmaster of both schools. After getting the permission, researcher started to teach at grade V. She taught the student on both group without using manipulative materials for a week. After a week researcher conduct the pre-test on both groups. The achievement test paper of pre-test was same in both experimental and control groups. After then theresearcher conducted the classes in experimental group for one month by using manipulative materials. She taught the control group also for one month without using manipulative materials. After finishing theresearcher took post-test to measure the impact of manipulative materials. Then carefully listed and noted achievement of experimental group using manipulative materials. For the qualitative parts the researcher asked some question to teacher and students about use of



manipulative materials and without use of manipulative materials in teaching mathematics. Then the researcher maintained the notes in brief about the significance feature of student's classroom activities, participation, discussion, regularity.

### **Data Analysis Procedure**

The collected data was analyzed and interpreted by using statistical devices. To analyze the obtained numerical data, the researcher used the statistical tools like mean, standard deviation, variance and t-test. T-test was used to compare the achievement score of student of experimental group and control group. It helps the researcher to make the decision. For the qualitative part, the researcher asked some questions about impact of manipulative materials in teaching mathematics. For example, what type of effect did you find from the class conducted by using manipulative material? What type of difference did you find in teaching between using manipulative materials and without using manipulative materials? Then the researcher described the noted information on the basis of the participation, performance, interaction in classroom, homework, regularity and interests on subject matter at primary level.

## **Chapter IV**

### **ANALYSIS OF DATA AND INTERPRETATION OF RESULT**

This is an experimental research related to find the effectiveness of manipulative materials in teaching mathematics at primary level. The objective of this study were to compare the achievement of mathematics of grade V student taught by using manipulative materials and

without using manipulative materials and to explore the feelings of student and their activeness in the class while teaching them by using manipulative materials in teaching mathematics at primary level. For this purpose pre-test, post-test, non-equivalent control and experimental group was adopted. The population of the study was selected all student of Madi Municipality Chitwan. Then the researcher selected only two public school SJJHSS and SJHSS. Tools of the study was achievement test and observation note. Required data collected from achievement test, class observation and class teaching. For this data collection of the study period for both group was one month. Then the collected data was analyzed and interpreted by using statistical device, to obtain numerical data the researcher used the statistical tools like mean, standard deviation, variance and t-test. T-test was used to compare the achievement score of the student of experimental group and control group. For the qualitative part, the researcher described the noted information from the basis of student participation, interaction, performance, homework, regularity and interest on subject matter. The data score on achievement tests were analyzed by using quantitative techniques.

Thus the obtained data were analyzed and interpretation under the following heading

- Comparison of mean achievement score of control and experimental groups for pre- test data
- Comparison of mean achievement score of control and experimental groups for Post- test data
- Comparative bar graph of mean achievement score of control and experimental group for the pre test and post test
- Analysis of the response given by the teacher and student about manipulative materials in teaching mathematic

**Comparison of mean achievement score between control and experimental group for pre-test data**

The pre test score of pupils control and experimental group are presented in appendix-1 and the summary of statistical calculation for both group on the pre test is presented in table no-2

Table 2

Distribution of Mean, S.D and Variance of pre-test

Group	Number (X)	Mean ( $\bar{X}$ )	S.D ( $\sigma$ )	Variance ( $\sigma^2$ )	t value	Level of significance
Control (C <sub>1</sub> )	25	18.2	5.27	27.84	0.46	0.05
Experimental (E <sub>1</sub> )	30	17.5	5.74	32.99		

The above table presents the mean SD and Coefficient of variation of experimental and control groups. The mean score of experimental group was 17.5 and the mean score of Control group was 18.2. The SD of control group was 5.27 and SD of experimental group was 5.74. The calculate t value in test was 0.46 which was less than critical value at 5% level of significance with degree of freedom  $53(n_1 + n_2 - 2)$ . Therefore null hypothesis  $\mu_1 = \mu_2$  was accepted hence there is no significance difference between student achievement in mathematics teaching without manipulative material. This means before conducting the treatment both group had same level of achievement score in mathematics.

### **Comparison of the achievement between control and experimental group for post-test data**

The post-test score of students of Control and experimental group are presented in appendix-2 and summary of statistical calculation for both groups on the post test was presented in table-3

Table-3

Distribution of Mean, S.D and Variance of post-test

Group	Number (X)	Mean ( $\bar{X}$ )	S.D ( $\sigma$ )	Variance ( $\sigma^2$ )	t value	Level of significance
Control (C <sub>1</sub> )	25	19.2	5.68	32.36	4.72	0.05
Experimental (E <sub>1</sub> )	30	27.2	6.88	47.38		

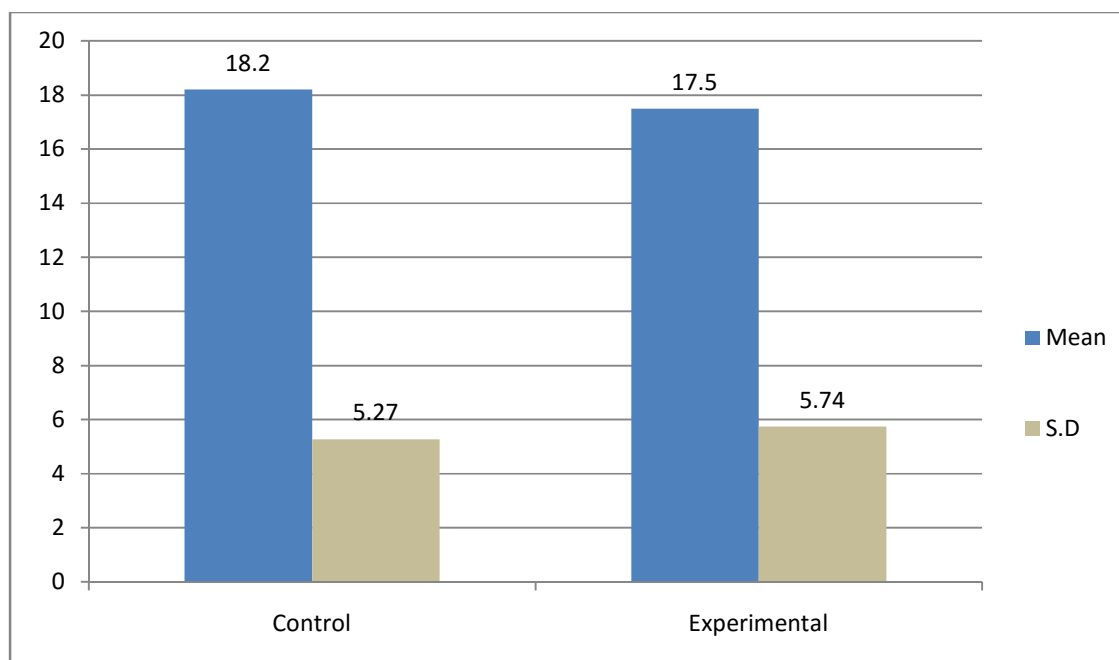
The above table presents the mean SD and Coefficient of variation of experimental and control groups. The mean score of experimental group was 27.2 and the mean score of Control group was 19.2. The SD of control group was 5.68 and SD of experimental group was 6.88. Above the table presents that the calculated t value ( $t=4.72$ ) is greater than the critical value ( $t=1.96$ ) at 5% level of significance with degree of freedom 53. Therefore the null hypothesis  $\mu_1 = \mu_2$  was rejected, so the alternative hypothesis was accepted. There is significant difference between the achievement score of the student of both control and experimental group. This means after conducting the treatment control and experimental groups had different level of achievement score in mathematics. So the better performance of the experimental group over control group in the post tests score.

#### **Comparative bar graph of mean achievement score of pre- test and post-test**

The addition to advance statistic data are presented in visual form to understand these result more effectively the above information and interpretation can be easily understandable if there depicted through bar graph, the graph indicate the score of the student which is given below

**Fig no:1**

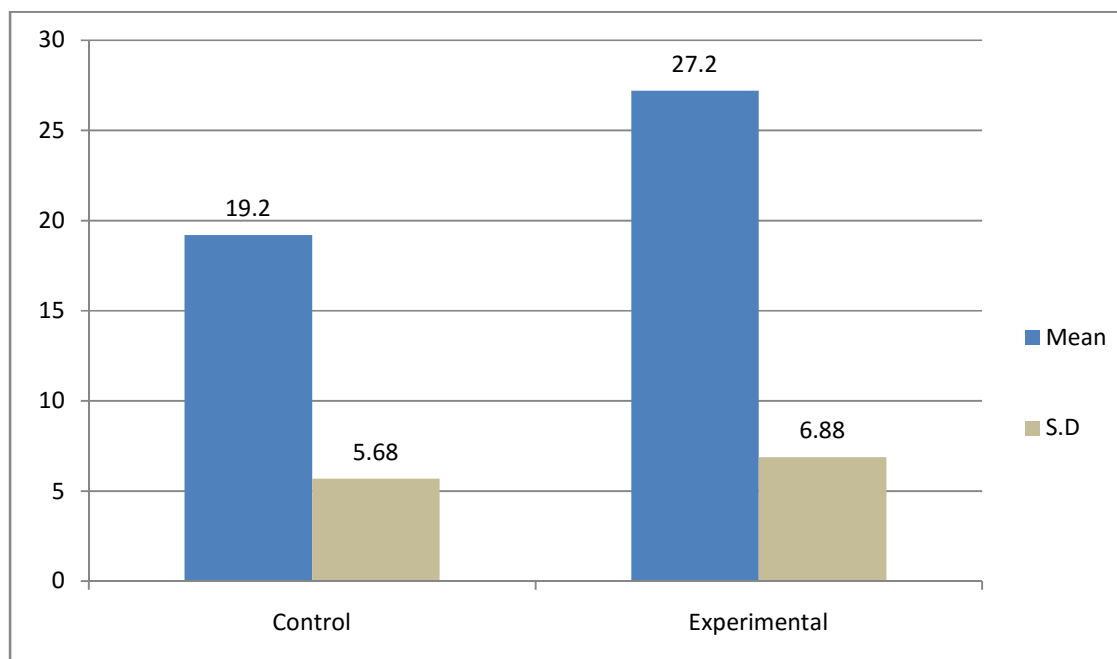
**Comparison between achievement score on pre-test of control and experimental groups:**



The mean and SD score obtained by the student of control and experimental group in the pre test have been show in the fig 1, the fig shows that the mean score and SD of Control groups are 18.2 and 5.27 resp. similarly the mean score and SD of experimental group are 17.5 and 5.74 respectively. The different between two mean was 0.7, this show that these both group control and experimental are nearly equal. Which indicate that there is no difference in achievement score in mathematics between control and experimental group of student.

**Fig no:2**

**Comparison between achievement score on Post test of control and experimental groups:**



The mean and SD score obtained by the students of control and experimental group in the post test is show in figure2. The main score of control and experimental group are 19.7 and 27.2 respectively and standard deviation of control and experimental group are 5.68 and 6.88 respectively. The different between two mean scores of control and experimental group 8, and difference bet SD of two groups is 1.2. This indicate that experimental group had better result than control group there fore we can conclude that the used of manipulative materials in teaching mathematics have great impact that with out using of manipulative materials in primary level.

### **Analysis of the response given by teacher and student about manipulative materials in teaching mathematics:**

To analyze the response of students, researcher organized focused group discussion among 8 to 12 students .Researcher conducted focused group discussion from half andhour to

one hour then the researcher asked some question to the students and collected the answers which is given below.

Researcher : Did you use the manipulative materials while teaching at class?

The Subject teacher says that; *“Yes I sometime use the different types of manipulative materials at the mathematics period in the class room”*.

Researcher : can the manipulative materials affect the students achievement?

Subject Teacher : *“Yes of course the manipulative materials affect the students achievement because these are the very important in learning process. In my 8 years teaching experience, when I teach the student using manipulative materials, the students are very active, teacher student relation is good and student are interested and very curious in learning process”*.

Researcher asked to the Teacher “how do you use the manipulative materials”?

Subject Teacher says that; *I use the manipulative materials sometime to change their behavior for such things as learning process, their difficult level to create a math is funny subject”*.

The above views indicate that the teaching of mathematics at primary level without using manipulative materials is not meaningful teaching. The use of manipulative materials in teaching mathematics at primary level is appropriate way of teaching and learning in which the teacher and learner are highly participate and activity involved in the process. But the control group a few students asked the question and most of them remained passive.

For the interview the researcher and students had conversation in this way:

Researcher : What is the area of rectangle?

Kishwor:  $(length)^2 = l^2$  (It was wrong)

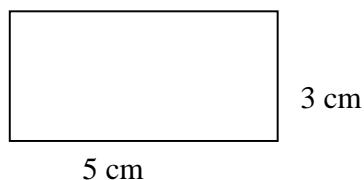
After some days he had conversation again.

What is the perimeter of rectangle?

Kishwor:  $l \times b$  (it was wrong)

Again some days later researcher made conversation with same students in this way:

Researcher: Can you find the perimeter of this rectangle?



For this, researcher gave wooden rectangle to kishwor and she told him to measure the all side of this rectangle and find out the perimeter. It is clear that manipulative materials help him to find out of the perimeter of that rectangle. Similarly other students are also curious about the use of manipulative materials and helps to solve the mensurational problems. It helps to solve the problem of perimeter, area, capacity and volume by using manipulative materials.

At the experimental period, researcher says some question and collected some student views like this:

Researcher: What type of different did you find in teaching between using manipulative materials and without using manipulative materials?

Roji :*teaching with manipulative materials is easy than teaching without manipulative materials.*

Sugan :*I felt that the learning becomes long time obtained by using manipulative materials.*

Saurya :*manipulative materials help for all student to understand subject matter.*

The answer of the above questions shows that the use of manipulative materials in teaching mathematics is effective without using manipulative materials. During the experimental period researcher had found that every students of experimental group were curious and interested to learn mathematics seriously and all student of that group were not making noise and



also they told to me teach regularly and to call me time to time teach. Similarly researcher had found that her teaching was not effective on control group because student of control group was not interested and curious to learn and also they neglect me. Hence the researcher found that there was significant effectiveness of manipulative materials on teaching mathematics.

## **Chapter v**

### **SUMMARY, FINDING, CONCLUSION RECOMMENDATION AND SUGGESTION**

This chapter is devoted to the presenting of the summary, finding, conclusion, recommendation and suggestion of the study.

#### **Summary**

This study is concerned with the study of impact of manipulative materials in teaching mathematics at primary level. This study was intended to answer the question whether the use of manipulative materials yield better achievement of students without manipulative materials in teaching mathematics in primary level.

For this purpose, the researcher were chosen the students of SJJSS and SJKSS at grade V. the two nonequivalent groups were established on the basis of pre-test result. The researcher herself taught both experimental and control group. She taught the chapter “perimeter, area, capacity and volume in class V textbook prescribed by government of Nepal. After the completion of the experimental stage, an achievement test of 1 marks including 20 objective question and 5 marks including 6 subjective question. The instruction period was one month. At the teaching achievement test was administrated on both groups. The pre-test, post-test, control, experimental groups design were adopted for the purpose of the study. Mean, SD and Variance were calculated in both group of pre-test and post-test with their obtained marks. T-test used at 0.05 level of significance to find whether the difference of means statistical significant. The scores obtained by the students in the test was analyzed and thus had the following finding.

### **Finding**

On the basis of the analysis of the scores obtained by those students, the researcher found the following information

- The mean achievement score of students taught with using manipulative materials is higher than the mean achievement score of the student taught without using manipulative materials on post-test.
- The students of experimental group were highly interested and curious in teaching and learning process than that of control group.
- Students enjoy more and become more interested to learn mathematical concept by using manipulative materials.

### **Conclusion**

From the result of this study, the researcher found that the mean achievement score of pre- test was as nearly same on both group without using manipulative materials But the mean achievement score of student taught with using different manipulative materials was higher than the achievement score of students taught without using manipulative materials in post-test. The students of control group felt bored and lazy to learn mathematics without manipulative materials. But the students of experimental group were so curious and interested to learn mathematics with using manipulative materials. It was concluded that the manipulative materials affected the teaching and learning. This shows that the students who were taught manipulative materials are more active, regular, participating in all activities of classroom than the student who were taught without using manipulative materials. So the manipulative materials help the student to understand problems of mathematics. Thus, use of manipulative materials is effective in mathematics at primary level. So the manipulative materials must be appropriate in teaching mathematics at primary level.

### **Recommendations**

On the basis of finding of this study some measures have been recommended for the improvement of the teaching situation in primary level as given below:

- The math teacher should try to use available materials in teaching mathematics.
- Before going to classroom every teacher should be confident in how to use the suitable materials.
- The classroom seating should be so arranged that the entire students could equally and easily participate in the classroom activities.
- Every school should have well qualified and trained teachers in preparing manipulative materials and their uses.
- The mathematics teachers should be encouraged to use different manipulative materials.
- The mathematics book should emphasize on the using of materials.
- Training programmed should priority the using of materials.
- Teacher training should help to make materials.

### **Suggestion for Further Research**

On the basis of this study the following suggestions have been put forward for research:

- This kind of study also should be conducted for different levels.
- The large research studies must be designed and carried out in order to investigate the effectiveness of using materials in sample in various school of different parts of Nepal.
- The present study was related to chapter perimeter, area, capacity and volume. Similar studies may be done with other topic.
- It may be interesting to replicate this study in different subject and different classes.

### **References**

- R. Thomas, (1981). *The role of manipulative materials in the learning of mathematical concept*. McCutchan Publishing Corporation.
- Chaudhary, B.C.(2011): *Effectiveness of instructional materials in teaching*

- mathematics in secondary level grade X*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Kshetri, K.B.B.(2011): *Effectiveness of instructional materials in teaching geometry at lower secondary level grade VIII*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Lesh (1979). *The role of manipulative materials in the learning of mathematical concept*. McCutchan Publishing Corporation.
- Evelyn J. Sowell. *Effect of manipulative materials III mathematics instruction, Journal for Research in mathematics education*. National Council of Teacher of Mathematics.
- Kennedy,s.(1986).”*Manipulative activities in mathematical learning.*”*Gernal for Reaserch in Mathmatics*.
- Acharya, N.H.(2007).*Mathematics learning strategies in community based school*, MasterThesis, Central Department of Education, T.U. Kirtipur.
- Amatya, B.P.(1978). *A study of effictiveness of teaching mathematics with and without the use of instructional materials*. Mater Thesis, Central Department of Education, T.U. Kirtipur.
- Baral, B.R.(2005).*Effectiveness of instrumental materials in teaching geometry at primary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Bhusal, I.P.(2000). *A study of effectiveness of instructional materials on teaching menturation at secondary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Khanal, I.P.(2008). *The effectiveness of themanipulative materials in teaching mathematics at primary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.

- Lamsal, S.(2005). *A study on the effectiveness of Van-Heile approach in teaching geometry at lower secondary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Khanal, P.(2011). *Educational research methodology*, Kathmandu, Sunlight Publication.
- Pandey,K.(2010). *Use of instructional materials and its impact in teaching method at primary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Maharjan, H.B(2003). *Teaching mathematics in secondary school*. Kathmandu Ratna PustakBhandar.
- Rai, B.C.(1979). *Method of teaching mathematics*. Lockknow, Prakasan Kendra, India.
- Subedi, B.P.(2005). *A study on the effectiveness of the teaching algebra by using tiles at primary level*. Master Thesis, Central Department of Education, T.U. Kirtipur.
- Sharma, S.N.(2002). *A study on the availability and use of instructional materials in teaching mathematics at primary school of parbat district of nepal*. Master Thesis, Central Department of Education, T.U. Kirtipur.

**Appendix-A**  
**Item Analysis of Pre-test**

Students Items	Upper 27% Students giving correct response							Lower 27% Students giving correct response							P- value	D- value	Remarks
	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total			
1	1	1	1	0	0	1	4	1	0	0	0	0	1	2	0.50	0.33	
2	1	1	0	1	1	1	5	1	1	0	0	0	0	2	0.58	0.5	
3	1	1	1	1	0	1	5	0	0	0	0	0	1	1	0.50	0.66	
4	1	1	0	1	0	1	4	0	0	0	0	0	0	0	0.58	0.16	Remarks
5	1	0	0	0	1	0	2	0	0	0	0	0	0	3	0.58	0.18	Rejected
6	1	0	0	0	1	0	2	1	0	0	0	0	0	1	0.33	0.33	
7	0	1	1	1	0	0	3	0	0	0	1	0	0	1	0.33	0.33	
8	1	1	0	1	1	0	4	1	0	0	1	0	0	2	0.50	0.33	
9	1	0	1	1	1	1	5	0	1	0	0	0	1	2	0.58	0.50	
10	0	0	1	1	1	1	4	0	0	0	1	0	0	1	0.41	0.50	
11	0	1	0	0	0	1	2	0	1	0	0	0	0	1	0.25	0.16	
12	1	1	1	1	1	1	6	0	0	1	0	0	0	1	0.58	0.83	
13	1	0	0	0	0	0	5	1	0	0	1	0	0	2	0.58	0.66	
14	1	1	1	1	1	1	6	0	0	0	0	1	1	2	0.66	0.66	
15	0	1	1	1	1	1	5	1	0	0	0	0	0	1	0.50	0.33	
16	0	0	1	1	1	0	3	0	0	0	0	1	0	1	0.33	0.33	
17	0	1	1	1	1	1	5	1	0	0	1	1	0	3	0.66	0.50	
18	1	1	0	0	1	1	4	0	0	1	0	0	0	1	0.41	0.16	Rejected
19	1	0	1	0	1	0	3	0	1	0	0	1	0	2	0.41	0.16	
20	1	1	0	0	1	0	3	1	0	0	0	0	1	2	0.41	0.66	
21	1	0	1	1	0	0	3	0	0	0	1	0	0	1	0.33	0.66	
22	0	1	0	1	0	1	3	0	0	0	0	1	0	1	0.33	0.33	
23	0	0	0	1	1	1	3	1	0	0	0	0	1	2	0.41	0.16	
24	0	1	1	0	0	0	2	0	0	1	0	0	0	1	0.25	0.16	Rejected
25	1	1	1	0	1	1	5	0	0	0	0	1	0	1	0.50	0.66	
26	1	1	0	0	1	1	4	0	0	0	1	0	1	2	0.50	0.33	

**Appendix – B**  
**Item analysis of post test**



1	1	1	1	0	1	1	5	1	0	0	0	0	1	2	0.58	0.5		
2	1	1	0	1	1	1	5	1	1	0	0	0	0	2	0.58	0.5		
3	1	1	1	1	0	1	5	0	0	0	0	0	1	1	0.50	0.66		
4	Students	1	1	0	0	0	4	Even (Y)	1	1	0	0	1	3	0.58	0.16	$Y^2$	
5	1	1	1	0	1	1	4	20	0	0	1	13	6	0	3	0.58	0.16	408 Rejected
6	2	1	0	1	1	1	5	18	1	0	0	03	20	0	1	0.50	0.66	324
7		0	1	1	1	0	0	3	0	0	0	1	0	0	1	0.33	0.33	
8		1	1	0	1	1	0	4	1	0	0	1	0	0	2	0.50	0.33	
9		1	0	1	1	1	1	5	0	1	0	0	0	1	2	0.58	0.50	
10		0	0	1	1	1	1	4	1	0	1	1	0	0	4	0.66	0.00	
11		0	1	0	1	0	1	3	0	1	0	0	0	0	1	0.33	0.33	
12		1	1	1	1	1	1	6	0	0	1	0	0	0	1	0.58	0.83	
13		1	0	0	0	0	0	5	1	0	0	1	0	0	2	0.58	0.50	
14		1	1	1	1	1	1	6	0	0	0	0	1	1	2	0.66	0.66	
15		0	1	1	1	1	1	5	1	0	1	0	1	0	3	0.66	0.33	
16		0	0	1	1	1	0	3	0	0	0	0	1	0	1	0.33	0.33	
17		0	1	1	1	1	1	5	1	0	0	1	1	0	3	0.66	0.33	
18		1	1	0	0	1	1	4	0	0	1	0	0	0	1	0.41	0.50	
19		1	0	1	0	1	1	4	0	1	0	0	1	0	2	0.50	0.33	
20		1	1	0	1	1	0	4	1	0	0	0	0	1	2	0.50	0.33	
21		1	0	1	1	0	0	3	1	0	0	1	0	1	3	0.50	0.00	
22		1	1	1	1	0	1	5	0	0	0	0	1	0	1	0.50	0.66	
23		0	1	1	1	1	1	5	1	0	0	0	0	1	2	0.58	0.50	
24		0	1	1	0	1	0	3	0	1	1	0	1	0	3	0.33	0.00	Modify
25		1	1	1	0	1	1	5	0	0	0	0	1	0	1	0.50	0.66	
26		1	1	0	0	1	1	4	0	0	0	1	0	1	2	0.50	0.33	

**Appendix-C**  
**Split –half Reliability of the Pre-test**

3	15	16	240	225	240
4	16	15	240	256	225
5	15	12	180	225	144
6	13	10	130	169	100
7	12	8	96	144	64
8	10	9	90	100	81
9	9	6	54	81	36
10	7	7	49	49	49
11	6	6	36	36	36
12	7	5	35	49	25
13	5	5	25	25	25
14	4	6	24	16	36
15	5	4	20	25	16
16	3	3	9	9	9
17	4	3	12	16	9
18	3	4	12	9	16
19	3	3	9	9	9
20	4	3	12	16	9
N=20	ΣX=177	ΣY=163	ΣXY=1957	ΣX <sup>2</sup> =2107	ΣY <sup>2</sup> =1853

$$\begin{aligned} \text{Now, Reliability of Split Half test } (r_{xy}) &= \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}} \\ &= \frac{20 \times 1957 - 177 \times 163}{\sqrt{20 \times 2107 - (177)^2} \sqrt{20 \times 1853 - (163)^2}} \\ &= 0.97 \end{aligned}$$

$$\begin{aligned} \text{The reliability of whole test } (r_{tt}) &= \frac{2r_{xy}}{1+r_{xy}} \\ &= \frac{2 \times 0.97}{1+0.97} = \frac{1.94}{1.97} = 0.98 \end{aligned}$$

#### Appendix-D Split –half Reliability of the Post-test

Students	Odd (X)	Even (Y)	XY	X <sup>2</sup>	Y <sup>2</sup>
1	19	20	380	361	400

2	19	19	361	361	361
3	17	18	306	289	324
4	16	17	272	256	289
5	15	15	225	225	225
6	13	14	182	169	196
7	14	12	168	196	144
8	13	12	156	169	144
9	11	11	121	121	121
10	10	11	110	100	121
11	8	9	72	64	81
12	7	8	56	49	64
13	8	6	48	64	36
14	5	6	30	25	36
15	5	4	20	25	16
16	4	3	12	16	9
17	4	5	20	16	16
18	3	4	12	9	16
19	3	4	12	9	16
20	4	3	12	16	9
N=20	ΣX=198	ΣY=201	ΣXY=2575	ΣX <sup>2</sup> =2540	ΣY <sup>2</sup> = 2633

$$\begin{aligned} \text{Now, Reliability of Split Half test } (r_{xy}) &= \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}} \\ &= \frac{20 \times 2575 - 198 \times 201}{\sqrt{20 \times 2540 - (198)^2} \sqrt{20 \times 2633 - (201)^2}} \\ &= 0.98 \end{aligned}$$

$$\begin{aligned} \text{The reliability of whole test } (r_{tt}) &= \frac{2r_{xy}}{1+r_{xy}} \\ &= \frac{2 \times 0.98}{1+0.98} = \frac{1.96}{1.98} = 0.98 \end{aligned}$$

### Appendix-E Pre-test Result of the Students of Control and Experimental Group

Control Group (SJJSS)				Experimental Group (SJKSS)			
S.N	X	d = X - X	d <sup>2</sup> =(X-X) <sup>2</sup>	S.N	X	d = X - X	d <sup>2</sup> =(X-X) <sup>2</sup>

1	27	8.8	77.44	1	28	10.5	110.25
2	26	7.8	60.84	2	28	10.5	110.25
3	26	7.8	60.84	3	27	9.5	90.25
4	25	6.8	46.24	4	27	9.5	90.25
5	24	5.8	33.64	5	26	8.5	72.25
6	23	4.8	23.04	6	26	8.5	72.25
7	22	3.8	14.44	7	25	7.5	56.25
8	22	3.8	14.44	8	24	6.5	42.25
9	21	2.8	7.84	9	23	5.5	30.25
10	21	2.8	7.84	10	23	5.5	30.25
11	20	1.8	3.24	11	21	3.5	12.25
12	18	-0.2	0.04	12	20	2.5	6.25
13	18	-0.2	0.04	13	20	2.5	6.25
14	18	-0.2	0.04	14	18	0.5	0.25
15	17	-1.2	1.44	15	17	-0.5	0.25
16	16	-2.2	4.84	16	17	-0.5	0.25
17	15	-3.2	10.24	17	16	-1.5	2.25
18	15	-3.2	10.24	18	16	-1.5	2.25
19	13	-5.2	27.04	19	16	-1.5	2.25
20	13	-5.2	27.04	20	15	-2.5	6.25
21	12	-6.2	38.44	21	15	-2.5	6.25
22	12	-6.2	38.44	22	14	-3.5	12.25
23	11	-7.2	51.84	23	14	-3.5	12.25
24	11	-7.2	51.84	24	13	-4.5	20.25
25	9	-9.2	84.64	25	13	-4.5	20.25
				26	13	-4.5	20.25
				27	12	-5.5	30.25
				28	12	-5.5	30.25
	$\Sigma X_1=455$		$\Sigma d_1^2=696$	29	11	-6.5	42.25
				30	11	-6.5	42.25
	$\bar{X}_1=18.2$				$\Sigma X_2=$		
					$\bar{X}_2=17.5$		$\Sigma d_2^2=989.75$
Var( $\sigma^2$ )=27.84				Var( $\sigma^2$ )= 32.99			
S.D( $\sigma$ )=5.27				S.D( $\sigma$ )= 5.74			

t-value = 0.46

**Appendix-F**  
**Pre-test Result of the Students of Control and Experimental Group**

Control Group (SJJSS)				Experimental Group (SJKSS)			
S.N	X	d = X - X	$d^2=(X-X)^2$	S.N	X	d = X - X	$d^2=(X-X)^2$

1	30	10.8	116.64	1	38	10.8	116.64
2	27	7.8	60.84	2	38	10.8	116.64
3	26	6.8	46.24	3	36	8.8	77.44
4	26	6.8	46.24	4	36	8.8	77.44
5	25	5.8	33.64	5	35	7.8	60.84
6	25	5.8	33.64	6	35	7.8	60.84
7	24	4.8	23.04	7	34	6.8	46.24
8	23	3.8	14.44	8	33	5.8	33.64
9	22	2.8	7.84	9	33	5.8	33.64
10	22	2.8	7.84	10	32	4.8	23.04
11	21	1.8	3.24	11	31	3.8	14.44
12	21	1.8	3.24	12	30	2.8	7.84
13	20	0.8	0.64	13	30	2.8	7.84
14	20	0.8	0.64	14	28	0.8	0.64
15	17	-2.2	4.84	15	28	0.8	0.64
16	17	-2.2	4.84	16	27	-0.2	0.04
17	16	-3.2	10.24	17	26	-1.2	1.44
18	15	-4.2	17.64	18	26	-1.2	1.44
19	13	-6.2	38.44	19	25	-2.2	4.84
20	13	-6.2	38.44	20	24	-3.2	10.24
21	13	-6.2	38.44	21	24	-3.2	10.24
22	12	-7.2	51.84	22	23	-4.2	17.64
23	12	-7.2	51.84	23	21	-6.2	38.44
24	11	-8.2	67.24	24	21	-6.2	38.44
25	9	-10.2	104.04	25	20	-7.2	51.84
				26	18	-9.2	84.64
				27	18	-9.2	84.64
				28	16	-11.2	125.44
	$\Sigma X_1=480$		$\Sigma d_1^2=826$	29	16	-11.2	125.44
				30	15	-12.2	148.84
	$\bar{X}_1=19.2$				$\Sigma X_2=816$		
					$\bar{X}_2=27.2$		$\Sigma d_2^2=1421.44$
Var( $\sigma^2$ )=32.36				Var( $\sigma^2$ )= 47.38			
S.D( $\sigma$ )=5.68				S.D( $\sigma$ )= 6.88			

t-value = 4.72

### Appendix-G Criteria for Analysis

For item difficulty level (p-value)

Criteria	Item Evaluation	Remarks
Below 25%	Difficult	Not improvement or reject
25%-75%	Good	Accepted
Above 75%	Easy	Need Improvement or reject

For Item discriminating Index (D-value)

Criteria	Item Analysis	Remarks
0.40 and above	Very good	Accepted
25% - 75%	Good	Accepted
0.20 – 0.29	Marginal	Modified
Below 0.20	Poor	Need Improvement or reject

Source: Education Measurement and Evaluation  
BidhyarthiPustakBhandar, Bhotahity

### Appendix - H

#### Statistical Formula used in Data Collection and Analysis procedure

- Mean( $\bar{X}$ ) =  $\frac{\sum X}{N}$  where, X = Random Variable

N = Number of item

- Variance ( $\sigma^2$ ) =  $\frac{\Sigma(X-\bar{X})^2}{N}$
- Standard Deviation ( $\sigma$ ) =  $\sqrt{\frac{\Sigma(X-\bar{X})^2}{N}}$
- Karl Person's Correlation Coefficient ( $r_{xy}$ ) =  $\frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$

Where, X and Y are paired scores

N = Number of students

- Difficulty level of item (p – value) =  $\frac{R_U - R_L}{N}$

Where,  $R_U$  = Number of examinees answering correctly by upper 27 %

$R_L$  = Number of examinees answering correctly by upper 27 %

N = Total Number of examinees in upper and lower 27 %

- Discrimination of index of items (D= value) =  $\frac{R_U - R_L}{\frac{N}{2}}$

Where,  $R_U$  = Number of examinees answering correctly by upper 27 %

$R_L$  = Number of examinees answering correctly by upper 27 %

N = Total Number of examinees in upper and lower 27 %

- Separman Brown's Splits-half reliability of the test ( $r_{tt}$ ) =  $\frac{2r_{xy}}{1+r_{xy}}$

Where,  $r_{tt}$  = Reliability coefficient of whole test

$r_{xy}$  = correlation coefficient of two halves

- t-test (t) =  $\frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(\sigma_1)^2}{N_1} + \frac{(\sigma_2)^2}{N_2}}}$

Where,  $\bar{X}_1$  = mean score of control group

$\bar{X}_2$  = mean score of experimental group

$N_1$  = number of student of control group

$N_2$  = number of student of experimental group

$\sigma_1^2$  = variance of control group

$\sigma_2^2$  = variance of experimental group

### Appendix - I

#### Achievement test paper for pre-test

कक्षा : ५

समय : १ घन्टा



## विषय : गणित

## खण्ड (क) वस्तुगत प्रश्नहरू (20x1=20)

1. ठिक उतर छानी उतर पुस्तिकामा सार I

(क) ७ लि. मा कति मि.लि. हुन्छ ?

अ) ७०                      आ) ७००                      इ) ७०००                      ई) ७००००

(ख) ५ मिटरमा कति सेन्टिमिटर हुन्छ ?

अ) ५०                      आ) ५००                      इ) ५०००                      ई) ५००००

(ग) 1 वर्ष मा कति हप्ता हुन्छ ?

अ) ५२                      आ) ५३                      इ) ५४                      ई) ५५

(घ) ८ को वर्ग संख्या कति हुन्छ ?

अ) १६                      आ) ६४                      इ) ५१२                      ई) ४०९६

(ङ) १८० सेकेण्डमा कति मिनेट हुन्छ ?

अ) 3                      आ) 4                      इ) 5                      ई) 6

(च) 1 मि मा कति cm हुन्छ ?

अ) 10cm                      आ) 50cm                      इ) 100cm                      ई) 1000cm

(छ) 1 km मा कति मिटर हुन्छ ?

अ) 10मि                      आ) 20मि                      इ) 100 मि                      ई) 1000 मि

(ज) यदि  $x = 10$  भए  $x+15$  को मान कति हुन्छ ?

अ) 15                      आ) 15                      इ) 20                      ई) 25

(झ) यदि  $x=5$  भए  $x+3$  को मान कति हुन्छ ?

अ) 5                      आ) 8                      इ) 9                      ई) 10

(ञ) यदि  $x=3$  भए  $8-x$  को मान कति हुन्छ ?

अ) 4                      आ) 5                      इ) 6                      ई) 7

(ट) यदि  $x=3$  भए  $8-x$  को मान कति हुन्छ ?

अ) 4                      आ) 5                      इ) 6                      ई) 7

ठ) 64 को वर्गमूल कति हुन्छ ?

अ) 4                      आ) 8                      इ) 16                      ई) 32

ड) 225 को वर्गमूल कति हुन्छ ?

अ) 5                      आ) 15                      इ) 25                      ई) 125

ढ) 1 रुपैया मा 25 पैसा का कतिओटा सिक्का हुन्छ ?

अ) 1                      आ) 2                      इ) 3                      ई) 4

ण) 1 मि 75 से.मि. लाई से.मि. मा रुपान्तर गर ?

अ) 100 cm                      आ) 125 cm                      इ) 75 cm                      ई) 175 cm

त) आयातकार बस्तु को परिमिति निकाल्ने सुत्र कुन हो ?

अ)  $2(l+b)$                       आ)  $l \times b$                       इ)  $l^2$                       ई)  $4l$ 

थ) बर्गाकर बस्तुको परिमिति निकाल्ने सुत्र कुन हो ?

अ)  $2(l+b)$                       आ)  $l \times b$                       इ)  $l^2$                       ई)  $4l$ 

द) आयातकार बस्तुको क्षेत्रफल निकाल्ने सुत्र कुन हो ?

अ)  $2(l+b)$                       आ)  $l \times b$                       इ)  $l^2$                       ई)  $4l$ 

ध) बर्गाकर बस्तुको क्षेत्रफल निकाल्ने सुत्र कुन हो ?

अ)  $2(1+b)$       आ)  $l \times b$       इ)  $l^2$       ई)  $4l$

खण्ड (ख) विषयगत प्रश्नहरू (6x5=30)

- 1) अंकमा लेख  
Fifty-seven million ninehundred twenty-six thousand onehundred and thirty-three
- 2) एक लाईन मा 20 ओटा बिरुवा पर्ने गरि बर्गाकर खेत मा काउलीक बिरुवा सन्तुपदा कति बिरुवा चाहिन्छ ?
- 3) एउटा बेट्री को रु. 10 पर्छ भने 1 दर्जन बेट्री को कति पर्छ ?
- 4) 5 km 600m. 75 cm. मा कति cm. हुन्छ ?
- 5) यदि  $a=4$ ,  $b=6$  and  $c=10$  भए  $a+b+c$  को मन निकाल ।
- 6) लम्बाई 10 cm र चौडाई 8 cm भएको आयात को परिमिति निकाल ।

**Appendix-J**  
**Achievement Test Paper for Post-Test**

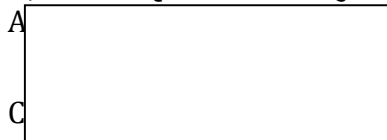
कक्षा : ५  
समय : १:१५ मि.

पुर्णांक : ५०  
उतिर्ण : २०

विषय : गणित

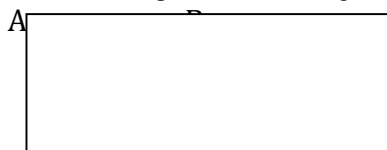
खण्ड (क) वस्तुगत प्रश्नहरू (20x1=20)

क) तलको आकृति को लम्बाई भुजा कुन हो ?



अ) AC      आ) CD      इ) BD      ई) AD

ख) तलको आकृति को लम्बाई भुजा कुन हो ?



- C                      D
- अ)AC                      आ)CD                      इ)AB                      ई)AD
- ग)आयात को परिमिति निकालने सुत्र क हो ?  
 अ)2(l+b)                      आ)lxb                      इ)l<sup>2</sup>                      ई)4l
- घ)वर्ग को परिमिति निकालने सुत्र क हो ?  
 अ)2(l+b)                      आ)lxb                      इ)l<sup>2</sup>                      ई)4l
- ङ)आयात को क्षेत्रफल निकालने सुत्र के हो ?  
 अ)2(l+b)                      आ)lxb                      इ)l<sup>2</sup>                      ई)4l
- च)वर्ग को क्षेत्रफल निकालने सुत्र के हो ?  
 अ)2(l+b)                      आ)lxb                      इ)l<sup>2</sup>                      ई)4l
- छ)लम्बाई 8 cm र चौडाई 6 cm भयको आयातकर बस्तु को परिमिति कति हुन्छ ?  
 अ)48 cm<sup>2</sup>                      आ) 64 cm<sup>2</sup> इ)36 cm                      ई)28 cm
- ज)लम्बाई 7 cm र चौडाई 3 cm वयाको आयात को परिमिति कति हुन्छ ?  
 अ)20 cm                      आ) 49 cm<sup>2</sup>इ)9 cm<sup>2</sup>                      ई)21 cm<sup>2</sup>
- झ) लम्बाई 3 cm भएको वर्ग को परिमिति कति हुन्छ ?  
 अ)9 cm<sup>2</sup>                      आ) 6 cm<sup>2</sup> इ)12 cm                      ई)18 cm
- ञ)लम्बाई 12 cm भएको वर्ग को परिमिति कति हुन्छ ?  
 अ)24 cm<sup>2</sup>                      आ) 48 cm इ)36 cm<sup>2</sup>                      ई)144 cm<sup>2</sup>
- ट) लम्बाई 12 cm र चौडाई 6 cm भएको आयातकर बस्तु को क्षेत्रफल कति हुन्छ ?  
 अ)24 cm<sup>2</sup>                      आ) 36 cm<sup>2</sup> इ)36 cm<sup>2</sup>                      ई) 72 cm<sup>2</sup>
- ठ)लम्बाई 15 cm र चौडाई 13 cm भएको आयात को क्षेत्रफल कति हुन्छ ?  
 अ)195 cm<sup>2</sup>                      आ) 56 cm<sup>2</sup> इ)225 cm<sup>2</sup>                      ई)169 cm<sup>2</sup>
- ड) लम्बाई 5 cm भएको वर्ग को क्षेत्रफल कति हुन्छ ?  
 अ)10 cm<sup>2</sup>                      आ) 20 cm<sup>2</sup> इ)25 cm<sup>2</sup>                      ई)30 cm<sup>2</sup>
- ढ)लम्बाई 12 cm भएको वर्ग को क्षेत्रफल कति हुन्छ ?  
 अ)24 cm<sup>2</sup>                      आ) 48 cm<sup>2</sup> इ)144 cm<sup>2</sup>                      ई)160 cm<sup>2</sup>
- ण)1 लि. मा कति मि.लि. हुन्छ ?  
 अ)10 मि.लि.                      आ)100 मि.लि. इ)1000 मि.लि. ई)१०००० मि.लि.
- त)5 लि. 200 मि.लि.मा कति मि.लि. हुन्छ ?  
 अ) 500 मि.लि. आ) 700 मि.लि.                      इ) 5200मि.लि. ई)5000मि.लि.
- थ)आयातकार ठोस बस्तुको आयतन निकालने सुत्र के हो ?  
 अ)lxb                      आ)l<sup>2</sup>                      इ) l<sup>3</sup>                      ई) lxbxh
- द) लम्बाई 8 cm, चौडाई 5 cm र उचाई 3 cm भएको आयातकर ठोस बस्तुको आयतन कति हुन्छ ?  
 अ)16 cm                      आ) 32 cm इ)120 cm<sup>2</sup>                      ई)120 cm<sup>3</sup>
- ध) लम्बाई 5 cm, चौडाई 4 cm र उचाई 2 cm भएको आयातकर ठोस बस्तुको आयतन कति हुन्छ ?  
 अ)11 cm                      आ) 22 cm इ)40 cm<sup>2</sup>                      ई)40 cm<sup>3</sup>

### खण्ड (ख): विषयगत प्रश्न

**प्रश्न न. 1.** एउटा खेतको लम्बाई 55 मि. र चौडाई 40 मि. 6 भने त्यस खेत को परिमिति र क्षेत्रफल निकाल ।

**प्रश्न न. 2.** एउटा आयातकार खेत को लम्बाई 30 मि. र चौडाई 20 मि. छ भने त्यसखेत को परिमिति र क्षेत्रफल निकाल ।

**प्रश्न न. 3.** एउटा बर्गाकार खेत को लम्बाई 30 मि. छ भने त्यसखेत को परिमिति र क्षेत्रफल निकाल ।

**प्रश्न न. 4.** एउटा बर्गाकार खेत को लम्बाई 45 मि. छ भने त्यसखेत को परिमिति र क्षेत्रफल निकाल ।

**प्रश्न न. 5.** एउटा आयातकार ठोस बस्तु को लम्बाई 30 मि. चौडाई 20 मि. र उचाई 15 मि छ भने त्यस को आयतन निकाल ।

**प्रश्न न. 6.** एउटा सलाई को बट्टाको लम्बाई 8.5 मि., चौडाई 4.5 मि. र उचाई 3 मि. छ भने उक्त बट्टा को आयतन निकाल साथै यस्ता 18 ओटा बट्टा को जम्मा आयतान कति हुन्छ ।

### Appendix -K

पठ्योजना-१

विषय : मेरो गणित

मिति :

एकाई : सात

पट्टिशर्षक : परिमिति

पठ्यबस्तु : आयातकर बस्तुको परिमिति

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

### १ विशिष्ट उदेश्य :

यस कक्षा क्रियाकलपको अन्त्य मा विधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) आयातकार बस्तुको लम्बाई र चौडाई निकाल्न ।

ख) आयातकार बस्तुको परिभाषा बताउन ।

ग) आयातकार बस्तुको सुत्र निर्माण गर्न ।

### २. शिक्षणसामग्रीहरु :

किताब, स्केल, काठरकागजकाआयातकारबस्तुहरु,जिओबोर्ड, धागो,टायल्सआदि

### ३. शिक्षण सिकाई क्रियाकलाप :

क) विधार्थी मा पूर्वज्ञान कति छ वानी जचदै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : कति से.मि. को १ मि. हुन्छ ?

त्यसपछि विधार्थीहरु को अगाडी टायल्स, किताब, आयातकार र बर्गाकर बस्तुहरु अ अलग अलग गर्न लगाउने । विधार्थीहरुलाई आयातकार बस्तुको परिमितिको बारेमा पूर्व धारणा सोध्ने ।

ब्लाकबोर्ड देखाउदै, ब्लाकबोर्ड को लम्बाई र चौडाई कुन कुन हो ?

गणित किताब देखाउदै, किताब को लम्बाई र चौडाई कुन कुन हो? आदि जस्ता प्रश्न सोध्ने । यदि उतर नआएको खण्ड मा, आफुले लम्बाई र चौडाई यो यो हो भनी प्रस्ट सग बुझाउने । त्यसपछि धागो ले जिओबोर्डमा आयात बनायर देखाउने । त्यसपछि धागो को लम्बाई नै उक्त आयात को परिमिति हो भनी बुझाउने ।

ख) गणित किताब को लम्बाई र चौडाई नाप्र लगाउने ,

जस्तै, लम्बाई (l) : 20 से. मि. चौडाई (b) : १६ से.मि.

ग) माथि दिईएको किताब को आधार मा यसरि सुत्र निर्माण गरेर देखाउने ,

परिमिति (p) : लम्बाई + चौडाई + लम्बाई + चौडाई

$$= २ लम्बाई + २ चौडाई$$

$$= २ (लम्बाई + चौडाई)$$

$$= २ (l+b)$$

किताबकै परिमिति निकालेर देखाउने

परिमिति (p) = लम्बाई + चौडाई + लम्बाई + चौडाई

$$= २० cm + १६ cm + २० cm + १६ cm$$

$$= ७२ cm$$

यसरि कुनै पनि बस्तु को परिमिति भन्नाले त्यस बस्तु को जम्मा लम्बाई र चौडाई को योगफल हो भनि बताउने ।

### ४. मूल्यांकन

विधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ

i. कस्तो बस्तु लाई आयातकार बस्तु भनिन्छ ?

ii. आयातकार बस्तु को लम्बाई र चौडाई क क लाई भनिन्छ ?

iii. आयातकार बस्तु को परिमिति निकाल्ने सुत्र

### गृहकार्य

आयातकार बस्तुको परिमिति जानेर आउ र तिम्रो नेपाली किताब र नोट कपि को परिमिति निकालेर आउ।

### पठ्योजना-२

विषय : मेरो गणित

एकाई : सात

पठिर्षक : परिमिति

पठ्यबस्तु : बर्गाकर बस्तुको परिमिति

मिति :

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

#### १ विशिष्ट उदेश्य :

यस कक्षा क्रियाकलपको अन्त्य मा विधार्थीहरु निम्न कुरामा सक्षम हुनेछन

क) बर्गाकर बस्तुको परिमितिको सुत्र निर्माण गर्न ।

ख) सुत्र को आधारमा बर्गाकर बस्तुको परिमिति निकाल्न

#### २. शिक्षणसामाग्रीहरु :

किताब, स्केल, काठरकागजकाबर्गाकरबस्तुहरु, जिओबोर्ड, धागो, टायल्स आदि

### ३. शिक्षण सिकाई क्रियाकलाप :

क.) विद्यार्थी मा पूर्वज्ञान कति छ वानी जचदै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : आयातकार बस्तुको परिमिति निकालने सुत्र के हो ?

त्यसपछि विद्यार्थीहरू को अगाडी टयाल्स, किताब, आयातकार र बर्गाकर बस्तुहरू अलग अलग गर्न लगाउने । विद्यार्थीहरूलाई बर्गाकार बस्तुको परिमितिको बारेमा पूर्व धारणा सोध्ने । ब्ल्याकबोर्ड देखाउदै, ब्ल्याकबोर्ड आयात हो कि वर्ग हो वानी सोध्ने ।

बर्गाकर टयाल्स को टुक्रा देखाउने, जियोबोर्ड मा rubber band को सहायता ले वर्ग बनायर देखाउने । साथै वर्ग को चित्र बोर्ड मा यसरी कोर्ने:



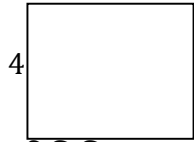
यहाँ, लम्बाई(l) : 1 से. मि. र चौडाई(b) : 1 से.मि., बराबर भएकोले दिइएको आकृति बर्गाकर भयो ।

परिमिति (p) = 2 (l + b)

$$= 2 (1+1)$$

$$= 2 \times 2 = 4 \text{ हुन्छ}$$

ग.) बर्गाकर बस्तु को परिमिति निकालेर देखाउने ।



परिमिति (p) = 4 l

$$= 4 \times \text{लम्बाई}$$

$$= 4 \times 4 \text{ cm} = 16 \text{ cm}$$

यसरि कुनै पनि बस्तु को परिमिति भन्नाले त्यस बस्तु को जम्मा लम्बाई र चौडाई को योगफल हो भनि बताउने ।

### ४. मूल्यांकन

विद्यार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. कस्तो बस्तु लाई बर्गाकर बस्तु भनिन्छ ?

ii. बर्गाकर बस्तुको एउटा भुजा को लम्बाई २ cm ६ वने अरु वहुजा को लम्बाई कति कति हुन्छ ?

iii. बर्गाकार बस्तु को परिमिति निकालने सुत्र भन ?

### गृहकार्य

बर्गाकर बस्तुको परिमिति जानेर आउ र ५ cm लम्बाई भएको वर्ग को परिमिति निकालेर आऊ ।

### पठ्योजना-३

विषय : मेरो गणित

एकाई : आठ

पठिर्षक : क्षेत्रफल

पठ्यबस्तु : आयातकार सतह को क्षेत्रफल

मिति :

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

#### १ विशिष्ट उद्देश्य :

यस कक्षा क्रियाकलपको अन्त्य मा विधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) आयातकार सतह को क्षेत्रफल निकाल्ने सुत्र निर्माण गर्न ।

ख) सुत्र को आधारमा आयातकार सतह को क्षेत्रफल निकाल्न ।

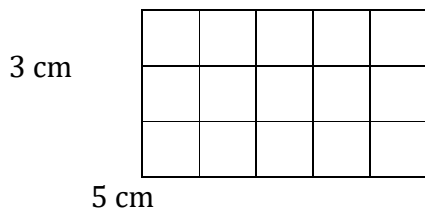
#### २. शिक्षणसामग्रीहरु :

किताब, स्केल, काठरकागजकाआयातकरबस्तुहरु,जिओबोर्ड, धागो,टायल्सर रबर ब्याण्ड आदि

#### ३. शिक्षण सिकाई क्रियाकलाप :

क) विधार्थी मा पूर्वज्ञान कति छ भनी जच्चै विसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : आयातकार बस्तुको परिमिति निकाल्ने सुत्र के हो ?

त्यसपछि विधार्थीहरु को अगाडी जियोबोर्ड राखेर र रबर को सयता ले जियोबोर्ड मा आयातकर आकृति बनाएर देखाउने । बनाइएका आकृति ले जियोबोर्ड मा भएका  $1/1 \text{ cm}^2$  कतिओटा खोथा ओगटेको ६ गन्न लगाउने, साथै उक्त आयातकार बस्तुको चित्र ब्लाकबोर्ड मा बनाएर देखाउने ।



यहाँ, लम्बाई(l) : 5 cm (लम्बाई तिर  $1/1 \text{ cm}$  भएका ५ ओटा कोठा भएकाले ) र चौडाई(b) : 3 cm ( चौडाई तिर  $1/1 \text{ cm}$  क 3 ओटा कोठा भएकाले )छ

अब उक्त आयात मा रहेका कोठा गन्न लगाउने , यहाँ, जम्मा १५ ओटा कोठा छन् भने एउटा कोठा को क्षेत्रफल  $1 \text{ cm}^2$  रहेको छ ।

त्यसैले, दिइएको आयात को क्षेत्रफल =  $15 \text{ cm}^2$  हुन्छ ।

$$= 5 \text{ cm} \times 3 \text{ cm}$$

$$= \text{लम्बाई} \times \text{चौडाई}$$



यसरी, आयात को क्षेत्रफल (A) =  $l \times b$  हुन्छ भनि निकालेर देखाउने ।

#### ४. मूल्यांकन

बिधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. आयातकार बस्तु को क्षेत्रफल निकाल्ने सुत्र भन ?

#### गृहकार्य

आयातकार बस्तु को क्षेत्रफलको सुत्र निकाल्ने तरिका जानेर आउ ।

विषय : मेरो गणित

एकाई : आठ

पठिर्षक : क्षेत्रफल

पठ्यबस्तु : आयातकार सतह को क्षेत्रफल

मिति :

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

### १ विशिष्ट उदेश्य :

यस कक्षा क्रियाकलपको अन्त्य मा विधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) आयातकार बस्तुको को क्षेत्रफल निकाल्न ।

ख) आयातकार बस्तुको क्षेत्रफल साग सम्बन्धित समस्या हल गर्न ।

### २. शिक्षणसामाग्रीहरु :

किताब, स्केल, काठरकागजकाआयातकरबस्तुहरु,जिओबोर्ड, धागो,टायल्सर रबर ब्याण्ड आदि

### ३. शिक्षण सिकाई क्रियाकलाप :

क) विधार्थी मा पूर्वज्ञान कति छ भनी जचदै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : आयातकार बस्तुको क्षेत्रफल निकाल्ने सुत्र के हो ?

त्यसपछि विधार्थीहरु को अगाडी जियोबोर्ड राखेर र रबर को सयता ले जियोबोर्ड मा आयातकर आकृति बनाएर देखाउने । बनाइएका आकृति को लम्बाई र चौडाई स्केल को सहायता बाट नापेर ब्लाकबोर्ड मा लेख्ने, जस्तै:

लम्बाई(l) : 9 cm

चौडाई(b) : 5 cm

सुत्रबाट, आयात को क्षेत्रफल (A) = l x b

$$= 9 \text{ cm} \times 5 \text{ cm}$$

$$= 45 \text{ cm}^2$$

(ग) कुनै आयात को क्षेत्रफल  $30 \text{ cm}^2$  च र चौडाई 5 cm छ भने उक्त आयात को लम्बाई निकालेर देखाउने ।

यहाँ, आयात को क्षेत्रफल (A) =  $30 \text{ cm}^2$

$$\text{चौडाई (b)} = 5 \text{ cm}$$

$$\text{लम्बाई (l)} = ?$$

सुत्रबाट, आयातको क्षेत्रफल (A) = l x b

$$l = \frac{A}{b}$$

$$l = \frac{30}{5}$$

$$\text{लम्बाई (l)} = 6 \text{ cm}$$

### ४. मूल्यांकन

विधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. लम्बाई = 12 cm , चौडाई = 8 cm भयको आयातको क्षेत्रफल निकाल ।

### गृहकार्य

आभ्यास आठ को प्रश्न 1 क सम्पूर्ण हिसाब गरेर ल्याऊ

### पठ्योजना-5

विषय : मेरो गणित

एकाई : आठ

पठिर्षक : क्षेत्रफल

पठ्यबस्तु : बर्गाकर बस्तुको क्षेत्रफल

**१ विशिष्ट उदेश्य :**

यस कक्षा क्रियाकलपको अन्त्य मा विधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) बर्गाकर बस्तुको क्षेत्रफल निकाल्ने सुत्र निर्माण गर्न ।

ख) सुत्र को आधारमा बर्गाकर बस्तुको क्षेत्रफल निकाल्न ।

**२. शिक्षणसामाग्रीहरु :**

मिति :

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

किताब, स्केल, काठरकागजकाआयातकरबस्तुहरु,जिओबोर्ड, धागो,टायल्सर रबर ब्याण्ड आदि

### ३. शिक्षण सिकाई क्रियाकलाप :

क) विधार्थी मा पूर्वज्ञान कति छ भनी जच्चै विषयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : आयातकार बस्तुको क्षेत्रफल निकाल्ने सुत्र के हो ?

त्यसपछि विधार्थीहरु को अगाडी जियोबोर्ड राख्ने र रबर को साह्यता ले जियोबोर्ड मा बर्गाकार आकृति बनाएर देखाउने । बनाइएका आकृति ले जियोबोर्ड मा भएका  $1/1 \text{ cm}^2$  का कतिओटा कोठा ओगटेको छ गन्न लगाउने, साथै उक्त बर्गाकार बस्तुको चित्र ब्लाकबोर्ड मा बनाएर देखाउने ।

3 cm	<table border="1" style="border-collapse: collapse; width: 100%; height: 100%;"> <tr><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td></tr> <tr><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td></tr> <tr><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td><td style="width: 33%; height: 33%;"></td></tr> </table>										
3 cm											
यहाँ, लम्बाई(l)		: 3 cm = चौडाई (b) = 3									

लम्बाई र चौडाई बराबर भएकोले,  $l = b$

क्षेत्रफल (A) =  $l \times l = l^2$

जियोबोर्ड मा कोठा गन्दा, दिइएको वर्गको क्षेत्रफल =  $9 \text{ cm}^2$  हुन्छ ।

$= 3 \text{ cm} \times 3 \text{ cm}$

$= \text{लम्बाई} \times \text{लम्बाई}$

यसरी, वर्गको क्षेत्रफल (A) =  $l^2$  हुन्छ भनि निकालेर देखाउने ।

### ४. मूल्यांकन

विधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. बर्गाकार बस्तु को क्षेत्रफल निकाल्ने सुत्र भन ?

### गृहकार्य

एकाइ 8 को प्रश्न 2 र 3 हल गरेर ल्याऊ ।

### पठ्योजना-6

विषय : मेरो गणित

एकाई : नौ

पठिर्षक : क्षमता

पठ्यबस्तु : तरल बस्तुहरु राख्ने बस्तुको क्षमता

मिति :

कक्षा : ५

घन्टी : चौथो

समय : ४५ मि

#### १ विशिष्ट उदेश्य :

यस कक्षा क्रियाकलपको अन्त्य मा बिधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क)बस्तुको क्षमता को परिभाषा भन्न ।

ख)बस्तुको क्षमता को हिसाब गरेर देखाउन ।

#### २. शिक्षणसामाग्रीहरु :

सेतो कागज मा बनाएका चित्रहरु, आयतकार बट्टा जयिमतिबक्स

#### ३. शिक्षण सिकाई क्रियाकलाप :

क ) बिधार्थी मा पूर्वज्ञान कति छ भनी जचदै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै :1 लि. मा कति मि.लि. हुन्छ ?

ख )बस्तुको क्षमता को परिभाषा बताउने: बस्तुको क्षमता भन्नाले त्यस बस्तु भित्र कति परिमाण को तरल बस्तु आटाउछ भन्ने बुझिन्छ । त्यसपछि बिधार्थीहरु को अगाडी एउटा खाली बट्टा राख्ने र त्यसमा पनि भरेर देखाउदै यहि पनि को मात्र नै त्यो बट्टा को क्षमता हो भनि बुझाउने।

i)4 लि. 200 मई.लि मा कति मि.लि. हुन्छ भन्ने हिसाब गरेर देखाउने

यहाँ, 5 लि. = 5 x 1000 मि.लि. = 5000 मि.लि.

अब, 5 लि. 200 मि.लि. = 5 लि. + 200 मि.लि.

= 5000 मि.लि. + 200 मि.लि.

= 5200 मि.लि.

#### ४. मूल्यांकन

बिधार्थी हरुलाई मुल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. 3 लि. 300 मि.लि. मा कति मि.लि. हुन्छ ?

#### गृहकार्य

आभ्यास 9 को प्रश्न न.1 को हिसाब गरेर ल्याऊ ।

#### पठ्योजना-७

विषय : मेरो गणित

एकाई : दश

पठिदर्शक : आयतन

पठ्यबस्तु : आयातकार ठोस बस्तुहरुको आयतन

१ विशिष्ट उद्देश्य :

यस कक्षा क्रियाकलापको अन्त्य मा बिधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) आयातकार ठोस बस्तुहरुको लम्बाई, चौडाई र उचाई बताउन ।

ख) आयातकार ठोस बस्तुहरुको आयतनको सुत्र बताउन ।

२. शिक्षणसामग्रीहरु :

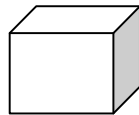
आयातकारल खालको काठ को घनाकर बस्तु, आयातकार बट्टा, ज्यामिती बक्स, डाइस को गोटी, गिलो माटो आदि

३. शिक्षण सिकाई क्रियाकलाप :

क) बिधार्थी मा पूर्वज्ञान कति छ भनी जाचदै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : 1 लि. मा कति मि.लि. हुन्छ ?

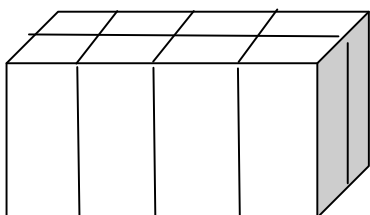
ख) 4 cm लम्बाई, 2 cm चौडाई र 2 cm उचाई भएको गिलोमाटो को आकृतिलाई 1/1 cm को ग्यापमा लम्बाई र चौदैको भागबाट काटेर देखाउने ।

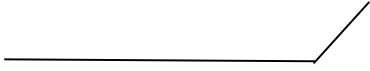
जस्तै,



यहाँ, लम्बाई, चौडाई र उचाई 1/1 cm छ ।

त्यसैले यसको आयतन 1 घन से.मि. हुन्छ





यहाँ, लम्बाई 4 cm, चौड़ाई 2 cm, उचाई 2 cm छ। र तल्लो र माथिल्लो एकाइ मा 8/8 ओटा घन एकाइ हरु छन्।

त्यसैले यहाँ, आयातकार ठोस बस्तुको लम्बाई चौडाई र उचाई गुणन गर्दा

$$\begin{aligned} \text{लम्बाई} \times \text{चौडाई} \times \text{उचाई} &= 4\text{cm} \times 2\text{cm} \times 2\text{cm} \\ &= 16\text{cm}^3 \text{ हुन्छ।} \end{aligned}$$

त्यहाँ प्रत्येक घन एकाइ को 1घन से.मि.(1cm<sup>3</sup>) छ।

माथिको छलफल को आधारमा, आयातकार ठोस बस्तुको आयतन (V) = लम्बाई x चौडाई x उचाई  
अथवा,  $V = l \times b \times h$  हुन्छ भनि देखाइदिने।

#### ४.मूल्यांकन

बिधार्थी हरुलाई मुल्यांकन को लागि निम्न प्रश्न सोधिनेछ।

- i. आयातकार ठोस बस्तु को लम्बाई, चौडाई र उचाई कुन कुन हुन्छ?

#### ५.गृहकार्य

तिम्रो घर मा भएका तीनओटा ठोस बस्तुको आयतन निकालेर ल्याऊ।

## पठ्योजना-८

विषय : मेरो गणित

मिति :

एकाई : दश

कक्षा : ५

पठिर्षक : आयतन

घन्टी : चौथो

पठ्यबस्तु : बर्गाकार ठोस बस्तुहरुको आयतन

समय : ४५ मि

### १ विशिष्ट उद्देश्य :

यस कक्षा क्रियाकलापको अन्त्य मा बिधार्थीहरु निम्न कुरामा सक्षम हुनेछन ।

क) बर्गाकार ठोस बस्तुहरुको आयतन निकाल्ने सुत्र निर्माण गर्न ।

ख) बर्गाकार ठोस बस्तुहरुको आयतन सम्बन्धि हिसवहरु गर्न ।

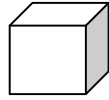
### २. शिक्षणसामग्रीहरु :

बर्गाकार खालको काठ को घनाकर बस्तु, बर्गाकर बट्टा, ज्यामिती बक्स , डाइस को गोटी, गिलो माटो आदि ।

### ३. शिक्षण सिकाई क्रियाकलाप :

क) बिधार्थी मा पूर्वज्ञान कति छ भनी जच्चै बिसयबस्तु तर्फा ध्यान केन्द्रित गराउने जस्तै : आयातकार ठोस बस्तुको आयतन को सुत्र क हो ?

लम्बाई, चौडाई र उचाई बराबर भएको गिलोमाटो मा 1/1 cm cm को ग्यापमा लम्बाई र चौडाई को भागबाट काटेर देखाउने ।



जस्तै,

यहाँ , लम्बाई, चौडाई र उचाई 1/1 cm छ । त्यसैले यो घनाकार बस्तु हो ।

त्यसैले घन को लम्बाई चौडाई र उचाई बराबर हुने भएको हुनाले

घनको आयतन (V) = (भुजा)<sup>3</sup> वा (लम्बाई)<sup>3</sup> हुन्छ

(V) = l<sup>3</sup> हुन्छ भनि देखाउने ।

### ४. मूल्यांकन

बिधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

i. 9 मि. लम्बाई भएको घनाकार बस्तुको आयतन निकाल । बिधार्थी हरुलाई मूल्यांकन को लागि निम्न प्रश्न सोधिनेछ ।

### ५. गृहकार्य

अभ्यास 10 को प्रश्न नं. 2 क सबै प्रश्न समाधान गरेर ल्याऊ ।