

## Chapter-I

### INTRODUCTION

#### Background of the Study

According to learning principle, “students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge”. The vision of school mathematics in Principles and Standards is based on students learning mathematics with understanding. Unfortunately, learning mathematics without understanding has long been a common outcome of school mathematics instruction. In fact learning without understanding has been a persistence problem and it has been the subject of much discussion and research by psychologists and educators over the years.

Constructivism is perspective of teaching and learning in which a learner constructs learning form experience and interaction with others and the teachers’ role is to provide meaningful experiences for students. Constructivism is a constructive method, principle or method of production featuring, architectural or mechanical structural on the stage, originally to give three dimensional effects to scenic design. According to Webster's Encyclopedic Dictionary, constructivism is a non-representational style of acts developed by a group of Russian artists principally in the early 20<sup>th</sup> century, characterized chiefly by a severally formal organization of mass, volume and space and by the employment of modern industrial material and techniques.

Constructivism is a philosophy of learning reflecting on grown experiences, we construct each of us generates our own “rules” and "mental models", which we use

to make of our experience. Thus learning is simply the process of adjusting our mental models to accommodate new experience. A first version of constructivism originating in the work of Piaget holds that knowledge is actively constructed by the learner and not passively transmitted by the educators. According to Radical constructivism of a Glasersfeld (1996), cognition is considered adoptive in the sense that it is based on and constantly modified by the learner's experience. Beyond that, there is the social constructivism; version of Vygotsky which is an effort to challenge Piaget's ideas developed a fully cultural psychology stressing the primary role of communication and social life in meaning formation and cognition. The later version of constructivism is developed by theories of sociology of scientific knowledge which argues that all knowledge in a social construct is the frame of science and technology.

Constructivism is based on a theory of learning as on the way we believe knowledge to be constructed in the human mind. The learners cannot merely be taught new information; they have to actively construct new knowledge for themselves. Each learner actively construct or reconstruct his or her own understanding rather than receiving it from a more authoritative source such as a teacher or text book. New knowledge is built up of already existing cognitive structures. If people experience something new they internalize it through past experience or knowledge constructs that have been previously established. Hence that constructivist educators stress the importance to define what is already known by their students.

Constructivism may be characterized as Both a cognitive and methodological perspective, as methodological perspective in the social sciences. Constructivism assume that human beings are knowing subject that human behavior is mainly

purpose, and that present-day human organisms have a highly developed capacity for organizing knowledge. These assumptions suggest methods ethnography, clinical interviews, overt thinking and the like specially designed to study complex semi-autonomous systems. Epistemology is the theory of knowledge. Its central questions include the origin of knowledge; the place of experience in generating knowledge; and place of reason in doing so; the relationship between knowledge and certainty. Two metaphors for different philosophies can be forwarded:

- ) *Building built on foundation (secure foundation).*
- ) *A boat that has no foundation but owes its strength to stability given by is interlocking parts. (Favors the idea of coherence).*

As an advocate of radical constructivist Glaser field stated, “Knowledge is the result of an individual subjective constructive activity, not a commodity that somehow resides outside the knower and can be convey or instilled by diligent perception or linguistic communication.” From a constructivist point of view there is always more than one way of solving problem and problem solvers must approach problem situation from different perspectives. These views held by constructivists on the nature of knowledge are harmony, with relativist perspectives of many, through certainly not all, 20<sup>th</sup> century philosopher and mathematicians. Historically constructivism was started and theorized by great thinkers Jean Rousseau, John Dewey, and Jean Piaget with the names of develop mentalist exponents. In the year during which it gained ascendancy, developmentalism served as a basis for rejecting harsh and inhumane teaching methods.

The work of Jean Piaget, John Dewey, Bruner, Neisser, Van Glaserfeld and Vygotsky led to the evolution of constructivism. The work of Piaget and Dienes provide psychological bases of constructivism. Similarly, the work of Dewey and others provides the philosophical bases of constructivism whereas Lanes and Bruner's works added some to provide the firm foundation of constructivism. Jean Piaget provided basis for the psychological theory of cognitive in a constructivism. He believed that individuals build understanding by a process of active interaction with their environment. Jean Piaget perhaps the western civilization to explore learning and knowledge structure with a model that viewed children as the "Builders of their intellectual structure". In recent years, the work of Daniel Asubel has supported and reinforced constructivist ideas. Soviet psychologist Vygotsky developed "dialectic theory" a social learning perspective that describes how children learn through interaction and dialogues, how children learn through interaction and dialogues with socializing agents.

Constructivism is a theory about acquisition of knowledge and learning process, not only a teaching technique. Students need to construct their own understanding of each mathematical concept, so that the primary role of teaching is not to lecture, explain, to transfer mathematical knowledge, but to create situations for the students that will foster their making the necessary mental constructions. A critical aspect into developmental steps following a Piaget theory of knowledge based on observation and interviews with student as they empty to learn concept. Constructivism gives the ideas that have influenced how math has been taught: the concept of math as facts to be transmitted to the students and the view that some people have and some people don't, where the educators task it to figure out how

"smart and bright" students are and choose the right task for them to perform.

Questions remain, however about whether these offer rich information for developing different ways of teaching and what's to be done for those who aren't succeeding?

Every student has their own cognitive structure based on their own experience . Constructivism focuses our attention on how people learn. It suggests that mathematics to the questions and challenges that come from actively engaging math problems and environments, not from simply taking in information, nor as merely the blossoming of an innate gift. The challenge in teaching is to create experiences that encase the student and support his or her own explanation, evaluation, communication and application of the mathematical models needed to make sense of these experiences.

### **Constructivism and Education**

It is generally acknowledge that constructivism constitute a very important, although often contested, practical and theoretical perspective in current education research. A first mild version of constructivism originating in the work of Piaget hold that knowledge is actively constructed by the learner and not passively transmitted by the educator. In addition, in which cognitions considered adaptive in the sense that it is based on and constantly modified by a learners experience. Beyond that there is a version of social constructivism of Vygotsky, who in an effort to challenge Piaget's idea developed a fully cultural psychology stressing the primary role of communication and social life in meaning formation and cognition.

Constructivism is popular position today not only in mathematics education but in developmental psychology, theories of the family, human sexuality, psychology

of gender. It is also the center of considerable controversy in mathematics education. In a spirit of support for what constructivist is trying accomplishing, I want to discuss some strength and weaknesses in the position. In particular, I will suggest that constructivism is not a strong epistemological position despite its adherent's claims. Indeed it might best be offered as a post-epistemological perspective. The teacher acts as a facilitator who encourages students to discover principles for themselves and to construct knowledge by working to solve realistic problems.

Aspects of constructivism can be found in self-directed learning, transformational learning, experiential learning, situated cognition, and reflective practice and religious practice. The later version of constructivism is accentuated by theories of sociology of scientific knowledge, which argue that all knowledge is a social construct in the frame of science and technology.

### **Students in Constructivist Class**

In constructivist classroom, students are more actively involved than in a traditional classroom, they are sharing ideas, asking questions, discussing concepts and revising their ideas and misconceptions. In the constructivist theory, the emphasis is placed on the learner or the student rather than the teachers or the instructor. The learner constructs his/her own conceptualization and solution to problem. Learners with different skills and backgrounds should collaborate in tasks and discussion in order to arrive at a shared understanding of the truth in a specific field.

Constructivism emphasizes the importance of the learner active engagement during the learning process. The learner constructs or generates meaning from his/her experience rather than previously receiving knowledge from the teacher. Thus, the

students are achieved learner who consciously or unconsciously builds their own understanding based on their prior knowledge. Students come to class with a preexisting perception of mathematical structure, which they use to make sense of new ideas. So, in a constructivist classroom, students are more actively involved than in a traditional classroom.

### **Teachers in Constructivist Class**

Constructivist theory is a now revolutionary thought generated prior to the 20<sup>th</sup> century. Avoiding the old thought of teacher is as source of knowledge, translator of knowledge and main character of teaching learning process. In this concept teacher can neither be the power of God nor the decider of student learning. The constructivist teacher sets up problems and monitors student's exploration, guides direction of student inquiry and promotes new patterns of thinking. Classes can take unexpected turns as students are given the autonomy to direct their own explanations.

Constructivist teacher refer to raw data primary sources and interactive materials to provide experience for their students rather than relying solely on another set of data.

Constructivist teachers allow student responses to drive lessons, shift instructional strategies and alter content. This does not mean that if students are not interested in a topic, it should not be taught. Constructivist teachers organize information around conceptual clusters of problems and questions as opposed to facts in isolation. Activities and tasks are relevant or of emerging relevance to students. Such activities are often problem based rather than drill-and-practice. Instead of concentration on knowledge acquisition, problem-based activities allow students to develop a deeper understanding of the knowledge domain. Constructivist teachers

encourage students inquiring by asking thoughtful, open-ended questions and encouraging students to ask questions of each other. The questions are designed to challenge students to work beyond the apparent, solve issues deeply and broadly, and from their own understanding. The different characteristics of constructivist teacher:

- ) One of the many resources that the student can learn from, not the primary source of information.
- ) Teacher engages students in experiences that challenge previous conceptions of their existing knowledge.
- ) Teacher allows students' responses to drive lessons and seek elaboration of students' initial responses. He allows students some time for thinking after posing questions.
- ) Teachers encourage the spirit of questioning by asking thoughtful, open-ended questions. Teacher encourages discussion among students.

Constructivism is a learning theory in which learning is seen as an active process in which the learner constructs new ideas or concepts based on their current and past knowledge. Constructivism is the view in which the active role of the student or learner in building understanding and making sense of information. Constructivists believe that we construct meaning based upon our interactions with our surroundings. So, it is a model or metaphor of how learning takes place. It can only be understood through two roots. Ontology has been taken as issues concerning the nature of being and seeks to answer the question of epistemology. Related to the origin, foundation, limits and validity of knowledge are central questions of epistemology.



The constructivist perspectives are grounded in the research of Piaget, Vygotsky, Bruner, Gestalt, Bartlett as well as educational philosophy of Jhon Dewey. There are various types of constructivism like cultural constructivism, radical constructivism, critical constructivism, social constructivism etc. By all above discussion constructivism is a recent and applicable approach among the different method of teaching, which was developed to improve the teaching learning activities. The instruction is based on teacher center learning where as constructivism looks for better thinking for children better to do and will learn by doing . How learner build on existing or prior knowledge to incorporate new knowledge based on their learning experiences and the theory based on the principle that knowledge is not discovered but constructed in the mind of learner. The resulting perception and effect in the classroom are evident in student's recantation that is legitimate on involving questions. Most of the teaching strategies are found to be autocratically and traditional. It is too difficult to choose appropriate methods according to students need and interest. The learning of science in Nepal is facing many problems due to lack of qualified and untrained teachers, teacher materials, laboratory facilities and so on. To overcome these problems, constructivist methods should be used to develop the scientific ideas, concept and active practicing in classroom activities.

### **Statement of the Problems**

Most of people consider mathematics as a very difficult subject. It can be shown through their failure in mathematics. In the context of Nepal, most of the students are being failed in mathematics in S.L.C. Student of lower classes also have not got better achievement on mathematics. Due to this failure rate of student,

teachers as well as guardians feel it as very difficult subject. It has seen as burning problem of the learning mathematics.

In Nepalese context, generally teachers were used their own traditional methods and students do not get chance to construct their own knowledge. Also, there is a lack of knowledge about the relationship between teaching method and the achievement of students in mathematics. So, there is a need to bring radical change in its teaching methods. Constructivism is often uses to refer to a teaching method, or the advocacy of a teaching method, in which students construct their own mathematics.

The study mainly concerns about the effect of constructivist method of teaching over conventional method of teaching of mathematics at the lower-secondary level. Especially this study focused to answer the following questions.

- ) Does constructivist method improve the student achievement score in mathematics?
- ) Does constructive approach produce better result than conventional approach in student' achievement?

### **Objectives of the study**

This study aims to accomplishing the following objectives:

1. To determine the achievement level of the students taught by constructivist learning method.
2. To compare the achievement scores of the students taught by constructivism method and traditional method.

### **Significance of the Study**

Mathematics is an essential part of school curriculum, so every student should study. It has been taught for a compulsory subject at school level as well as optional subject. Teaching mathematics is a difficult and challenging because it's nature, course content social need, student interest and explosion of new field of knowledge. Constructivism is a theory about acquisition of knowledge and learning process, not only a teaching technique. Students need to construct their own understanding of each mathematical concept, so that the primary role of teaching is not to lecture, explain, to transfer mathematical knowledge, but to create situations for the students that will foster their making the necessary mental constructions. This study would be helpful to get information about the effect of constructivism in mathematics learning.

- ) Teaching is an art of the artist with skillful and tactful tasks so this method is very helpful for teaching effectively.
- ) It would also help to the teacher, parents and other common people to create better environment and awareness to provide positive attitude towards teaching.
- ) It would helpful to build of knowledge about constructivism education.
- ) This study would also help to know the effect of individual difference in mathematics achievement.

### **Hypothesis of the study**

#### **Null Hypothesis (H<sub>0</sub>):**

There is no significant difference between mean scores of the students taught by using constructivist method and traditional method. (H<sub>0</sub>:  $\hat{\mu}_1 = \hat{\mu}_2$ )

#### **Alternative Hypothesis (H<sub>1</sub>):**

There is significant difference between mean scores of the students taught by using constructivist method and traditional method. (H<sub>1</sub>:  $\hat{\mu}_1 \neq \hat{\mu}_2$ )

### **Delimitation of the Study**

The limitation of the study would as follows:

- ) This study would be limited on Palpa district.
- ) This would be limited for only mathematics students of grade VIII.
- ) Some of the variables like as age, level of teacher, social status, classroom environment, and teacher experiences would be ignored by researcher.
- ) The sample of the study would be selected through purposive sampling method.

### **Definition of the Related Terms**

**Achievement:** - In this study, student's achievement means the score obtained by the students on the test which is prepared by the researcher.

**Public School:** - The school which is established forms the government, conducted under national educational policies and depends upon government and nongovernmental organizations.

**Lower-Secondary level:** - The level in which class 6 to 8 taught.

**Achievements score:** - Numerical value of learning takes place in students.

**Test:** - Standardized instrumental develop by researcher with the help of text book and curriculum to determine the achievements of the students.

**Effect;**- something change in students learning by teaching method or teacher's activity.

**Constructivism;**- A tips of social learning theory by which students share their knowledge by their environment.

**Student;**- The school's students in sample school of grade VIII.

**Teaching;**- The way of sharing knowledge with students and teacher about the related topic.

## Chapter II

### REVIEW OF RELATED LITERATURES

The main purpose of review of related literature is to find out what work have been done and what work has not been done in the area of study being undertaken. During the past decade a lot of researcher studied and did research about the constructivism on mathematics. Teaching and learning are two way process. It is an art and complete process and is an interaction between teachers and students. The related literature of this study is given below as:

#### **Empirical Literature**

Shrestha (1975) did a research entitled “A study comparing the effectiveness of the discovery method and conventional method in a selected lower secondary class of Nepal”. He selected two lower secondary schools of the Butwal and Khasaili Bazar and established two groups from these schools. The experimental groups consisting of forty four students, was taught the unit “fraction” by the discovery method of teaching. The control group consisting of 44 students was taught the same topic by the conventional method of teaching. The duration of instruction was five weeks. At the termination of the instruction period, students of both groups were administered an achievement test.

The test result shows that the performance of students taught by the discovery method of teaching improved significantly when compared to the performance of students taught by the conventional method.

Amatya, (1978) on his topic entitled “A comparative study on the effectiveness of teaching mathematics with and without use of instructional materials”

found that out of 60 students in which 30 were control group and 30 were experimental group. The experimental group taught with the use of instructional materials and the control group was taught without use of instructional materials. At the end of instruction both groups were administered and taken achievement test. Lastly he concluded that the performance of the students taught by with the use of the instructional materials was significantly improved when compared with the performance of the students taught without the use of instructional materials.

Upadhyay, (2001) Study Entitled “The Effect Of Constructivism On Mathematics Achievement Of Grade V Students in Nepal” was targeted to explore the fact whether constructivist approach procedures better result than the conventional approach in student’s achievement in the immediate learning and concluded that constructivist must applied in the context of Nepal. His further aimed if constructivism encourages the habit of self learning and self correlation and constructivism in mathematics are applied in Nepalese school situation.

The researcher was conducted experimentally with the three key words action; researcher was to adopt and advocate constructivism in mathematics teaching in Nepalese classroom. From this research the researcher has to conclude that the possibility of constructivism in Nepalese school with significant difference in achievement than conventional method of teaching.

Pokhrel, (2004) on his study entitled “effectiveness of teaching mathematics with and without the use of constructivism”. In this topic the researcher had selected lower secondary school of Tanahu district and established two groups’ forms this school. The experimental groups consisting twenty eight and also control groups. The

researcher concluded that the performance of the students taught by the constructivist method of teaching improved significantly when compared to the performance of the students taught by the traditional methods.

Basnet, (2004) in his study entitled “the effects of the constructivism on achievements of grade IV students in mathematics”. The objective of this research was to compare the achievements score of the students taught by the constructivist method and traditional method. The researcher concluded that constructivist produce the better result than traditional method also concluded that constructivist method is the effective for teaching mathematics.

Kayastha, (2005) his study entitled “the effect of constructivism in teaching mathematics at grade V students at geometry” has chosen pretest, posttest, equivalent control group design of grade V in kaski district. The researcher concluded that constructivist technique is better effective than traditional method to get better achievement in mathematics. All of the above mentioned studies reported that the effect of constructivism method, compares with other method, relationship but effect of constructivism in particular area of grade VIII mathematics not have been adequately explored. So the present study will attempt to find the effect of constructivism in mathematics of grade VIII.

White (2005), did this research entitled “mathematical attitudes, Beliefs and Achievement in primary pre- service Mathematics Teacher educator” found that Australian primary teacher beliefs had a significant influence upon their attitudes and intentions to use the calculator in the classroom. Teacher attitude were also found to have a significant influence upon their intentions to use calculators. Studies of



primary school teacher intentions towards the use of group work and towards the use of worksheets in the classroom (White, 2000), reported similar findings. Other studies have shown that classroom strategies used to teach a subject are influenced by teacher attitudes that, in turn, influence pupil attitudes. Positive teacher attitudes are improved without first improving mathematical achievement or beliefs.

Raikhola (2007), he did the research in the title “Effect of constructivism Approach in Teaching Mathematics at Lower Secondary Level in Darchula District” was intended to determine effect of constructivist method of teaching compared to the conventional method of mathematics teaching based on the objectives to compare the difference of the achievement score of the students of experiment and control group and to advocate the constructivist as a better method in teaching mathematics. For his research two schools of Darchula districts selected purposively. And decided to control and experimental group by coin toss method. Design of his study was pretest posttest quasi experimental design. There were 29 students for experiment group and 27 students in control group. Experimental and control group were taught same topic “bearing and Scale Drawing” at grade VIII by using constructivism and conventional method of teaching respectively.

The duration of experiment was one and half weeks. After experiment achievement test was adopted both the groups and the mean, variance, S.D. and coefficient of variance were calculated. One tailed t-test was applied at the level of significance 0.05 to examine the mean difference. By his research researcher found that the mean score of the experimental group was more than the control group. It is concluded that the constructivist approach of teaching is more effective than the

convention method of teaching. The researcher advocates that constructivism as a better method in teaching mathematics.

Ghimire(2011), did the research in entitled “ Mathematics teachers belief and attitude towards the use of lesson plan in secondary school “has selected the objectives were to investigate the belief and attitude of mathematics teacher towards the use of the lesson plan in public and private school, to compare the belief and attitude of mathematics teacher towards the use of lesson plan in public and private school to the cases of not using the lesson plan in classroom teaching. In this research survey type, descriptive design was used and he selected public and private school of urban and rural areas of Arghakhanchi district and opinionative sheet, observation and questionnaire were used as tools. The data analysis procedure was descriptive, statically such as mean, standard deviation, chi square and t- value at 0.05 levels of significance. He found that to teach effectively teachers should be positive towards the use of lesson plan.

All of the above mentioned studies reported that the effect of constructivism method, compares with other method, relationship but effect of constructivism in particular area of grade VIII mathematics not have been adequately explored. So the present study will attempt to find the effect of constructivism in mathematics of grade VIII.

### **Theoretical Literature**

From the empirical review of literature, the researcher found that some area of mathematics seem to be more constructivist friendly matter of the course. So to

understand it in much better way, the researcher has presented the theoretical literature of the designed subject.

### **Constructivist Theory**

The constructivist theory or philosophy is based on "the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences. Learners therefore are not empty vessels waiting to be filled, but rather active organisms seeking meaning". A learner's understanding of something is constantly reconstructed as new evidence is presented which conflicts with the current understanding. Constructivist does not believe that there is one reality "out there" that everyone should learn, but that each person creates his or her own reality.

Constructivism is at once a theory of 'Knowing' and a theory about 'coming to know'. It emphasizes the importance of the learner's active engagement during the learning process. The learner constructs or generates meaning from his/her experience rather than passively receiving knowledge from the teacher. Constructivist believes that knowledge is not freestanding and context independent. They hold that knowledge is personally constructed through an individual's interactions with his/her environment. According to constructivism, learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge.

Jacqueline and Martin writes, "Constructivism is a philosophy of learning founded on the premise that by reflecting on our experiences, we construct our own understanding of the world we live in each of us generates our own 'rules' and 'mental models' which are use to make sense of our experiences. Learning therefore, is simply the process of adjusting our mental model to accommodate new experiences".

Constructivism is the theory of how we come to know, how we make sense of world. Social constructivism is the trend within the modern field of sociology of knowledge. Sociology of knowledge is created and acquired. Children's learning of world depends upon how they construct the knowledge. Knowledge is the capacity of the children store and use information about the world. This knowledge comes through the exposition of environment, interactions with others.

Regarding the construction of knowledge, personal constructivism, social constructivism, radical constructivism and critical constructivism are the different brands and degree of constructivism that explore how child perceives the world on the basis of their knowledge.

Many of these trends developed from Bruner's theoretical framework, which stressed that cognitive structure (in the form of schema and mental models) provides meaning and organization to experiences and allow the individual to use what is learned to generalize and go beyond the information given. Also influential in constructivism are Piaget's developmental theory as well as Vygotsky's and Bruner's emphasis that individual development occurs in social and cultural contexts. Vygotsky's theory on the Zone of Proximal Development (ZPD) has also influenced the development and implementation of constructivist learning environments.

Constructivist theory posits that students make senses of the world by synthesizing new experiences into what they have previously understood. The form rules through reflection on their interaction with objects and ideas. When they encounter an object, idea or relationship that does not make sense to them, they either interprets what they see to conform to their rules or they adjust their rules to better

account for the new information. The aforementioned activities are not new prescription for teaching mathematics. It is simply a set of activities which are necessary in constructivism. So, brief characteristics of the constructivist method are out lined below (A constructivist approach includes)

1. Taking student's former knowledge into account.
2. Maximizing social interactions.
3. Providing a variety of sensory experiences.
4. Interactive discussion and problem centered work.

### **Constructivist theory in Instruction**

Since the early 1990s, the focus on designing learning environments has been based on a Constructivist approach to learning. Some of the key tenets of Constructivism are that learning is a process of internal negotiation of meaning, and that learning occurs best in functional context, social and cultural context, and usefulness. Constructivists believe that such learning environments facilitate higher-order thinking, metacognition/reflection, and promote experiences and contexts that make the student willing and able to learn, a condition Bruner referred to as readiness.

Using the constructivist approach, the goals of instruction are to help learners to develop learning and thinking strategies, focus on individuals' active construction of knowledge, and facilitate learning by encouraging active inquiry. This approach is exemplified by Bruner's concept of Discovery Learning, wherein learners are encouraged to find regularities and relationships in the environment, which serve as models to guide discovery. A constructivist instructor should guide learners to

question tacit assumptions and help student to uncover meanings, taking on the role of a coach or guide and engaging students in active dialogue. A teacher using a constructivist approach would also provide student-centered instruction in complex learning environments with formats appropriate to the learner's current state of understanding that incorporate authentic activities, provide for social negotiation, and include access to multiple modes of representation. Techniques employed in constructivist instruction include: scaffolding, fading, cognitive apprenticeship, and collaborative learning.

In constructivist teaching the role of the teacher changed from talking and describing to listening and asking questions to the students.

According to constructivist methods, there are four keys areas of teacher's responsibilities (National Council of teachers of mathematics, 1991). They are:

- ) Setting goals and selecting or creating mathematics task to help students achieve these goals.
- ) Stimulating and managing classroom discourse so that both the students and the teachers are clear about what is being learned.
- ) Creating a classroom environment to support teaching and learning mathematics.
- ) Analyzing student's learning the mathematics task, and the environment in order to make on going instructional decision.

Cobb, Wood and Tackel (1993) elaborate the teacher's responsibilities in the mathematics classroom. The teacher has the dual role of fostering the development of

conceptual knowledge among his/her students and of facilitating of constitution of shared knowledge in the classroom community.

### **General principles of constructivist learning**

There are nine general principles of constructivist learning (The Teaching and Learning of Competence Based Mathematics, 2010). These principles are:

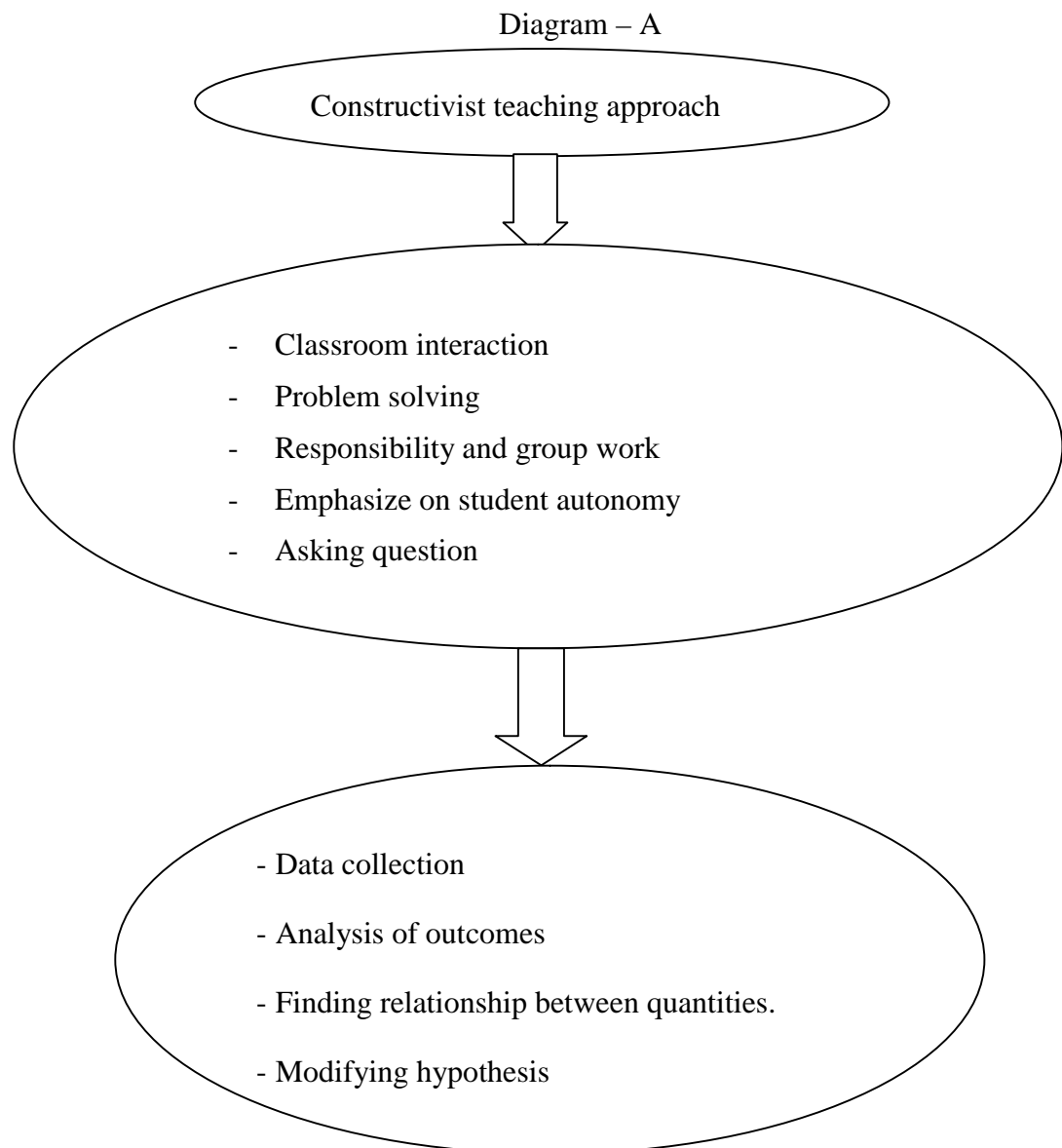
- ) Learning is an active process in which the learner used sensory input and construct meaning out of it.
- ) People learn to learn as they learn. Learning consists both of constructing meaning and constructing systems of meaning.
- ) The crucial action of constructing meaning is mental: it happens in the mind. Physical actions, hands-on experience may be necessary for learning, especially for children, but it is not sufficient; we need to provide activities which engage the mind as well as the hands.
- ) Learning involves language: the language we use influences learning. Vygotsky argued that language and learning are inextricably intertwined.
- ) Learning is a social activity: our learning is intimately associated with our connection with other human beings, our teachers, our peers, our family as well as casual acquaintances.
- ) Learning is contextual: we do not learn isolated facts and theories in some abstract ethereal land of the mind separate from the rest of our lives: we learn in relationship to what else we know, what we believe, our prejudices and our fears.

- ) One needs knowledge to learn: it is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. The more we know, the more we can learn.
- ) Learning is not instantaneous. For significant learning we need to revisit ideas, ponder them try them out, play with them and use them.
- ) Motivation is a key component in learning. Not only is it the case that motivation helps learning for learning.



## Conceptual Framework

For the research process there would be different approach to obtain the different goal. For my constructivist learning approach I would use the following process and finds the result.



In the constructivist classroom, there is a need to create an atmosphere in the classroom in which students discuss their ideas with one another, share ideas with

peer group and have discussion on these ideas in the healthy environment. In the constructivist classroom there are different activities like teacher students discussion would be organized. In the period of teaching provide environment to the students to think, reflect upon and construct ideas and classroom environment is non- threatening to allow free discussion and meaningful dialogues. The student seared the knowledge from the more knowledgeable other. The students solve practical work with the help of their speech as well as their eyes and hands have social origins and that they learn through interaction with others.

The above diagram shows that the classroom is run by the interaction between teacher students and students with students by making the good environment and the class work is depend upon the student center activity and the problem were solved by the discussion but first researcher focused or impressed them to solve by themselves and finally provide the cleared concept by the researcher himself. Researcher focused to the students to do in group and say the answer with the way solving problem strategies. Researcher provides the concept to the student by his episode and makes them active in classroom activity. Finally researcher provides the different question to the students and makes them solve the problem them solves.

After the finishing experiment period the researcher used the posttest for the students and collects the result. By collecting the result researcher represent the data in table. Then researcher used different mathematical tools for analysis of the data. By the help of the result the researcher discusses the table and then modifying the hypothesis.

### Chapter- III

#### **METHODS AND PROCEDURES**

This chapter would describe the design of the plan and procedure of study. The present research focused on “Effect of constructivism on achievement of students in mathematics”. This study followed the qualitative and quantitative approached. Mainly this chapter would contain some sub-heading such as population, sample of the study, instruments /tools, validation of tools, procedure of data collection, analysis and interpretation of data.

#### **Research Design**

The research design is a logical and systematic planning and direction of pieces of Research. It means that "research is the plan, structure and strategies of investigation conceived so as to obtain answers to research questions and to control variance". Simply, research design is an overall plan or scheme. The researcher designs his researcher strategies as experimental. So, this study was involving pretest, posttest non equivalent groups design to find The “Effect of constructivism on achievement of students in mathematics”.

**Table- 1**  
**Pretest and Posttest Design**

Group	Pretest	Treatment	Posttest
E	T <sub>1</sub>	Constructivist method	T <sub>2</sub>
C	T <sub>1</sub>	Traditional method	T <sub>2</sub>

E- Randomized Experimental Group

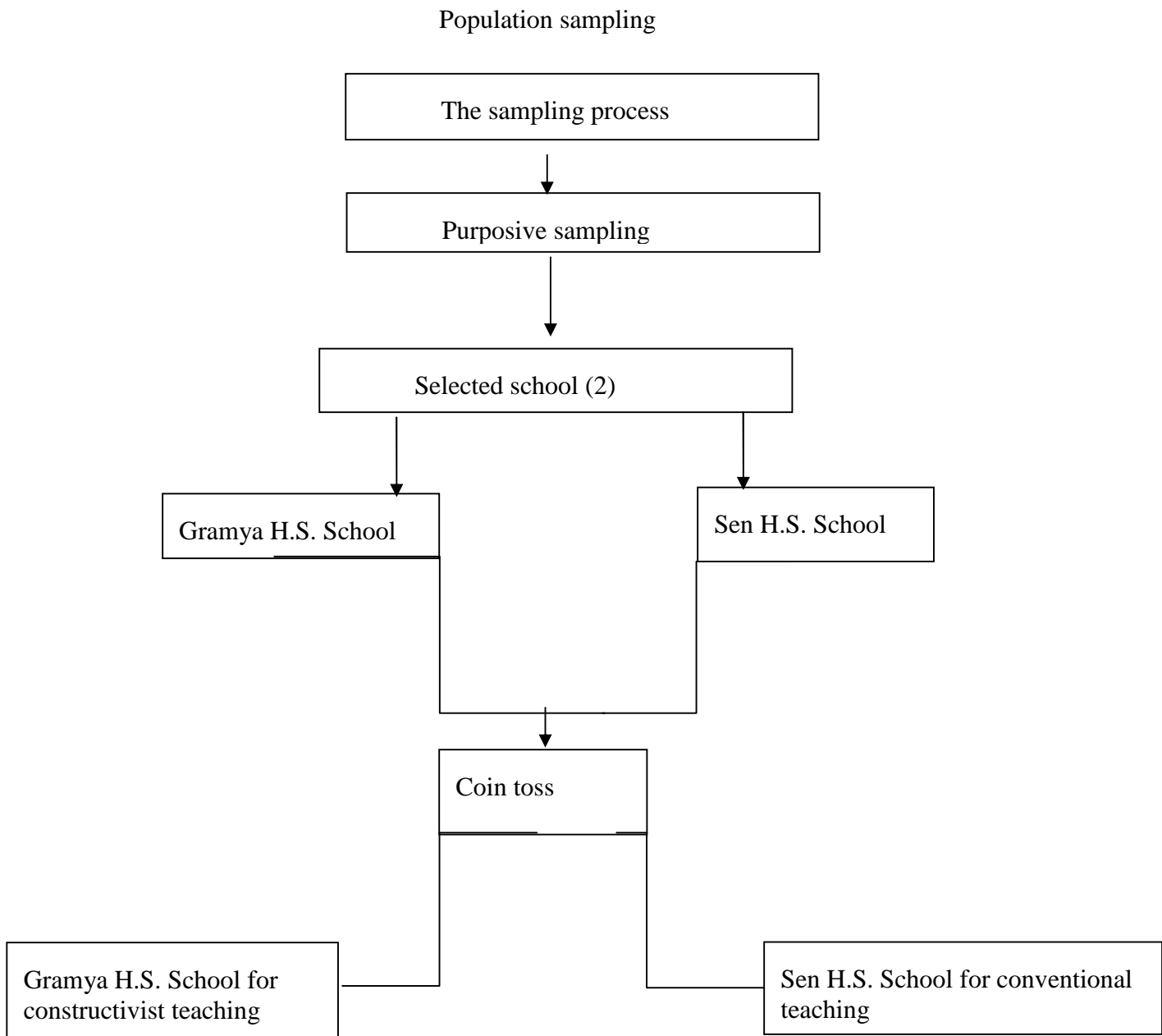
C- Randomized control group, T<sub>1</sub>- Pretest, T<sub>2</sub>- Posttest

### **Population of the Study**

In the present research, the population of the study would consist of all the grade VIII students in government school of Palpa District.

### **Sample of the Study**

The researcher could not evaluate, observe or administer to each and every unit of the population in the survey. Therefore this study was taking the representative part of the population in current school of researcher himself and Sen higher secondary school for the study. By the coin toss method researcher would be select Gramyaa H.S. School for experimental teaching and Sen H.S. School for traditional method teaching. There were 23 students in grade VIII of Gramyaa H.S. School and 28 students in grade VIII of Sen H.S. School purposively. Researcher decides to teach Gramya H.S. School by constructivist method and the Sen H.S. School by conventional method. The sampling process was present in table clearly as below



### **Instrument/Tools of the Study**

For processing the research, the researcher used both teaching episode for constructivist teaching and made the achievement test for pretest and posttest score. So, the researcher developed an achievement test paper from the mathematics text book of grade VIII, prescribed by the government of Nepal. It was included perimeter,

area and volume to measure the three level of cognitive domain. The achievement test paper of the researcher contained of items from knowledge level, comprehensive level and application level.

### **Variables**

In this study, certain extraneous variables e.g. Students, teachers, school environment etc would tried to control by the researcher. There are some intervening variable histories, maturation, testing, time etc which affects the outcomes largely, some of them would try to control by randomizing process.

### **Independent variables**

The independent variables were method of teaching mathematics in the class room instruction in accordance with the characteristics of the constructivism.

### **Dependent variables**

Achievement scores in the test of mathematics were dependent variables.

### **Stages of the study**

This study was conducted in three stages.

#### **Pre-Experimental Stages**

In this stage instructional materials would collect. Teaching episodes would prepare, for episode researcher only prepare for perimeter, area and volume related and each episode depend upon the student centered activity. It encourages the student and teacher only creating the environment for them. This would standardize by subject expert and subject teacher. For achievement test paper, first piloting and

validation of the test paper and was administered in the experimental and control group.

### **Experimental Stages**

In this stage the researcher taught the experimental way in Gramya H.S. School with constructivist method and conventional method in Sen H.S. School. Since the aim of this study was to examine the effect of constructivism on mathematics achievement of grade VIII students. It was very difficult and minimized the effect of other variables besides the experimental variable which directly impress the achievement. So researcher taught in two schools and taught one school by constructivist and other by conventional method of teaching for three weeks.

### **Post Experimental Stages**

In this stage the researcher was conduct posttest by using achievement test paper. The achievement test paper consists of 16 items. All the nature of questions was same as the pretest but the questions were different and collect the data for analysis and interpretation by using statistical tools and technique.

### **Reliability and Validity of the Instrument**

The content validity of the test was established by mathematics education experts, school teacher and thesis supervisor. For the reliability of the test, I used pilot test among 15 student of Grade VIII of Sen H. Secondary School, Palpa. Before administering the test paper, the investigator instructs the student how to response the test paper. For the reliability of the study the researcher administered the pilot study to the student of Grade VIII of Sen H. Secondary School, Palpa. After piloting, the data was analyzed by Rulon formula, calculated value was 0.81. It indicated that the

mathematical achievement test was reliable. The calculation of reliability table is presented in APPENDIX-E.

### **Data Collection Procedure**

Researcher would purposively select Gramya H.S. School and Sen H.S. School. The student in Gramya H.S. School was in experimental group and control group in Sen H.S. School. Prior to the administration of the achievement test, first researcher administering the pre-test paper, the researcher would explain the data collection procedure of mathematics achievement test to the students. Then researcher taught perimeter, area and volume to the experiment group with constructivist approach and control group with traditional approach for 3 week. For experimental group constructivist method of teaching with depend on the episode and control group was taught by conventional method. After the time duration of experimental period, researcher made a same achievement test paper for students. By the test researcher would collect the answer sheet and scored. The score was tabulate for the analysis.

### **Scoring procedure of Data**

Answer sheet of pretest and posttest were collected by the researcher and check out the sheet and scored them according as marks of each question. For both pretest and posttest same parallel question were used. For test there were 50 marks examination for both pre and posttest with time period was 2 hours. The types of question and score of each question were given below. There were 16 questions.



**Table – 2**  
**Scoring Strategies**

Group	Types of question	Number of question	Marks
A	Short question	Seven	$7 \times 2 = 14$ (each question with two marks.)
B	Long question	Nine	$9 \times 4 = 36$ (each question with four marks)

### **Data Analysis Procedure**

The collected data was analyzed by using different statistical techniques which were given below. For the level of students, researcher would tabulate the posttest score and pre- test score of experimental group and categorize their score in three divisions. The mean and SD would used to analyzed the score. The T-test would be used to compare the mathematics achievement of students taught by constructivist and traditional method.

### Statistical Technique Used

The statistical tool t-test was used to find out the significant difference between mean scores of experimental and control group. There is the level of significance of the research hypothesis at 0.05.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

Where,  $\bar{x}_1$  = mean of the first sample,  $\bar{x}_2$  = mean of the second sample.

$N_1$  = number of the sample in the first sample.

$N_2$  = number of the sample in the second sample.

## Chapter IV

### ANALYSIS AND INTERPRETATION OF DATA

This part of any research is main body to calculate the result from collected data. The collected data without analysis and interpretation there were no value in any research. So collected data should be reduced in simplified form and change it into any one can understandable by once looking. The main aims of this topic were to analyzed data by statistical tools and provide the conclusion. This study “Effect of constructivism on achievement of students in mathematics” is an experimental study. In this study involves pretest and protest result of the control group design.

Since the objectives of the study is to determined the achievement level of student who were taught by constructivist learning method. Also compare the mean achievement score of the student taught by constructivist method and traditional method. So the quantitative data were collected before and after the experiment. They were tabulated and analyzed by mean, SD, and one tailed t-test for differentiate the means.

The data of the achievement score were analyzed under the following headings. Pretest and posttest score of students in constructivist class. The score of posttest and pretest was compare with their level by description. Compare the mean achievement score of control group and experimental group from posttest data. Comparison of mean achievement score of experimental and control groups from posttest.

**The level of students who were taught by constructivism**

In this research, researcher studied the two groups. One was experimental and other was control group. For this topic he only studies the level of student who were taught by constructivist approach. To determine the level of student researcher both pretest score and posted score was analyze by the level. For the level, researcher only categorized into three levels first one is 60% and above, second level is 45% and above and third level is 32% and above. This shows that first, second and third division marks and less than 32% they were failed. The 50 marks examination was held in both pre and posttest with parallel test paper. The pretest and posttest score of 23 students of experimental group was given in table-3

**Table – 3**

**Pretest and Posttest Score of Experimental Group**

Student	Pretest score	Percent / Level	Posttest score	Percent / Level
A	21	42 III <sup>rd</sup>	35	70I <sup>st</sup>
B	20	40 III <sup>rd</sup>	31	62I <sup>st</sup>
C	17	34 III <sup>rd</sup>	26	52II <sup>nd</sup>
D	25	50 II <sup>nd</sup>	36	72 I <sup>st</sup>
E	28	56 II <sup>nd</sup>	35	70 I <sup>st</sup>
F	27	54 II <sup>nd</sup>	38	76 I <sup>st</sup>
G	15	30failed	22	44III <sup>rd</sup>
H	16	32 III <sup>rd</sup>	28	56 II <sup>nd</sup>
I	13	26 failed	25	50 II <sup>nd</sup>
J	20	40 II <sup>nd</sup>	29	58 II <sup>nd</sup>
K	12	24 failed	18	36 III <sup>rd</sup>
L	30	60 I <sup>st</sup>	40	80 I <sup>st</sup>
M	22	44 III <sup>rd</sup>	31	62 I <sup>st</sup>
N	29	58 II <sup>nd</sup>	30	60 I <sup>st</sup>

O	19	38 III <sup>rd</sup>	32	64 I <sup>st</sup>
P	15	30 failed	21	42 III <sup>rd</sup>
Q	28	56 II <sup>nd</sup>	35	70 I <sup>st</sup>
R	17	34 III <sup>rd</sup>	25	50 II <sup>nd</sup>
S	15	30 failed	28	56 II <sup>nd</sup>
T	11	22 failed	30	60 I <sup>st</sup>
U	18	36 III <sup>rd</sup>	31	62 I <sup>st</sup>
V	24	48 II <sup>nd</sup>	24	48 II <sup>nd</sup>
W	21	42 III <sup>rd</sup>	29	58 II <sup>nd</sup>

From the above table, shows that the achievement score level of student's in experimental group. The achievement score of pretest and posttest score of experimental group was compared after the experiment. This score shows that maximum number of student increase their achievement score after experiment. For the pretest only 1 student got first division after experiment, 10 students got first division. Before experiment most of the student were got the score of third division but after experiment more student got first and second division. Pretest some of the students were failed but after experiment the posttest result shows that no one failed but 3 student gate third division.

Score of the student in pretest is very low but the score of the student after experiment or the posttest score was increased highly. The highest score in pretest was 60 and lowest score of the student was 11 but the high score in posttest score was 80 and lowest score of the student was 21. This score also shows that the students who were in experimental group their achievement score were increased. By the

students score we can say that the experiment teaching by using constructivism teaching provide the better result in area and perimeter teaching in mathematics.

### **Comparisons of the Achievement Scores of Control and Experimental Groups**

#### **From Pretest Data**

There were 23 students in the experimental groups and 28 students in control groups. The pretest score of the students of both experimental and control group was presented in APPENDIX - A and the summarized calculation of both groups on the pretest is presented in the table-4.

**Table - 4**

### **Comparisons of the Achievement Scores of Control and Experimental Groups**

#### **From Pretest Data**

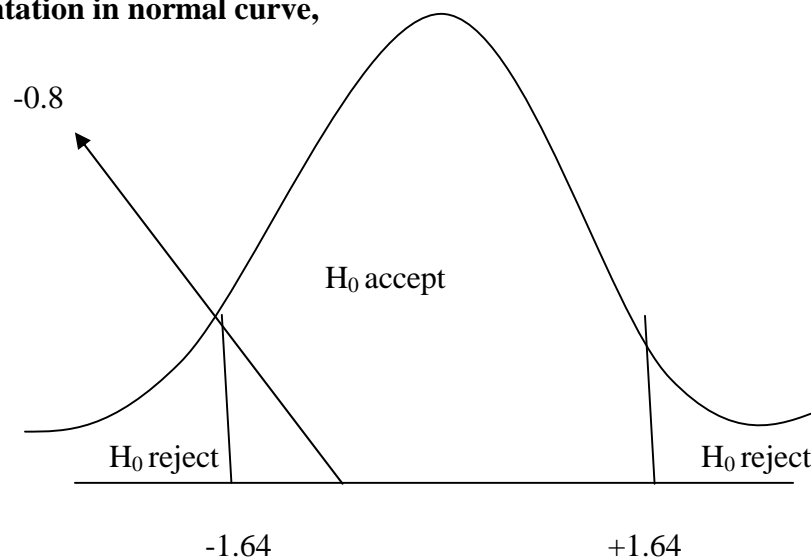
Group	No. of Students	Mean	Variance	Standard Deviation	t- value	Level of significance
E	23	20.13	38.07	6.17	-0.8	One tailed 0.05
C	28	21.46	31.36	5.60		

Tabulated value  $t_{0.05,49} = 1.64$

### Discussion based on table

The above Table- presented the mean, standard deviation and variance of both the groups, experimental and control group. In the table, both the mean scores of control group and experiment group have not any remarkable difference. In other words, the mean scores of experimental group were 20.13 and the mean score of the control group was 21.46. The standard deviation of control group was 5.60 in orders to see their initial difference existed between the two groups t-test was employed. The calculated t-value is -0.8 and the tabulated t-value was 1.64 at 5% level of significance. In other ways, the null hypothesis was not rejected. By this we conclude that the means of two groups were not found to be significant and therefore the groups were treated as equal. The t-value is rejected or accepted we decided as the following curve.

#### Representation in normal curve,



This figure shows that how we decide t- value was rejected or accepted. For this calculation tabulated value is 1.64 with 0.05 level of significance and degree of freedom 49. Calculated t- value was -0.8. The calculated value was lies between

+1.64 to -1.64. So this region accepts the null hypothesis. Then we can say that there is no significance difference between control group and experimental group.

### **Posttest Comparison between Achievement of experimental and Control Group**

There were 23 students in the experimental groups and 28 students in control groups. The pretest score of the students of both experimental and control group were presented in APPENDIX -A and the summarized calculation of both groups on the pretest is presented in the table.

**Table - 5**

### **Posttest Comparisons between Achievement of experimental and Control Group**

Group	No. of Student	Mean	Variance	Standard Deviation	t- value	Level of significance
E	23	29.52.	29.38	5.42	2.47	Two- tailed 0.05
C	28	23	38.07	6.17		

Tabulated value  $t_{0.05,49} = 1.96$

### **Discussion based on table**

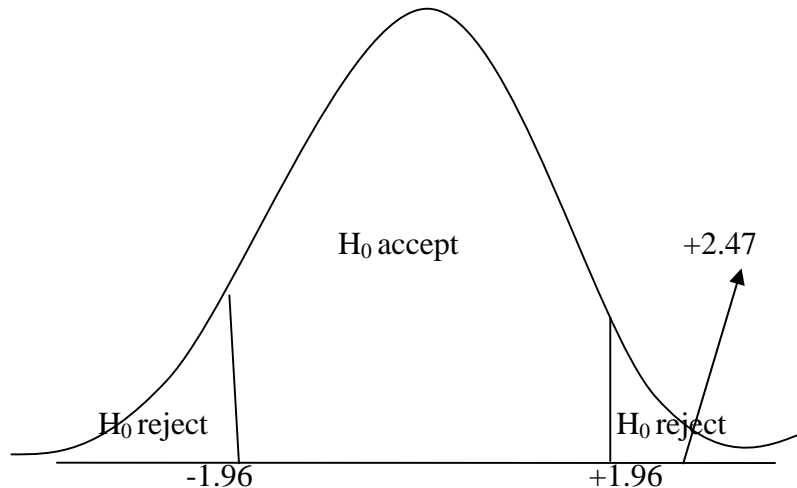
The above Table-5 presented the mean, standard deviation and variance of both the groups, experimental and control group. In the table, both the mean score of experiment and control groups were different. In other words, the mean scores of experimental group was 29.52 and the mean score of the control group was 23. The standard deviation of control group was 6.17 and experimental group was 5.42 in



orders to see initial difference existed between the two groups t-test was employed.

The t- value and hypothesis was decided by the following figure.

**Representation in normal curve,**



The calculated t-value is + 2.47 and the tabulated t-value were 1.96 at 5% level of significance. In other ways, the null hypothesis was not accepted. This shows that the calculated t- value is grater then the tabulated value. There for the null hypothesis was rejected and alternative hypothesis was accepted. This implies that ther is significance difference between mean achievement score of experimental and control group. We also say that there is significance difference between constructivist method and conventional method. Therefore the researcher concludes that the student of experimental group is significantly benefited in the achievement score then the student of control group. It means that the constructivist method provide the better result in teaching area, volume and perimeter. Finally we can say that the constructivist method was better the conventional method.

## Chapter V

### **SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS**

After the analysis and interpretation of collected data an attempt has been made to summarize the finding and recommendation for further study. The first section of this chapter presents the summary of the research and the second section presents its finding, third section present conclusion and last section present recommendation based in finding.

#### **Summary**

This study entitled “Effect of constructivism on achievement of students in mathematics” was concerned as mathematics teaching with constructivist method for experimental group and without constructivist method for control group. So the study was intended to answer the question whether the constructivist method is effective or non constructivist method. The experimental research design was adopted to achieve the purpose of the study. The population of the study consists of the student of grade VII in Palpa district. The researcher followed the purposive sampling to select the school. By purposively researcher selected the Gramya H.S. School and Sen H.S. School.

For the study, researcher had developed modules and taught in both the control and the experimental groups of the student. The experimental group was taught by use constructivist method and the control group was taught use conventional method of teaching. At the end of teaching mathematics achievement test was taken to both group, the score obtained in the test in each group was analyzed and obtained the

finding. To obtain the objectives of the study the following statistically tools were used.

- ) Average mean, S.D., Variance were used to compare the two groups.
- ) t- Test was used to compare the two group's effectiveness of teaching methods.

### **Findings**

By the analysis of achievement score of experimental and control group, from chapter IV the following findings were drowning.

- ) The experimental group seemed to be more successful in achievement test in comparison to the control group and it was found that constructivist method of teaching was effective for the students than the conventional method of teaching,
- ) In the pretest result, mean achievement score of experimental group was almost equal to the mean achievement score of the control group. But in the posttest result, the mean achievement score of control group was less than mean achievement score of the experimental group.
- ) After this result constructivist method of teaching was effective for the students than the conventional method of teaching.
- ) There was more positive belief of the grade VIII students towards the use of constructivist method in learning mathematics by the experimental period.

## **Conclusion**

After the reach process and analysis of the achievement score of experimental and control group researcher conclude that for teaching mathematics constructivist method is was better than the students taught by use conventional method. We can say constructivist method is more effective than conventional method in teaching mathematics content Perimeter, Area and Volume. This result also shows that the constructivist method helps student to understand and consequently perform better in achievement test over conventional method. Constructivist methods also increase the student's activity towards these types of mathematic activity and also help student to motivate and apply the real situation.

By the method of conventional teaching, the student s cannot actively participate in teaching learning activity. This method only depends upon the teacher center activity, student just a listen and reproduce of what the teacher writes on the board. These types of method just as teaching not learning but the constructivist method focused on how to learn. During the study, classroom activity shows that teaching was depend upon the conventional method; they were filling lazy, passive and fill board at this time. Student's activity also so that in the constructivist class they all should be active to solve the problems interestingly and have the chance to construct the knowledge, so that it would be better if teacher use the constructivist method of teaching.

### **Recommendation for Educational Implication**

On the findings of the researcher recommended some measures for the betterment of the teaching mathematics in lower secondary level which are listed as follows.

- ) Constructivist method provides the student for self activate learning so it is useful to the students.
- ) These types of teaching should provide the idea and concept of mathematical topics.
- ) The teacher's training must be incorporate constructivism in the training program.
- ) This method provides the knowledge by inductively to the students.
- ) Mathematics teacher should be encouraging the use of constructivism in teaching learning activity.
- ) Teacher should be incorporate for the use of teaching episode
- ) Student should be encouraged to actively participating in classroom activity.

### **Recommendation for Further Research**

The result and the conclusion of this study generate some other questions, which need to be verified. Some of them are:

- ) The study of these kinds should be conducted at all level of school.
- ) Similarly, study can be carried out in private school.

- ) This study was limited in Palpa. So, similarly study should be done in other place.
- ) The study must be designed for large sample in different school.

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**Appendix- A**  
**Pre Achievement Test (Pretest) Paper**

Class; 8

FM; 50

Time; 1;30 min.

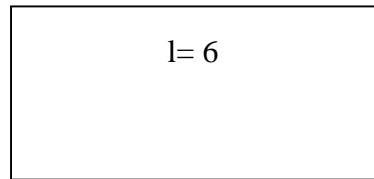
Sub; Mathematics

PM; 18

सबै प्रश्न अनिवार्य छन

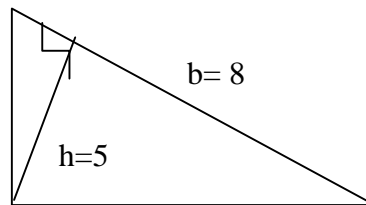
सम्रह A

क. तलको आएतको क्षेत्रफल कति हन्छ ?

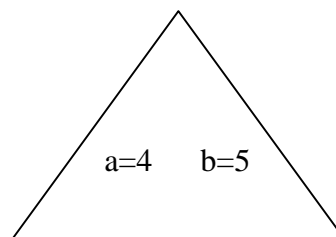


ख, माथिको चित्रको परिधि पता लगाउ ।

ग, चित्रको क्षेत्रफल पतालगाउ ।



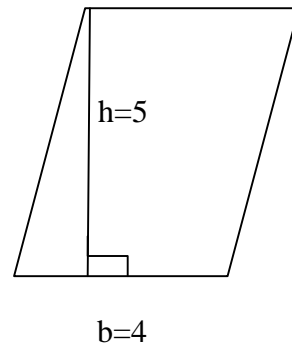
घ, चित्रमा परिधि कति हन्छ ?



ड, 4cm लम्बाइ भएको वर्गको क्षेत्रफल कति हन्छ ?

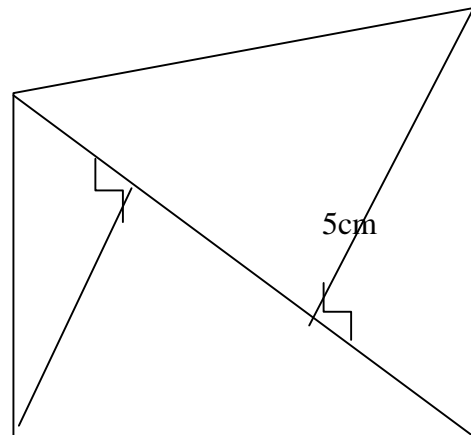
च, 8cm लम्बाइ भएको वर्गको परिधि कति हन्छ ?

छ, चित्रको क्षेत्रफल पता लगाउ ।

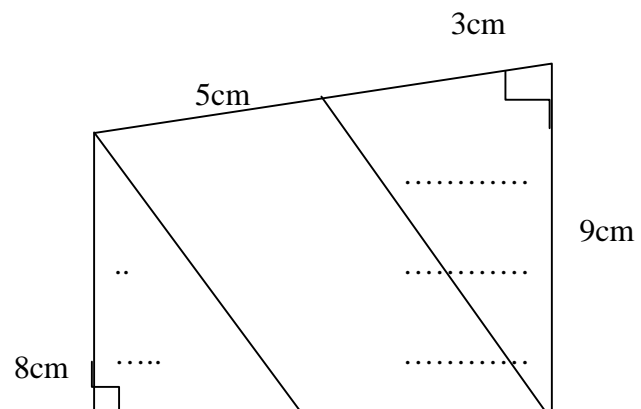


समूह B

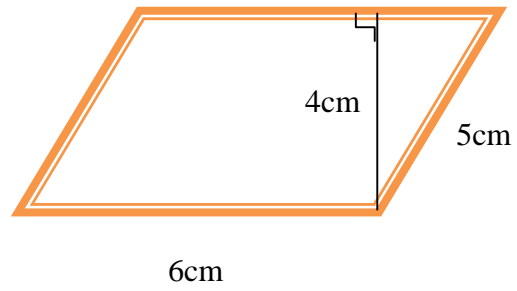
ज, तलको quadrilateral को क्षेत्रफल कति हन्छ ?



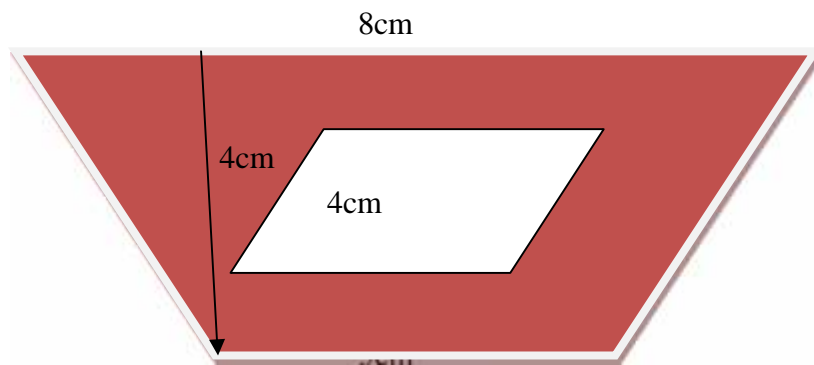
झ छथा पारिएको भागको क्षेत्रफल निकाल ।



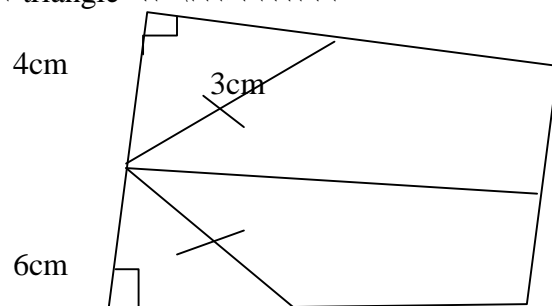
ट, चित्रको परिधि र क्षेत्रफल निकाल ।



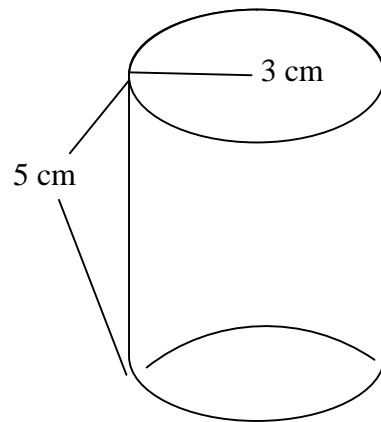
ठ, छाथा पारिएको भागको क्षेत्रफल निकाल ।



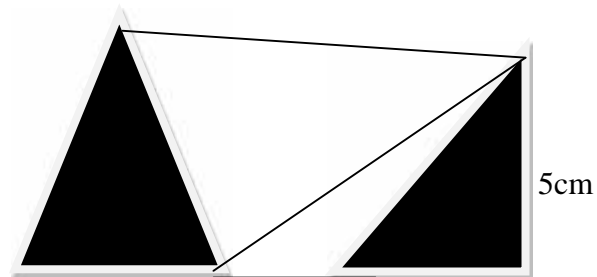
ड, चित्रका triangle को क्षेत्रफल निकाल ।



ढ, चित्रको परिधि र क्षेत्रफल निकाल ।



ण, छाया पारिएका भागको क्षेत्रफल निकाल । 9cm



त, अर्धव्यस 3cm भएको र उचाई 6cm भएको गोलाको परिधि र क्षेत्रफल निकाल ।

थ , दुई समानान्तर रेखा 3cm र 4cm भएको र उचाई 6cm भएको trapezoid को क्षेत्रफल निकाल ।

### APPENDIX- B

#### Achievement score of experimental and control groups of Pretest

Experimental Group		Control Group	
S.N.	Obtained score	S.N.	Obtained score
1	21	1	23
2	20	2	19
3	17	3	18
4	25	4	28
5	28	5	28
6	27	6	24
7	15	7	18
8	16	8	25
9	13	9	20
10	20	10	14
11	12	11	28
12	30	12	25
13	22	13	30
14	29	14	16
15	19	15	12
16	15	16	15
17	28	17	24
18	17	18	13
19	15	19	20
20	11	20	30
21	18	21	22
22	24	22	27
23	21	23	25
		24	23
		25	15
		26	28
		27	20
		28	16
N =23	$x_1 = 463$ $N = 23$ $\bar{X}_1 = 20.13$ $S.D. = 6.1657$ $Variance = 38.02$	N=28	$y_1 = 601$ $N = 28$ $\bar{Y}_1 = 21.46$ $S.D. = 5.60$ $Variance = 31.36$

## APPENDIX- C

## Post Achievement test (Posttest) Paper

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FM; 50

Time; 1;30 min.

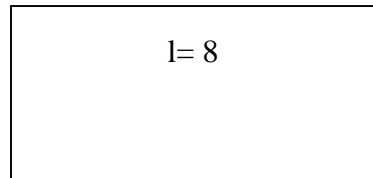
Sub; Mathematics

PM; 18

सबै प्रश्न अनिवार्य छन

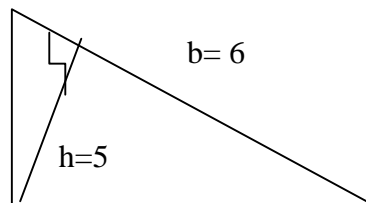
सम्रह A

क, तलको आएतको क्षेत्रफल कति हन्छ ?



ख, माथिबो चित्रबो परिधि पता लगाउ ।

ग, चित्रको क्षेत्रफल पतालगाउ ।

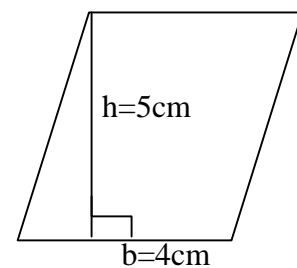


घ, त्रिभुजका तीन भुजाको लम्बाई 3cm, 4cm, 5cm भए परिधि कति हन्छ ?

ङ, 6cm लम्बाइ भएको वर्गको क्षेत्रफल कति हन्छ ?

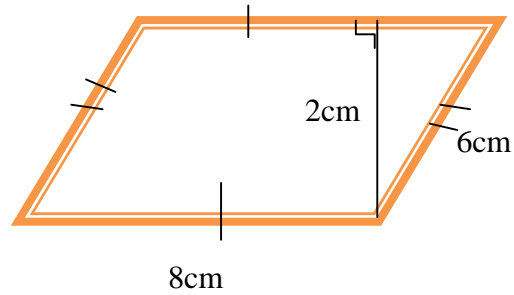
च, 7cm लम्बाइ भएको वर्गको परिधि कति हन्छ ?

छ, चित्रको क्षेत्रफल पतालगाउ ।

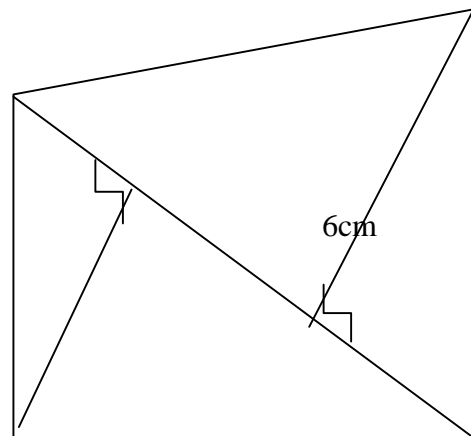


सम्रह B

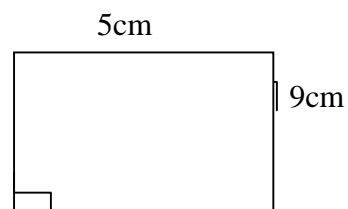
च, चित्रको परिधि र क्षेत्रफल निकाल ।



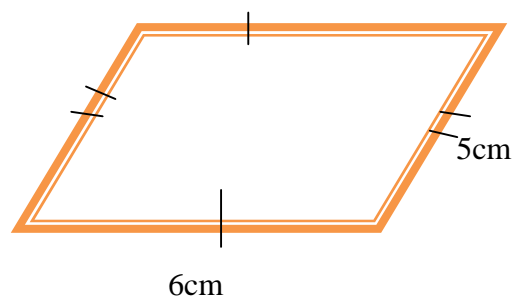
छ, तलको quadrilater को क्षेत्रफल कति हन्छ ?



झ चित्रको क्षेत्रफल निकाल ।



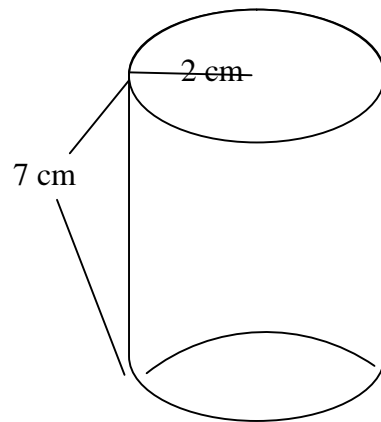
ट, चित्रको परिधि निकाल ।



ठ, लम्बाइ 3CM र 4CM चौडाई भएको चतुरभुजको क्षेत्रफल निकाल ।

ड, समानान्तर चर्तभुजका लम्बाइ र चौडाइ 6CM , 5CM भए क्षेत्रफल कतिहोला ?

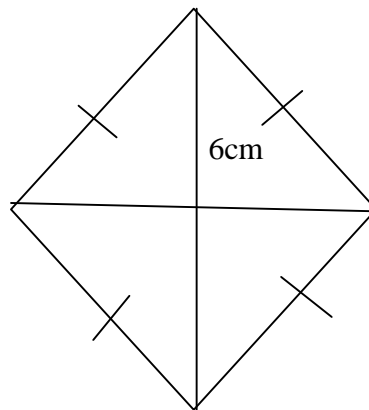
ढ, चित्रमा चित्रको पुरासतहको क्षेत्रफल कति हुन्छ ?



ण, समलम्ब चर्तुभुजका समानान्तर भुजा 8CM र 5CM र उचाई 4CM भए क्षेत्रफल कतिहोला ?

त, भुजा 3CM बराबर भएको त्रिभुजको क्षेत्रफल र परिधि कतिहुन्छ ?

थ, चित्रको क्षेत्रफल कतिहुन्छ ?





### APPENDIX- D

#### Achievement Score of Experimental and Control group of Posttest

Experimental Group		Control Group	
S.N.	Obtained score	S.N.	Obtained score
1	35	1	32
2	31	2	25
3	26	3	24
4	36	4	30
5	35	5	35
6	38	6	27
7	22	7	15
8	28	8	18
9	25	9	12
10	29	10	21
11	18	11	14
12	40	12	28
13	31	13	25
14	30	14	30
15	32	15	26
16	21	16	15
17	35	17	25
18	25	18	20
19	28	19	22
20	30	20	25
21	31	21	27
22	24	22	20
23	29	23	19
		24	16
		25	26
		26	21
		27	13
		28	19
	$x_2 = 679$ $N = 23$ $\bar{X}_2 = 29.52$ $S.D. = 5.42$ Variance = 29.38		$y_2 = 644$ $N = 28$ $\bar{Y}_2 = 23$ $S.D. = 6.17$ Variance = 38.07



**APPENDIX-F****Statistical formula used for data analysis**

$$R_{tt} = 1 - \frac{Dd^2}{Ds^2}$$

$$t X \frac{\overline{x_1} \overline{Zx_2}}{\sqrt{\frac{s_1^2}{N_1} \Gamma \frac{s_2^2}{N_2}}}$$

with  $n_1 + n_2 - 2$  degree of freedom

### Teaching episode -1

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

Topic : triangle

**Objectives;** Students will be able to;

- To identify the area of triangle.
- To identify the perimeter of the triangle.

#### Introduction

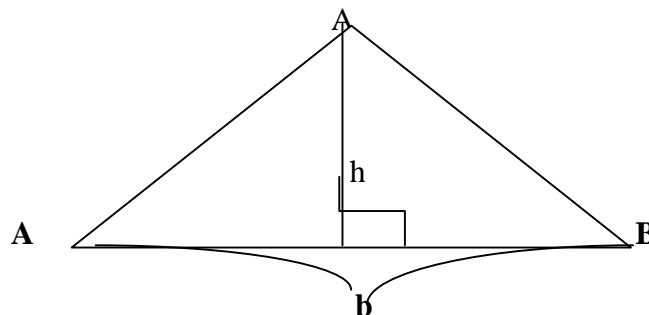
First of all teacher make ready about the topics by asking some question

- Do you know about area of the triangle?
- What is the idea of getting area of all types of triangles?
- Do you know about types of triangle?
- Do you know about the perimeter of the triangle?

By such questions and discussion student will be ready to learn and they will be interested for learning more.

#### Exploration

Problem I: what is the area of triangle in given figure?



- Motivate the student to sear the idea.

- Help them to manage the finding process.
- Say if  $h = 5$  and  $b = 4$  then what is the area of this triangle.

Ask about the idea and try to find the result them self and after doing student then solve the teacher himself in the blackboard

Given  $h = 5\text{cm}$  and  $b = 4\text{cm}$  then

Area of triangle =  $\frac{1}{2}$  (base  $\times$  height)

or  $A = \frac{1}{2} (4 \times 5)$

or  $A = \frac{1}{2} \times 20$

$\therefore A = 10\text{cm}^2$

By this process student provide the cleared concept for area of triangle.

Problem II; if triangle ABC has the side  $AB = 3\text{cm}$ ,  $BC = 4\text{cm}$  and  $CA = 5\text{cm}$  then what is the perimeter of the triangle?

First student will be encourage to find the perimeter them self.

- Discuss the answer between students.
- Then after teacher solved the problem as follows;

Given sides are

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

$$BC = 4\text{cm}$$

$$CA = 5\text{cm}$$

Then perimeter of the triangle is =  $AB + BC + CA$

$$P = 3\text{cm} + 4\text{cm} + 5\text{cm}$$

$$P = 12\text{cm}$$

For all the activities on this are and perimeter of the triangle are done as above.

### Reflection

Area of the triangle with given height is find by using the formula

$$= \frac{1}{2} (\text{base} \times \text{height})$$

Area of all triangle with given all side is find by the formula =  $\frac{s(s-a)(s-b)(s-c)}{4}$

Perimeter of the triangle is found by the sum of the sides of the triangle.

### Teaching episode-2

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

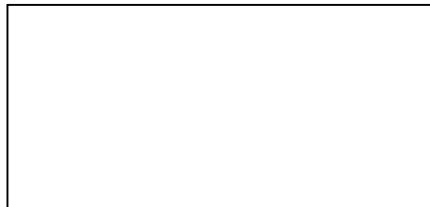
Topic : area and perimeter of rectangle

**Objectives;** Students will be able to;

- To find the area of rectangle.
- To find the perimeter of the rectangle.

**Introduction;**

- Ask about the rectangle and discuss about the finding area of the rectangle.



- Ask how we find the area of rectangle?
- Do you know about the perimeter of the rectangle?

**Exploration;**

- First provide the idea of generalized process of area of rectangle,


- For this figure we can say that the area is equal to the number of the box.
- So for this student encourage the count of this entire box.
- And say the total number of box equaled to the area of this figure.
- Also say the count all the box in outside.
- In the is way generalized the formula of the area of the rectangle as follows

No. of box in length side = 4 cm

No. of box in breadth = 3 cm

Then the area of rectangle =  $l \times b$

$$= 4 \times 3$$

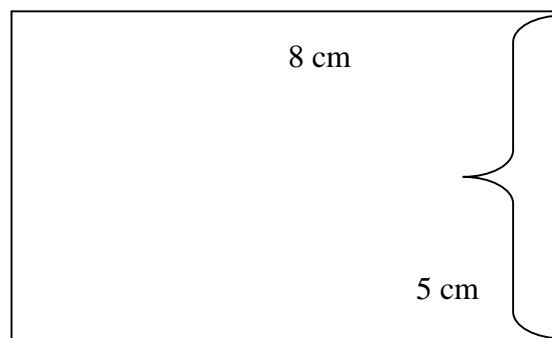
=  $12 \text{ cm}^2$  (which is equal to the number of box in figure)

The perimeter of the rectangle is =  $2(l + b)$

$$= 2(4 + 3)$$

$$= 14(\text{which is equal to the side's box.})$$

More discuss about this process and encourage the student to find the area and perimeter. Problem (I) find the area and perimeter of the rectangle given below by the above process,





To solve this problems make student self activate to find the result and finally teacher himself calculates the result.

**Reflection;**

For all the activities in rectangle to find the area and perimeter we use the flowing formula.

- Area of rectangle =  $l \times b$
- Perimeter of the rectangle =  $2 ( l + b )$

### Teaching episode-3

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

Topic : area and perimeter square and parallelogram

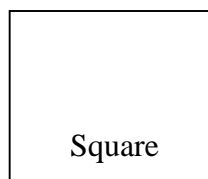
**Objectives;** Student will be able;

- To find the area of square and parallelograms.
- To find the perimeter of the square and parallelogram.

#### **Introduction;**

Square and parallelogram are the type of rectangle. We find the area and perimeter of this rectangle by different method.

- First ask the question what is square and rectangle and prepare them for their shape and discuss about their area and perimeter.
- Draw the figure in board for remaining the shape,



- Ask the question how we find the area and perimeter of this figure?

#### **Exploration;**

- First of all discuss about the side of the square and memorized the formula of rectangle.
- Ask student what is the formula for finding the area of rectangle

Then write the formula of rectangle to find area =  $l \times b$

- And say L and B are equal in square. Since all the sides of square are equal.

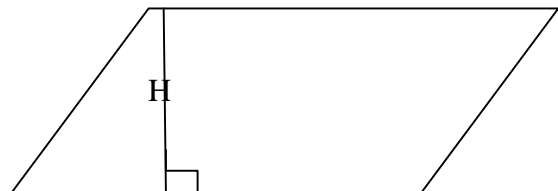
$$\begin{aligned} \text{So we can write } B &= L \text{ then we write } = l \times l \\ &= l^2 \end{aligned}$$

- Also for the perimeter of the square first discuss about the perimeter of any figure.
- Perimeter is the sum of all the sides.
- So square has four sides with equal length then we can write  $P = 4l$
- From the above process we decide the formula then we find the area and perimeter of the square by use this formula.

For exercise if square has length 5cm then how many area and perimeter covered it?

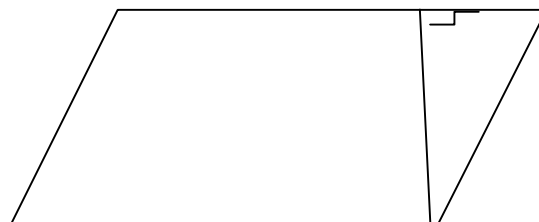
### For parallelogram

- Discuss about the parallelogram.
- Present the figure as below



- Discuss about the sides.
- Then area of the parallelogram can be written as  $A = b \times h$
- And also we can write the perimeter of the parallelogram  
 $P = 2 (\text{sum of the adjacent sides})$
- For further activity we can use this formula to find the area and perimeter.

For exercise, find the area and perimeter of the following figure?



For finding the value of this problem encourages the student to solve themselves and finally teacher solves the problem and provides the accurate concept of the area and perimeter of the figure.

**Reflection;**

For finding the area and perimeter of square and parallelogram we can use the following formula.

- To find the area of square  $A = l^2$
- Formula for perimeter of the square  $P = 4l$
- Area of parallelogram  $A = b \times h$
- Perimeter of the parallelogram  $P = 2 ( \text{sum of the adjacent side} )$

### Teaching episode-4

Subject : Compulsory Mathematics

Date : .....

Unit : mensuration

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

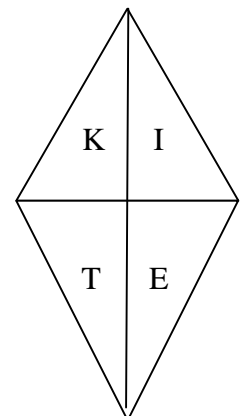
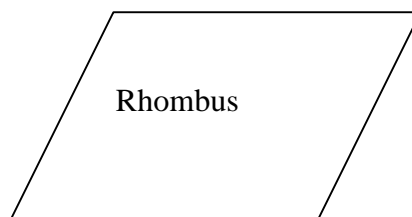
Topic : area and perimeter of rhombus and kite

**Objectives;** Student will be able;

- To identify the area of rhombus and kite.
- To find the perimeter of rhombus and kite.

**Introduction;**

- Ask the student about rhombus and kite. Then for real concept draw the figure in board. After drawing the figure say about their sides and diagonals.

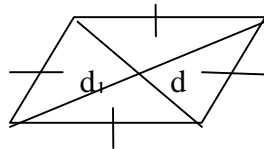


- Ask about the area of the rhombus and kite?
- Discussion about the area of both.
- Ask what the perimeter of the rhombus is and kite?
- Do you know about it?

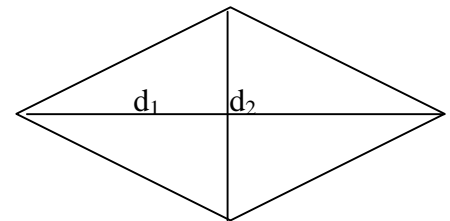
**Exploration;**

For finding the area and perimeter of the rhombus and kite, follow the following process.

Problem; find the area and perimeter of the given figure?



(I)



(II)

In figure first  $d_1 = 3\text{cm}$  and  $d_2 = 4\text{cm}$  and in figure second  $d_1 = 9\text{cm}$  and  $d_2 = 4\text{cm}$

- From the above figure, first decide which is kite and which is rhombus.
- Discuss between the students and decide kite and rhombus.
- After that ask to student what is the formula for finding the area and perimeter of the kite?
- Provide some minutes to remember the formula or the idea.
- Then with the help of the student calculate the value as below;

$$\text{The area of rhombus } A = \frac{1}{2} (d_1 \times d_2)$$

$$A = \frac{1}{2} (3 \times 4)$$

$$A = 6 \text{ cm}^2$$

- For finding the perimeter of the Rhombus is the sum of the sides.
- For the area of the kite we have to find as,

$$A = \frac{1}{2} (d_1 \times d_2)$$

$$A = \frac{1}{2} (9 \times 4)$$

$$A = 18 \text{ cm}^2$$

- For perimeter of the kite is also the sum of the sides.

**Reflection;**

For finding the area of rhombus and kite we use same formula for both which is

$$A = \frac{1}{2} (d_1 \times d_2)$$

### Teaching episode-5

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

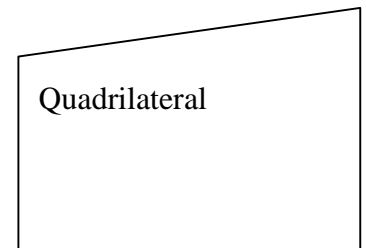
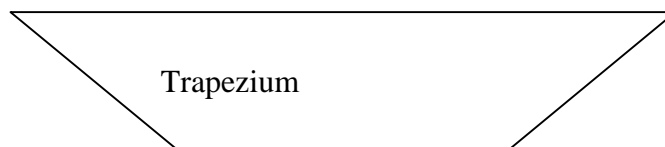
Topic : area and perimeter of trapezium and quadrilateral

**Objectives;** Student will be able

- To identify the area of trapezium and quadrilateral.
- To identify the perimeter of trapezium and quadrilateral.

**Introduction;**

- Ask question about the trapezium and quadrilateral and discuss them.
- Then for the concept of quadrilateral and trapezoid teacher draw the figure in the board.



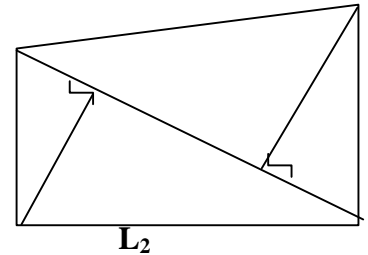
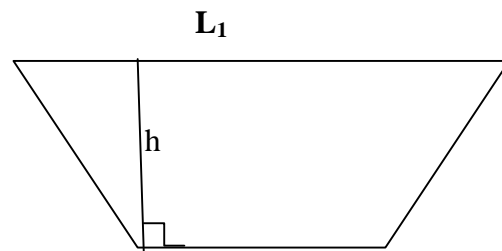
- Discuss about their sides and relation between them.
- Do you know about the trapezoid?
- Ask question how we find the area of the trapezoid and quadrilateral.
- Can you give me the idea of finding area and perimeter?

**Exploration;**

First provide the problem then discuss about them.

- Find the area and perimeter of the following figure?





Where  $l_1 = 7\text{cm}$  and  $l_2 = 4\text{cm}$  also  $h = 3\text{cm}$

$P_1 = 5\text{cm}$  and  $P_2 = 6\text{cm}$

Then  $d = 10\text{cm}$

- Try to find the area of the figure.
- Student and teacher both discuss about the finding process of area.
- Introduce student about the perimeter which shows that the sum of the sides of any figure.
- Encourage the student to find the area of the figure them self.
- Then after teacher activate the student and by discussion find the area of the figure as below,

For area of the trapezoid  $A = \frac{1}{2} (l_1 + l_2) \times h$

$$A = \frac{1}{2} (7 + 4) \times 3$$

$$A = 16.5 \text{ cm}^2$$

- Also for the area of the trapezoid

$$A = d (p_1 + p_2)$$

$$A = 10 (5 + 6)$$

$$A = 110\text{cm}^2$$

By this process student can find the area of the trapezoid and quadrilateral for any types of question. This process helps student to find the area them self.

**Reflection**

The area of the trapezoid and quadrilateral is finding by the following formula

$$\text{(Trapezoid)} \quad A = \frac{1}{2} (l_1 + l_2) \times h$$

$$\text{(Quadrilateral)} \quad A = d (p_1 + p_2)$$

**Episode- 6**

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

Topic : area of cylinder

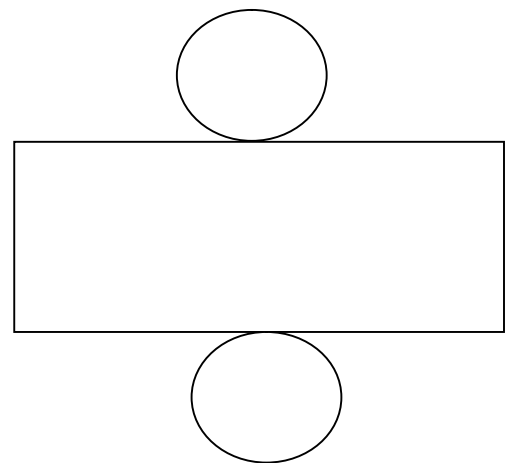
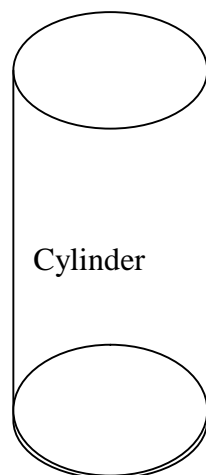
**Objectives;** Student will be able;

- To find the area of cylinder.

**Introduction;**

First of all teacher make student mentally prepare for the study and ask some question for exercise of yesterday. For starting new topic teacher check

- The student they have previous knowledge of this topic.
- If they have knowledge, discuss about the cylinder.
- Ask question do you know about the cylinder and what is cylinder?
- Then show the figure of this as below,

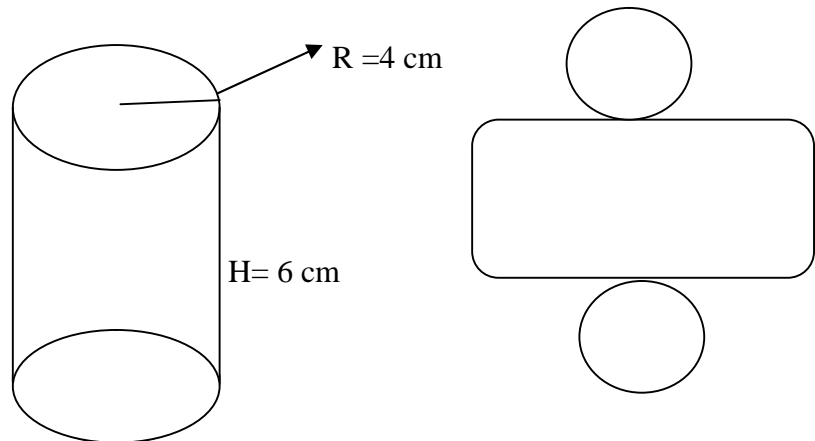


- Do you know about the area of cylinder?

- How we find the area of the cylinder?

**Exploration;**

Ask student how we find the area of the cylinder if it has radius 4 and height 6?



Where  $r = 4$  and  $h = 6$

- For finding the area of the cylinder we have to participate as above where two circles with area  $r^2$  and the area of the remaining  $2rh$ .
- This participation helps student to clear concept about the area of the cylinder.
- By this participation we can say the area of the cylinder is

$$A = \text{area of rectangle} + 2 \times \text{area of the circle}$$

- By this formula student incorporate the student to find the area of the cylinder.
- Then after activating the student teacher also help as follows,

$$A = 2rh. + 2r^2$$

$$A = 2 \times 3.14 \times 4 \times 6 + 2 \times 3.14 \times 4 \times 4$$

$$A =$$

In this way student can find the result of the cylinder.

**Reflection;**

For finding the area of the cylinder we can use the formula

$$A = 2 \pi r h + 2 \pi r^2$$

**Episode – 7**

Subject : Compulsory Mathematics

Date : .....

Unit : menstruation

Class : 8

Name of School : Shree Gramya H.S. School

Time : 45 / 45 two period

Topic : area and perimeter of circle

**Objectives; students will be able,**

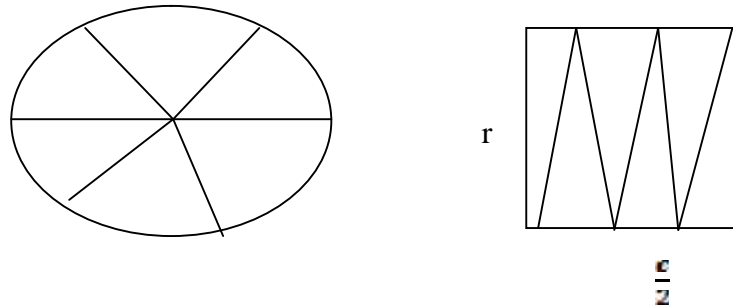
- To find the area of circle.
- To find the perimeter of circle.

**Introduction**

First teacher start to discuss about the topic with the related previous knowledge like

- What is circle?
- Can you say about radius, diameter and circumference of the circle?
- How we find the area of circle?
- Did you calculate area of circle before?
- Can you find perimeter of the circle?

By discussion of such question teacher make impress them how to calculate area and perimeter of the circle. And provide some example and give idea from the area of rectangle. Then the perimeter of the circle is to find the relation by the circumference of the circle and their diameters. To provide the idea teacher provide the picture of circle and cut them as in the figure and then join as also in the figure as the rectangle.



### Exploration

For the development of the students learning teacher will be provide some example and solve by the help of the students and every steps of the problem will be discuss between the students and encourage to solve the problem them solves.

For the solving related problem teacher provide such examples like as,

If the radius of the circle is 7cm then finds it's area and perimeter

At first radius of the circle = 5cm

$$\text{Area of the circle } A = r^2$$

$$A = 7^2$$

Where  $\frac{22}{7} =$

$$A = \frac{22}{7} \times 7^2$$

$$A = 154 \text{ cm}^2$$

Than the perimeter of the circle is

$$P = 2 r$$

$$P = 2 \times \frac{22}{7} \times 7$$

$$P = 44\text{cm}$$

Provide clear idea of this problem and make them easy to solve other problem.

### Reflection;

For finding the area and perimeter of the circle we can use the formula

$$\text{Area } A = r^2$$

$$\text{Perimeter } P = 2 r$$