

Chapter-I

INTRODUCTION

Background of the Study

The nature is controlled by man because he is the best among the all creations. Since, he always thinks how to control over the nature for the betterment of his life and to continue it. Mathematics can be taken as the backbone of all civilization. It has led to the development of the various subjects, vocation science and technology. It is an exact science which plays a vital role in various way of life.

Mathematics is created by the mind of man and is therefore, primarily concerned with ideas, process and reasoning. It was developed with abstraction, logical reasoning from counting measurement, calculation and study of the shapes and motion of physical object. It has continuously developed and improved with changing need of contemporary society. The beginning of mathematics was advanced with ancient period of human civilization. With the advancement of science and technology, the need of advanced mathematical concept and skill and their application have been demanded. Mathematics has recently achieved a new status and became more general. It is applicable to every aspect of individual life. Today, mathematics is used throughout the world on many fields including science, engineering, medicine, economics, etc. So, it is now widely studied because of its usefulness. Its introduction became broader and more inclusive than in the past.

Mathematics and mathematics education are quite different discipline although they have many things in common, for example their origin and development .Among them mathematics education mainly deals with teaching learning process. Teaching and learning are very complex interrelated process which has not been precisely specified. To avoid frustration and disillusionment, it is important to realize that there is

no teacher education program, teacher or book can teach how to teach mold on outstanding teacher. Discussion on the trend of mathematics education is complex matter. It is difficult to teach perfectly on each aspects of mathematics education. In the history of humanity mathematics first appeared as a set of practice. The reflection on mathematics emerged later, but long before, the reflection on teaching mathematics required practical basis for its development and such a basis arose with the evolution of more advanced form of society.

To reach in the present situation of mathematics education, it crossed various stages. The most important point for the development of mathematics education can be seen with the work of Jean Piaget. He gave a new impetus to mathematics to mathematics education by changing the previous epistemological empiricism and rationalism by introducing the world. “ action is prime source of knowledge” Dell Kappan challenged the Cartesian Philosophy that knowledge is viewed as a set of universal “truth” with the set of working hypothesis.

Constructivism

The constructivism refers to the idea that learners construct knowledge by themselves. Each learner individually constructs meaning as he/she learns. Constructivism is a theory of knowing and theory about coming to know. It emphasis, the importance of the learner’s active engagement during learning processes. In constructivism, the learner constructs his/her own understanding of each mathematical concept rather than passively receive knowledge from the teacher. According to this theory, learning is an active process in which learner constructs new ideas or concepts based upon his/her current or previous knowledge.

It is generally acknowledged that the constructivism constructs knowledge themselves, although often contested, practical and theoretical. In 20th century Piaget

and Dewey developed theories of childhood development and learning in education that led to the evolution of constructivism.

Jean Piaget (1896-1980) was perhaps the best-known constructivist. He provided the basis of the psychological theory of cognitive constructivism. He believed that humans learn through the construction of logical structure after another. He claims that knowledge arises as a result of construction between what is already known and what is new to learner. For him, learning is accumulation, adaptation and assimilation of knowledge. He emphasized self initiated and self- directed activities. He argues that learning is dependent on exploration, discovery and first hand experience and child ability to construct individual level. Piaget theory greatly emphasize on the personal or individual constructivism.

Vygotsky (1896-1934) is a great psychologist, who contributed much on the constructivist theory. He emphasizes the cognitive ability of the learner and claims that the children construct the mathematical concept through. Active use of memorized facts. He believed that all higher cognitive processes develop out of social-interaction. He introduced the social aspects of learning into constructivism. His theory regards social interaction between peers and adults and important aspect in creating meaning, making sense and convening within the shared context.

John Dewey (1859-1952) is often referred father of constructivist pedagogy. "Learning by doing" is a good phrase to summarize Dewey's theories. In which learner actively is seen as crucial. The central issues in Dewey's writing are that students should draw on their background knowledge to find meaningful information in larger authentic materials and the role ascribed to the social contest in which the learning occurs.

Upadhyay (2001) “ In constructivism , the role of teacher changes from talking and describing to listening and asking question to the students” he further states , “ Constructivist theory points that students make sense of the world by synthesizing new experiences into what they have previously understood.” They formed rules through reflection on their interaction with objects, idea or relationship that does not make sense to them, they either interpret what they see to conform to their rules or to better account for the information.

Statement of the Problem

Mathematics is a technical subject and considered as a difficult subject. The successful learning depends upon the teaching procedure or method of teaching that can motivate the learners in the learning process through active participation doing things themselves.

Mathematics teaching is difficult, challenging and exciting profession. In order to become an efficient and effective teacher, it is necessary to understand the relationship among the mathematics content and various teaching strategies for presenting mathematics lesson. Almost all national base line survey of school education in Nepal indicates the poor achievement in mathematics. Considering low achievement, in mathematics constructivist method can be a hope for betterment in Nepal.

Most of the teaching learning strategies are founded to be authoritative and autocratic. Different student have different need, interest, attitude and aptitude about mathematics. In this case, it is too vague to choose appropriate method according to student need, interest level and subject matter. Most of the teaching techniques applied in the classroom are based on teacher centered that make student make passive and push them into the rote learner. Most of the teacher still is applying the

traditional method. In this situation we need to bring radical change in teaching learning mathematics. Constructivism seems to be a powerful source for an alternative to traditional method. According to constructivist learning is the result of mental construction. It leads us to think critically and imaginatively about the teaching learning process. To improve the current teaching learning situation we need to apply constructivist approach in classroom.

Therefore, the focus of the study was to identify the answer of the following question:

- Is the achievement level of students differing in using constructivist approach and traditional approach?
- What sort of reflection does student have about constructivist method?

Objective of the Study

The Objectives of the study were

- To analyze the effects of constructivism on mathematics achievement of the students.
- To analyze the reflection of students towards constructivist approach in learning mathematics.

Hypothesis of the Study

- **Research Hypothesis**

There is a significance difference between the achievements scores in mathematics of Grade V students exposed to constructivist method and traditional method.

- **Statistical Hypothesis**

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

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

where H_0 and H_1 are null and alternative hypothesis and μ_1 and μ_2 are mean scores of the students taught by using constructivist method and traditional method respectively.

Limitation of the Study

The study was limited to the following aspects:

- The study was conducted with the experimental design.
- The study was limited in a sample of Grade V students of D.A.V. School, Jawalakhel, Lalitpur.
- Experimental period of the study was 30 days.
- The study was covered only the units “Angles and Triangle” of “Geometry” of the entire mathematics curriculum of Primary curriculum in Grade V.

Significance of the Study

Mathematics is widely used in every field of social sciences and other sciences. It is more applicable to every aspect of individual life, social work, economic, politics, etc. Without the knowledge of mathematics, many other subjects cannot be developing beyond a descriptive level. However the situation of mathematics in Nepal is still very miserable in every aspect. Most of the courses are not practical; they are traditional and completely based on theory. There are many approaches to improve teaching. Look for different ways to engage individual students, develop rich environments for exploration and prepare coherent problem sets and challenges that focus the model building effort, elicit and communicate student’s perception and interpretation and so on. Although many teaching methods are developed we are still following the traditional method of teaching to improve the current situation in mathematics field, we need to add more focus in teaching methods in classroom.

Although, there has been done some significant studies on constructivism since past few years, how constructivism is applied in the classroom is still unknown to the most of the students and teachers in Nepal. So, this study aims to describe constructivism and to determine its impact in mathematics classroom. I hope it would bring some change in teaching mathematics and both students and teachers will be benefited.

Definitions of the Terms

Constructivist method

Constructivist method is a modern teaching method where teacher's role changes from talking and describing to listening and asking question to the students. The students play a vital role in the construction of new knowledge.

Traditional Method

In this study, the traditional method mainly refers to the lecture method. In this method, the teacher plays the vital role in the classroom and the students remain silent while teaching. The teacher encourages the students to have rote memorization.

Student Achievement

Student achievement in this study is defined in terms of scores obtained by the students on a mathematics test constructed by researcher.

Experimental Group

The group that is taught by the researcher using constructivist method of teaching is called "Experimental Group."

Control Group

The group that is taught by the researcher using the traditional method of the teaching is termed "Control Group".

Chapter- II

REVIEW OF RELATED LITERATURE

This chapter reviews the different views of educators and their research findings in order to explain the basis and explore the trends of research in this field.

Basnet (2004) did an experimental research on “The effects of constructivism in achievement of grade V students in mathematics” on “Four fundamental operations”. The aim of research was to find out if there exists any relationship between achievement scores. So, constructivist method of teaching was better than the traditional method of teaching mathematics at primary level.

Pokhrel (2004) did research on “Effectiveness of teaching mathematics with and without the use of constructivism” with the objective to measure and test difference in the achievement scores of students of the experimental and control group. In order to fulfill the objective of the study the researcher selected 56 students of grade VI from “Raipur Secondary school, Raipur, Tanahun for experiment. After completion of experiment, an achievement test was administered on both the group and then mean scored were calculated. The difference in mean achievement score were tested using t-test for determine statistical difference between them. The t-test at 0.05 level of significance show that the constructivist method teaching was found to be better than the conventional method.

Adhikari (2005) did a research entitled “Effects of constructivism in teaching mathematics at primary level”. The study was experimental nature. The main objective of the research was to see the effect of constructivism on students’ achievement score on mathematics. She took 42 students from two public schools of Tanahun district Nepal. The researcher prepared achievement test paper for both experimental and control group. The researcher concluded that the constructivist

method of teaching mathematics increases the achievement of students in mathematics.

Regmi (2006) did an experimental research on “The effect of constructivist method on student’s achievements in mathematics classroom”. The research was to find out the difference in achievements score of the students taught by constructivist method was greater than the student taught by using conventional method.

Raikhola (2007) carried out a study entitled “Effects of constructivist approach in teaching mathematics at lower secondary level in Darchula district”. His main objective was to identify the effect of constructivist approach is positive or negative while teaching mathematics. He sample on 60 students of two different lower secondary school of Darchula district. He found that the constructivist method became more effective than conventional method of teaching.

Dahal (2008) did a study on “Use of constructivism in mathematics classroom at lower secondary level”. This was qualitative research as well as descriptive in nature. He took 26 individual as sample. The main tool of this study was classroom observation form and interview. The collected information was analyzed by observing the school and SLC. Result of past four years. The researcher concluded that the steps of constructivism were followed except organizing and evaluation in both schools.

Basnet (2014) did his research on “The effects of constructivism on the achievement of grade IV students in Math’s” the researcher selected the pre-test and post-test, non equivalent group design. Two groups experimental and control groups were taught by using constructivist and traditional method teaching respectively in the topic “Four fundamental operation of number”. After the result the research concluded that the constructivist method is more effective than the traditional method of teaching in mathematics at primary level.

Pandey (2016) did an experimental research on “Effectiveness of Teaching Mathematics with and without the use of constructivism”. The researcher intended to determine effectiveness of the constructivist method compared to the conventional method of mathematics teaching based on to measure and test the difference in the achievement score of students of the experimental and control groups collaborate the constructivism as a better method in teaching mathematics classroom. He selected the grade VII students of Narayani Higher Secondary School and Chitwan Secondary school as a experimental and control group. He found that constructivist method was better than that of conventional method in teaching of fraction and decimal.

Review of the Theoretical Literature

The topic focused on the discussion of the theory and ideas that are stood as the base to develop the steps and concepts of using constructivism method in teaching and learning. At this section overall deals about how the established theory is tested in constructivism method. Constructivism learning theory mainly consists of theory of psychological constructivism and theory of social constructivism. But the social constructivist theory of Vygotsky’s (Russian psychologist and philosopher) is applied in research. This theory emphasizes on the effects of cultural social condition in learning. According to this theory, the learner constructs his/her knowledge through the interaction with social environment.

The term social constructivism originated in sociology and philosophy that comes from two sources (Restivo). Social constructivism focused on questions. How to account the nature of mathematical knowledge as socially construct? How to give a social constructivist account of the individual’s learning and construction of mathematics? (Ernst, 1991).

Vygotsky (1978) states that cognitive growth occurs first on a social level and then it can occur within the individual. To make sense of others and construct knowledge on such a social level allow learner to relate themselves to circumstances.

Roth (2000). Roth also states that roots of individual' knowledge are found in their interaction with their surrounding and other people before their knowledge is internalized.

In these study constructivist methods of teaching based on Vygotsky's social constructivist perspective, because knowledge is actively constructed by students while they are making construction and analyzing figure instead of knowledge being passively received and accepted. The zone of proximal development (ZPD), in the learning of Angle and Triangle, the more skilled students were able to assist their peers with information and manner of constructing diagram and more capable students were able to fill in gaps in their peers, knowledge or explanation they have missed. In addition, when working in a group due to the different ZPD of each student, they may have different views: therefore through interaction with peers they can achieve share understanding. In such a situation, there must be a balance in terms of the insights and ideas contributed by each group member. It is important to have shared views and justification of opinion to reach mutual understanding. This enables al students to participate in critical thinking skills because one's cognitive development becomes apparent when news views and ideas are taken into the current cognitive state.

A constructivist classroom may contain the following four characteristic:
 cognitive exploration to encourage inquiry and direct hands on, minds on activates:
 students autonomy where students are in charge of their own learning: social
 interaction where students work together in groups with opportunities for cognitive

conflict; and student centered where students ideas and opinion are important. In this respect, it can also be concluded that the teacher's role here is more of facilitator.

The study draws upon the constructivist theory of social interaction for cognitive development. This main principal was anchor on the zone of proximal development (ZPD) and scaffolding. Students generally have challenges in understanding mathematics concepts: therefore in this study constructivism teaching method was as a scaffold to enhance students understanding of angle and triangle.

The teacher advocated instructional intervention at the beginning of the lesson to enable the students to work in pairs on their own using the step by step guide without the teacher's assistance. The teacher role here after is more facilitator, to encourage students to actively participate in the lesson and make significant connection. This relate to Piaget's work, where he stressed the need to provide formal instruction to assists students to reach a developmental stage where they are able to accommodate and assimilate information at a given level of complexity. Social interaction between peers gave the students opportunities to guide one another and reach a level of shared understanding. Here the higher ability students play a big role in helping the lower ability students to reach their zone of proximal development. The higher ability students also benefit through the new ideas and views of their peer.

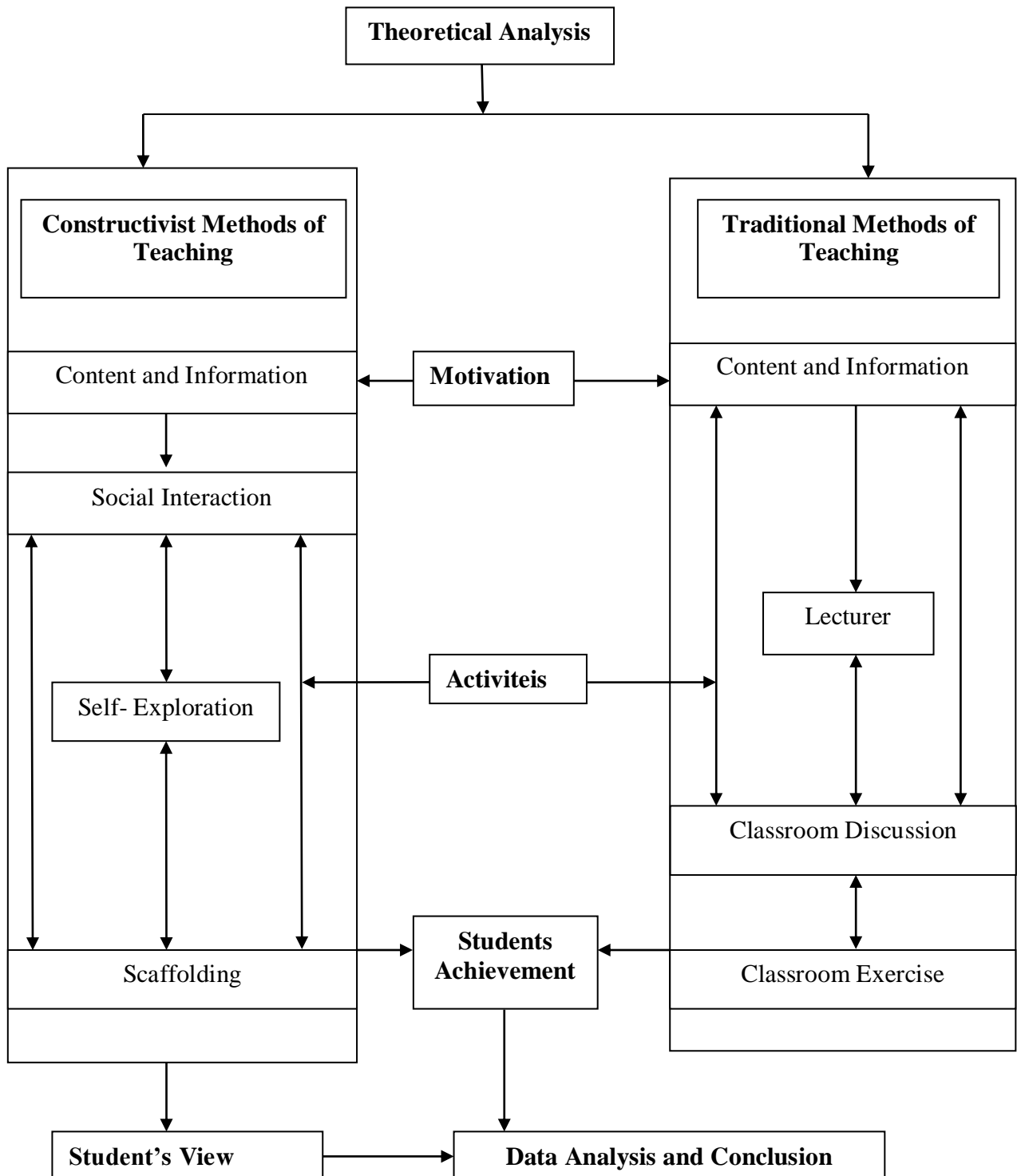
Conceptual framework of the Study

Conceptual framework provides the information about structure/content of the whole study based on the literature review. The conceptual framework stems from the theoretical framework and concentrates usually on one section of the theoretical framework which becomes the basis of the study (Kumar, 2009). Theoretical framework consist of the theories in which the study is embedded where as conceptual framework describes the way or process to conduct the actual research.

The point is not to summarize what has already been done in the field, instead it is to ground your proposed study in the relevant previous work and the reader a clear sense of your theoretical approach to the phenomena that you propose the study (Maxwell, 2005)

So far conclusion of any logical study conceptual framework has vital role while learning the concepts, facts, skills etc. related to angle and triangle. The students discover the facts by constructivist method under the guidance of researcher. Having similar types of concern for conceptual framework in my research I made the base of reviewed thesis i.e. Basnet (2004), Pokhrel (2004), Adhikari (2005), Regmi (2006), Raikhola (2007), Dahal (2008), Basnet (2014), and Pokhrel (2016) got the Vygotsky's social constructivism for conceptual framework which is presented in the following diagram.

Figure-I: Conceptual Framework of the Study



The researcher did the processes, interaction and activities daily as mentioned in above. The students of experimental group were taught constructivism method whereas control group were taught traditional method. The researcher emphasize in

the activities like interaction, self- explosion, scaffolding etc. experimental group whereas lecture, classroom discussion and classroom exercise were emphasized for control group. The two groups were analyzed differently during research. Then the experimental groups were asked about their understanding of mathematics while teaching constructivist method. The views of those students were analyzed from experimental group and the achievements of both groups have been analyzed.

This review of related literature shows that there have been done something significant researches under the constructivism. But in the context of Nepal, there is still lack of the information about how to apply the constructivism in mathematics classroom. Most of the studies have been conducted with small number of student and limited single unit in most of the studies. The student samples were taken from the different school. Which might increase the variability of the students? In addition to lack of the clarity of research often disturb the practitioners who depend on research to determine the best instructional techniques for classroom use. So purpose of the present study was to describe the constructivism and find how it impacts in mathematics classroom.

Chapter- III

METHODS AND PROCEDURE

This study entitled “Effectiveness of Constructivism in Mathematics Learning” is an experimental in nature. This is intended to examine how constructivism impact in mathematics classroom. Researcher collects the quantitative data and qualitative data to fulfill the objective of the study.

In this chapter, design of the study, sample and population of the study, variable of the study, data collection tools, item analysis, reliability and validity, data collection procedure and data analysis are presented detail.

Design of the Study

The researcher used the Pre-test, Post-test and quasi experimental design of the study.

The design of the study as follow:

Table-1

Group	Pre-test	Treatment	Post-test
Experimental	T ₁	Constructivist method	T ₂
Control	T ₃	Traditional method	T ₄

where, T₁, T₃= Pre-test was given to the student of the experimental and control group respectively.

T₂, T₄=Post-test was given to the student of experimental and control group respectively.

The design of the study consists of two groups, one is experimental group and other is control group. Before selecting the experimental and control T₂ group, researcher was visit the resource person and analysis the First Summative Examination(S.A.1) result of the year 2015/16 of both group at Grade V and these two groups would

assume to have homogeneity in variance with respect to abilities in mathematics.

Before treatment, these two groups have taken achievement test T_1 and T_3 . In this design, the experimental group taught by constructivist method and the control group taught by traditional method of teaching. Finally both groups have taken achievement test T_2 and T_4 .

Population and Sample of the Study

All the students enroll in class of Private Boarding School at Lalitpur district are population of the study. Among them, researcher was selecting the only one of the school "D.A.V. Sushil Kedia Vishwa Bharti Higher Secondary School". The selection of the school is primarily purposive in nature with respect of the distance so that the researcher went to school every day.

After selecting the school, the researcher found the number of students of Grade V of the school. According to the school register, there were 28 students in section-A and 28 students in section-E. Section-A was selected for experimental group and section-E was selected for control group by tossing the coin represents as the sample of the study.

Variable of the Study

Different variable can affect the validity of the research activity. So, it is very important to find out the effect of other variables besides experimental variable like teacher, subject matter, teaching aids, school environment etc. which may directly influence the achievement? Some variables were control by special procedures and other variable such as history, maturation, testing effects and statistical mortality control through the design of the study. These variables are described below:

Independent Variables

In this study, the independent variable was method of instruction/strategies used in classroom instruction in accordance with the characteristic of constructivism.

Dependent Variable

The dependent variable of this study was learning outcomes i.e. achievement scores of students in mathematics.

Non-experimental Variables

There were some non experimental variables besides independent variables. The following non experimental variables (teacher variables, subject matter, teaching aids, length of experiment action, evaluation applied, student and school environment) was controlled in order to minimize the effect on dependent variables.

Control Exercise in the Experiment

Some non experimental variables were controlled by the following ways:

Teacher variables

Researcher himself taught both experimental and control groups. Duration of the time and units were same, which control certain extraneous variables such as teacher's behavior, teacher's ability, emotion and activities.

Subject matter

Some content taught both the experimental and control groups from the same curriculum. Same textbook prescribed by "United Publication Nepal".

Teaching aids

The instructional materials were prepared by the investigator also provide to control group students with a view to reduce the variation of teaching aids.

Length of the experiment

Researcher develops equal time duration to teach both experimental and control group. Time duration is 30 days in both groups by using two different teaching methods. Control group for traditional method and experimental group for constructivist method.

Evaluation item

After the end of the experiment, the same test was taken to the control and experimental group. The investigator was always alert to see student's creativity and their own way of answering the problem. The researcher himself marked the test paper. So the variation in marking of test paper was also reduced.

Data Collection Tools

To accomplish the research task within time, research tools and techniques would be necessary and appropriate for the particular work. Data collection tools depend on the research design. In this study quantitative and qualitative both types of data collection tools were used. In order to collect relative quantitative and qualitative data, the following data collection tools were used.

Mathematics Achievement Test

An achievement test was main instrument for data collection of the study. The pre-test had used to determine the achievement level of the student of both groups. The achievement test was developed by him with the pilot test (Appendix-M) and (Appendix-N). Pre- test was determining the achievement test of students in both groups. This test contains ten objective and eight subjective questions, where objective question were weight of one marks, six subjective questions were weight of two marks and two subjective questions were weight of four marks. This was determined before the experimentation process. At the end of experimental time post-

test was determined for the purpose of this study. Pre-test and post- test were based on same questions same with weight. See both pre- test and post test question in (Appendix-E)

Interview Schedule

Interview is the process of communication in which the subject or interviewee gives the needed information verbally in a face to face situation. An interviewer can be regarded as a change of views between two or more people on a topic, enabling verbal, non verbal, spoken and heard channel to be used. I had used interview schedule (open ended question) for collecting the views of the interviewee about constructivist method in learning mathematics. The question of interview was asked to the interviewee and their responses analyzed and made conclusion to analyze and effectiveness of constructivism on mathematics learning in qualitative approach. Only five students were selected from experimental group for interview. See interview questionnaire in (Appendix-L)

Sources of Data

This study based on the experimental design. In order to carry out study, the following sources of data were adopted.

Primary Source and Secondary Source

The primary source based on achievement test and interview schedule. The secondary source based on articles, previous research related for analysis data.

Item Analysis of the Data

Item analysis is the process of collecting, summarizing and using information from student's responses to assess the quality of test items. Mainly, difficulty level (Difficulty index-P) and discrimination index- D were determined to standardize test items. In the first phase of research pilot test conducted for the difficulty level of

question. In item analysis, the difficulty level (Difficulty index-P) and discrimination index-D of the test computed to check which item accept for achievement test and also to check quality of the test item of each item is accepted if its value lies between the ranges 40 to 70 whereas discrimination of each item is accepted if its value lies between the ranges 0.20 to 1.

The researcher conducted the pilot test among 28 students of grade V, Creative Academy, Kirtipur, Kathmandu. After that researcher checked the answer sheets of each students and then difficulty index-P and discrimination index- D of each items were calculated from tabulated upper 27% students and lower 27% students.

Researcher tabulated the marks of each question of eight/eight students who had attained higher and lower scores. According to norms of acceptance and rejection of items, seven items were rejected from twenty objective questions and two items were rejected from ten subjective question. The formulae used to calculate difficulty index- P and discrimination index- D for the acceptance and rejection of the items are mentioned in (Appendix-A and Appendix-B). After that, item analysis of the questions, which were going to use in pre- test and post- test.

Reliability and Validity of Tools

The reliability was an internal consistency of a test while validity was consistency with external criteria. The extent to which it gives consistent result is testing and re- testing is known as reliability (Freeman, 1965).

Reliability is the extent to which an experiment, test or any measuring procedure yields the same result on repeated trails. The tendency towards consistency in repeated measurements is its reliability. Reliability of the test was very important of this study. For this purpose, every test items were piloted and reliability was checked before it was conducted. In this study, mathematics achievement test piloted involving

twenty eight students of Creative Academy, Kirtipur, Kathmandu. The coefficient of reliability was 0.95 (Appendix-D) which indicates that the mathematics test was highly reliable.

Validity is the extent to which a measure, indicator or method of data process the quality of being sound or true as far as can be judged. Validity refers to the credibility or believability of the research. Validity of the achievement test and questionnaire was established by the help of subject teacher, expert and supervisor.

Data Collection Procedures

Data collection is an integral part of research. It is a synthetic approach to gathering information from a variety of source. This study has mainly based on the quantitative data obtained from achievement test and qualitative information obtained from interview schedule. At the beginning of data collection process I granted permission from the principal of the school and subject teacher to conduct experiment.

Then I had conducted pilot test for the difficulty level of question. In item analysis, the difficulty level (Difficulty index- P) and discrimination index- D of the test computed to check which item accept for achievement test and also to check quality of the test item. An achievement test paper was main tool of the data collection for the study. The achievement test paper I (pre- test) was administered on the students of both section of Grade-V before giving treatment (Index-F). The score of students was tabulated their mean, standard deviation and variance will be calculated by using statistic formulae (Index-G).

The experimental group taught by using constructivist method and the control group couldn't get treatment. This group taught by traditional method. The researcher

taught experimental group in the first period (9:20 a.m.-10:00 a.m.) and control group in the fourth period (11:30 a.m.-12:10 p.m.)

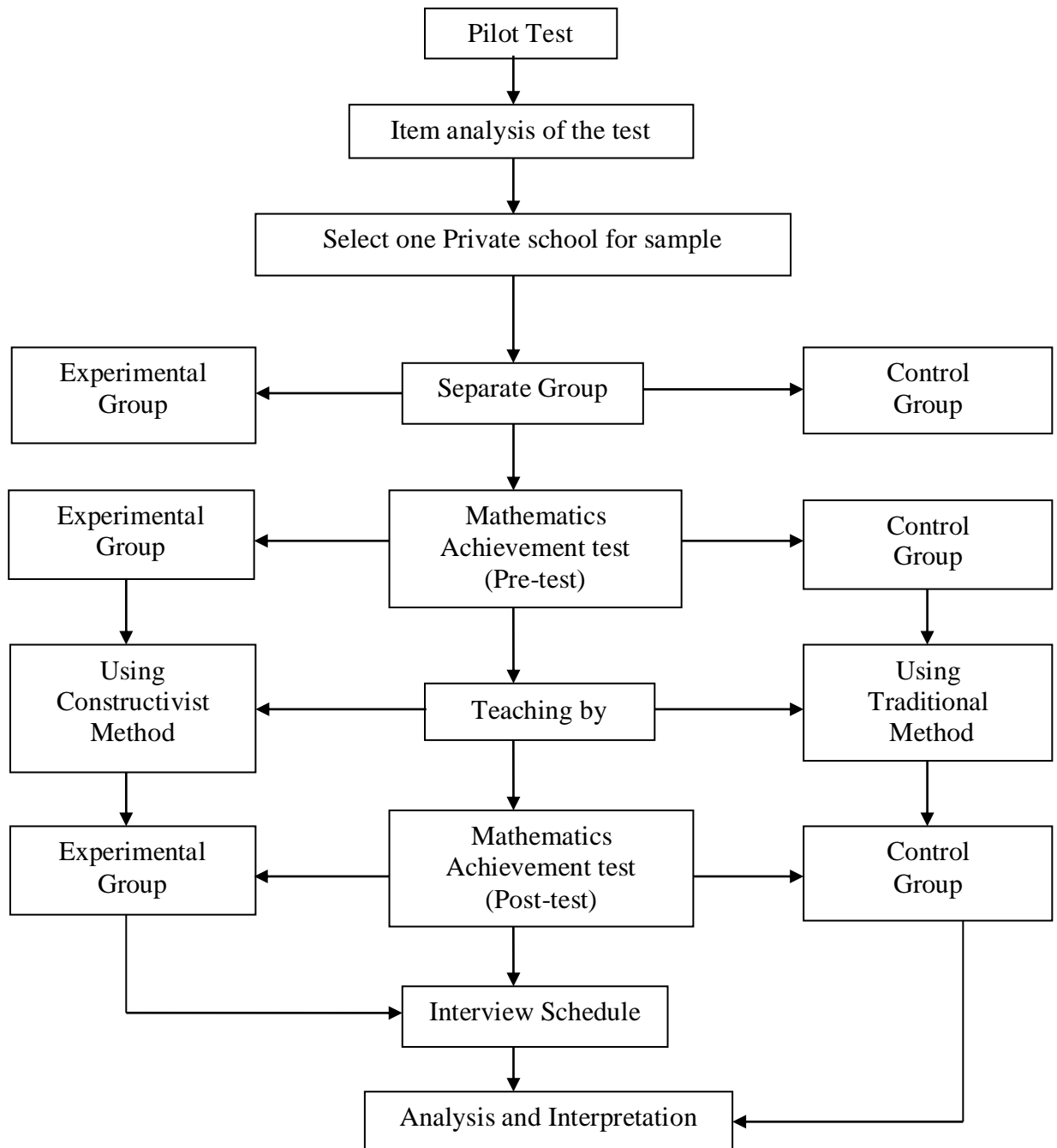
Afterwards, post-test was administered on the both group (Index-I). The post test contains same test items that use in pre-test but the serial number of each item was interchanged. The duration of the test was same as the pre-test. The answer sheets were collected and process manually by researcher himself. The score of these students was tabulate and their mean, standard deviation and variance was calculated by using statistical formulae (Index-J).

Data Analysis and Interpretation Procedures

After the collection of the data, it was necessary for organization of data so that data can be organizes by using computer. It was blue print of research. Thus, it was the next step and the top most steps with the view to arrive at the empirical solution of the stated problem. Then collection data was analyzed by using descriptive and inferential statistical models. Descriptive statistics like mean, variance and standard deviation were calculated. The both groups score in pre-test and post-test. Then, the t-test at 0.05 level of significance was use to compare pre-test result. Similarly, t- test at 0.05 level of significance was used to compare post- test result.

Finally, the data obtained from student's interview was categorized based on the different themes. Thematic analysis was applied to analyze and interpret the data. An interview was conducted to the students from experimental group. The interview was asked to them to know about effects of constructivism in Mathematics learning. The responses of the interviewee were analyzed by using qualitative approach. I interpreted the data on the theoretical outlook and conceptual framework. Interpretation involved explaining the social interaction and self- exploration into an analysis framework.

Figure II: Summary of the Data Collection Procedures



Chapter- IV

ANALYSIS AND INTERPRETATION OF DATA

The present study entitled “Effectiveness of constructivism in mathematics learning” is an experimental in nature. The achievement test was the basic tools of data collection to achieve the result for objectives. The analysis and interpretation of data is necessary to get full information.

This chapter deals the statistical analysis and interpretation of data obtained from the achievement scores of the sample students and reveals the factual output of the collected data. The data collected in the form of large amount of information are to be reduced into simplified form .These data were tabulated and analyzed using mean, variance, standard deviation and two-tailed test. Also, to analysis and interpretation about the views of students on constructivist method as an interview schedule.

Comparison of Achievement Scores of Experimental and Control Groups for Pre-test Data

Scores of the pre-test of the students of the experimental and control groups are presented in Appendix-F and the calculation of the pre-test of both the groups are represented in Table 2.

Table: 2

Group	N	Mean	variance	S.D.	t-value	Level of significance
Control	28	15.71	7.19	5.93	0.44	0.05
Experimental	28	16.42	7.44	5.8		

$$t_{0.05,56} = 1.645$$

The means, variances and standard deviations (Appendix-G) of both experimental and control groups are presented in the table 2. The means, variances

and the standard deviations of the scores in pretest of both control and experiment groups are slightly different.

In order to see whether initial difference existed between two- groups, the t- test was employed. The calculated t- value was 0.44 (Appendix-H) and tabulated t- value was 1.645 at 0.05 level of significance .The calculated t- value was less than the tabulated value and therefore there was no significance difference between the achievements of two groups. So the two groups were statistically similar. Then null hypothesis was accepted.

Comparison of Achievement Scores of Experimental Group and Control Group for Posttest Data

The post-test was administered to both experimental and control group after the treatment was given. The posttest Scores of student of experimental and control group are presented in Appendix-I and the summary of the statistical calculation for both groups in the Table 3.

Table: 3

Group	N	Mean	variance	S.D.	t-value	Level of significance
Control	28	16.42	7.25	6.39	3.16	0.05
Experimental	28	21.42	11.55	5.49		

$t_{0.05,56} = 1.645$

The scores of experimental group ranged from 5 to 29 with means score 21.42 and standard deviations 5.49 and the scores of control group ranged from 4 to 27 with mean score 16.42 and standard deviation 6.39 (Appendix-J). In order to see whether initial difference is existed between two groups, t-test was calculated at 0.05 levels of significances. On table 3, the calculated value 3.16 (Appendix-K) was greater than the critical value i.e. tabulated value 1.645 at 0.05 level of significance. Therefore, the

null hypothesis, $H_0: \mu_1 = \mu_2$ there was no significance difference between two means of experimental and control group is rejected and the alternative hypothesis $H_1: \mu_1 \neq \mu_2$ was accepted. This indicates that the students' achievement scores, who were taught by constructivist method, significantly different from that of students who were taught by traditional method of teaching. Thus, the researcher concludes that the achievement of the Grade-V students, under the constructivist method achieved better achievement than the students taught by traditional method.

Views of Students on Constructivist Method

Constructivist method is an approach used to improve child engagement, learning and independence in every activities and routines. In this research, researcher collected qualitative data as well as to fulfill the objective. It is believed that statistical tools in research work cannot support to obtained opinion of respondents. For this, the views of student's effects of constructivism through the interview schedule. Interview is a systematic ways of talking and listening to people and another way to collect data from individuals through conversation. The researcher or interviewer often uses open question. Data is collected from the interviewee. The main task in the interviewing is to understand the meaning of what the interviewees say (Kvale, 1996). So the researcher in this research used interview as the tool to understand students view an effect of constructivism in teaching mathematics at primary level in terms of social-interaction and self- exploration.

Social Interaction

A social interaction is the way of people talk and act with each other. It may include interaction in a team. It includes any relation between two or more individuals. Social interaction is a part of the means by which we do our thinking that only rarely do we take it as an object of study in itself (Bales 1954). According to

Vygotsky (1978), much important learning by the child occurs through social interaction with the skillful tutor. Vygotsky's refers to this is cooperative or collaborative dialogue. Furthermore, the researcher had asked the students that: what do you do when you can't solve a mathematical problem? Do you discuss with your friend in class about mathematical problem?

The students replied:

"I get help of my brother if I have any confusion at home. Similarly, I asked my friend and teachers for the problem at school. I like interacting with friends about mathematics."

The above mentioned students state their answer separately. One of them learns by the guidance from whom and by asking with teachers and friends. Another likes to learn from the interaction with friends in specific topics. He/she feels easy in learning through interaction. Learning through constructivism helps to make learning effective and sustainable. Thus, in social constructivism classroom students are actively involved. The environment is democratic and interaction between teacher to learning. The same question were asked to remaining students in the class whose answer were approximately same with answer of the above mentioned students which are prescribe below.

"We share knowledge skill and ideas related to mathematics with friends in group. I can understand mathematical matter sooner in this way. I feel great to guide my friends in the matter known to me. We get help of the teacher for the matter that we cannot solve the group"

"Since nobody is there to help me at home, I get help of my friends and teachers. At school regarding the confusion of geometry and angle, I love the way of learning the mathematics from my friends. Even our teacher helps for this way of learning."

Vygotsky says that the students must be encouraged in search for new knowledge and formation of concept themselves. The teacher must be the facilitator in the process of student. The students were found active in learning geometry. Bright students were helping to the weak students in learning. Most of the students were found active in learning mathematics through constructive method. Taking part in the interaction with the friends encouraging them in solving problem. If the solution hadn't got from the interaction, they had been found asking teacher for the solution at the final stage. These activities are matched with the social constructivism Vygotsky. Same question was done to the remaining students who had given different view regarding learning. Those views are presented below.

“There is nobody to guide me study at home. So I get the help of my friends and subject teachers to solve the different problem at school. In this way I get easier to go through mathematical problems to solve. My subject teacher helped me in my study in friendly way.”

As Vygotsky focused on social- interaction in learning and I also try to apply them in my classroom being myself as a facilitator which help my students to be confident in subject matter. I felt easy to make my students involved in interacting by showing them picture of geometry.

According to Vygotsky- “Social interaction plays an important role in the learning process and propose the zone of proximal development (ZPD) where learner construct the new language through socially.”

Social interaction between peers gives the students opportunities to guide one another and reach the level of share understanding. Here the higher ability students play a big role in helping the lower ability students to reach their zone of proximal development. Furthermore, the researchers had asked the students that Vygotsky also

views interaction with peers as an effective way of developing skills and strategy. He suggest that teachers use cooperative learning and exercise where less competent children develop with help from more skillful peers within the zone of proximal development.

Self Exploration

It is the process to me by investigating within me. It's me who feel happy and unhappy, successful and unsuccessful. Therefore, what is right to me it is judge to by myself only. This process is called self- exploration. According to Marriam- Webster "The examination and analysis of one's own unreleased spiritual or intellectual capacities". Social constructivism strongly influenced (Vygotsky, 1978). Work, suggests that knowledge is find constructed in a school context and used by individual. Social constructivism believed that the process of sharing individuals perspective. Social constructivist scholar views learning is an active process to learn and discover principal, concept and facts for themselves, the researcher asked geometry: Angle and Triangle are available even in school, home and surrounding your premises, have ever seen them? .

Students replied: - *yes, I had realized when I open the fingers of my hand and observe. Similarly, two adjacent sides of notebook, adjacent walls of a room, adjacent edges of a marker board, hour and minute hand of the wall clock, capital letters of English alphabet, divider and scissor etc. For triangle; uses of ten gram, set square, paper cutting in triangular shape.*

From the views of above mentioned students, we knew about the concept of angle and triangle clearly. While asking similar question to the rest of the students, most of them they feel easy to understand and concept of angle and triangle. Mostly the students were confused to measure the angle with protractor. Starting the degree

from left 0^0 or right 0^0 . For that researcher instruct the student: find the base rays and fix the vertex afterwards count the degrees of angle. Types of angle, properties of triangle with the basis of sides and angles are help to find the unknown angle of the given geometric figure.

On the basis of the views of above mentioned students, it is found that the students have good concept of angle and triangle. The knowledge of mathematical games, making different shapes by paper folding and cutting are found more interesting in learning angle and triangle. Other student learns mathematics by using textbook only. Having concern with the similar matter I requested students to observe drawing objects matched with angle and triangle available nearby house and school. I found the students more interested with the objects. I came to realize that if we can make student active in such way learning can be more effective.

According to Vygotsky's social constructivism not only like a constructivism acknowledges the uniqueness and completeness and complexity of the learner, but actually encourages, utilizes and rewards learner as an integral part of the learning process. Social constructivism encourages the learner's own version of the truth that is influenced by his/her background, culture or knowledge of the world. Social constructivism which assumes that cognitive growth first occurs on a social level and later on individual level.

Chapter- V

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter deals with whole summary, finding, conclusion and recommendation of the study. After going through the analysis and interpretation of collected data an attempt has been made for summary, conclusion and recommendation. In similar way, the recommendation was intended for further study. The purpose of this chapter is to present the result of the study precisely.

Summary of the Study

The research on “Effectiveness of constructivism in mathematics learning” is an experimental design. The objective of this study were to analyze the effectiveness of constructivism on mathematics achievement of students taught by using constructivist method and traditional method in mathematics and to analyze the reflection of students towards constructivist approach in learning mathematics. Mathematics achievement test and interview schedule were used as data collection tools.

Extraneous variable were controlled as much as possible.

For the reliability of achievement test paper pilot test was conducted on twenty eight students of Creative Academy, Kirtipur, Kathmandu. The test consisted of objective multiple choice type item and subjective short and long answer type of question on the area of angle and triangle. The reliability pilot test was 0.95 found. A pre-test and post- test design of quasi- experimental was adopted for the purpose of this study. Students of grade-V of Lalitpur district was considered as a population. The sample school was selected through the purposive method of sampling which was named as D.A.V. Sushil Kedia Vishwa Bharati Higher Secondary School, which was located on Jawalakhel, Lalitpur. According to the school register, there were 28 students in section-A and 28 students in section-E. Section-A was selected for

experimental group and section-E was selected for control group by tossing the coin represents as the sample of the study. First, students of both groups were assessed in the term of pre-test in order to find out level of the achievement in the content which was going to be taught. Then after quantitative analysis was completed for the result of pre-test. After certain treatment both groups, then post-test was administered in the same group. Then after, quantitative analysis of the result of pre-test and post test of mathematics achievement were analyzed by both descriptive and inferential statistics. An interview data were analyzed based on qualitative approach. This interview was conducted only on experimental group and result shows that students gave positive view about constructivism method of learning angle and triangle.

Findings of the study

On the basis of the data obtained from achievement test and interview, it was founded that:

- The result of pre-test showed that calculated t- value is 0.44 While tabulated t- value at 0.05 level of significant is 1.645 This implies that there was no significant difference between the mean achievement of experimental group students and that of the control group students on pre-test.
- The mean achievement of experimental group students was (21.42) higher than the control group students (16.42) on post-test.
- The result shows that students gave positive feedback or view about the constructivist method in learning angle and triangle.
- The students of experimental group were found to be more motivated and encouraging while solving mathematics problems than that of control group.

- The classroom environment was friendly, students were engaged to learning among the experimental group as compared with the students of control group.

Conclusion

In context of Nepal, it seems to be more effective to apply constructivist method of teaching mathematics rather than using traditional teaching method from school level to campus and university level. Obviously, it's certain that the result of students group taught by constructivist method is far better than students who were taught by traditional method. It is because my research on the same title angle and triangle of grade-V mathematics through experimental group and control group. It is quite clear that the analysis of post-test result indicates the experimental group teaching by using constructivist method is much more improved than traditional teaching method in the control group. Also, the result shows that students gave positive feedback of views about constructivist method in teaching angle and triangle. Moreover, students seem to concentrate in their study when taught through constructivist method and thought by students about sense of complicated mathematics subject can be minimized somehow.

Besides, it provides golden and amicable opportunity to interact between students to students and teacher to student. It's also proved through the process of self-exploration. Among the students of experimental group can easily and more conveniently compare things surrounding them after showing the figures on angle and triangle with the constructivist method.

Recommendations for Educational Implication

On the finding of the researcher recommended some measures for the betterment of the teaching mathematics in primary level, which are listed:

- The government should organize seminar, workshop etc. for making math's teacher clear about the constructivist method of teaching learning.
- The math's teacher should use constructivist method and make students involved in interaction and self-exploration.
- Curriculum designers, textbook writer should emphasize on constructivist method of teaching mathematics.
- Minister of Education (MOE) should be able to introduce the constructivist method.

Recommendations for Further Study

This study has focused on only improvement of student's achievement and positive attitude towards the constructivism method on angle and triangle lesson based on quasi- experiment design with the small sample size. Other researcher may carry out a study with in large sample in order to increase effects of constructivist method in mathematics lesson. Based on the research, the research has made following recommendation for the further study:

- It is recommended to use constructivist method in mathematics classroom covering all public and private school.
- It is recommended to such kind of research study can be done by taking other lesson and contents of mathematics from lower to higher level.
- It is recommended to analyzing the teachers view on constructivist method of teaching and learning mathematics.
- It is recommended to further studies can be done to find the ways in order to reduce the gaps relating to gender, race, competency etc. through constructivist method.

Appendix- A, (Item analysis of an Objective Question)

Q. N. S.N↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20 ^c H'
2	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	18 ^c H'
3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1		17
4	1	0	0	0	1	1	1	1	0	0	0	1	1	0	0	0	1	1	1	1	0	10 ^c L'
5	1	1	1	0	0	0	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	13
6	1	1	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	16
7	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	18 ^c H'
8	1	1	1	0	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	15
9	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	18 ^c H'
10	1	1	0	1	1	1	1	0	0	0	1	0	1	1	0	1	1	1	1	1	1	14
11	0	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	0	1	0	1		14
12	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	16
13	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0		15
14	1	0	1	0	0	1	1	0	0	1	0	1	0	0	1	0	0	1	0	0		8 ^c L'
15	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1		14
16	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1		18 ^c H'
17	0	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	16
18	1	0	0	1	1	0	1	1	1	0	0	1	1	1	1	0	1	1	0	0		12 ^c L'
19	0	0	1	1	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0		9 ^c L'
20	0	0	0	1	1	1	0	0	0	1	1	0	0	1	1	1	1	1	0	1	0	10 ^c L'
21	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19 ^c H'
22	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	19 ^c H'
23	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
24	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1		18 ^c H'
25	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0		7 ^c L'
26	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
27	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0		4 ^c L'
28	1	1	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0		7 ^c L'

Appendix-B, Difficulty index-P (Objective Question)

	Upper 27% students who	Lower 27% students who	P%	Rem
--	------------------------	------------------------	----	-----

S .N. Q. N.	have given correct response									have given correct response									arks	
	1	2	7	9	1 6	2 1	2 2	2 4	To tal	4	1 4	1 8	1 9	2 0	2 5	2 7	2 8	To tal		
1	1	1	1	1	1	0	1	0	6	1	1	1	0	0	0	0	1	4	62.5%	Accepted
2	1	1	1	1	1	1	1	1	8	0	0	0	0	0	0	0	1	1	56.52%	Accepted
3	1	1	1	1	1	1	1	1	8	0	1	0	1	0	0	0	0	2	62.25%	Accepted
4	1	0	0	0	1	1	1	1	5	0	0	1	1	1	0	0	0	3	50%	Accepted
5	1	1	1	1	1	1	1	1	8	1	0	1	0	1	0	0	1	4	75%	Rejected
6	1	1	1	1	1	1	1	1	8	1	1	0	0	1	0	0	0	3	68.75%	Accepted
7	1	1	1	1	1	1	1	1	8	1	1	1	0	0	1	1	0	5	81.25%	Rejected
8	1	1	0	1	1	1	1	1	7	1	0	1	1	0	0	0	0	3	62.5%	Accepted
9	1	1	1	1	1	1	1	1	8	0	0	1	1	0	1	0	1	4	75%	Rejected
10	1	1	1	1	1	1	1	1	8	0	1	0	1	1	0	0	0	3	68.75%	Accepted
11	1	1	1	1	1	1	1	1	8	0	0	0	1	1	1	1	0	4	75%	Rejected
12	1	1	1	1	1	1	1	1	8	1	1	1	1	0	0	0	0	4	75%	Rejected
13	1	1	1	1	1	1	1	1	8	1	0	1	1	0	1	0	1	5	81.25%	Rejected
14	1	1	1	1	0	1	0	1	6	0	0	1	0	1	0	0	0	2	50%	Accepted
15	1	1	1	1	1	1	1	1	8	0	1	1	0	1	1	1	0	5	81.25%	Rejected
16	1	0	1	1	1	1	1	1	7	0	0	0	1	1	0	0	1	3	62.5%	Accepted
17	1	1	1	1	1	1	1	0	7	1	0	1	0	1	1	0	0	4	68.75%	Accepted
18	1	1	1	0	1	1	1	1	7	1	1	1	0	0	0	1	0	4	68.75%	Accepted

																			%	
19	1	1	1	1	0	1	1	1	7	1	0	0	0	1	1	0	1	4	68.75%	Accepted
20	1	1	1	1	1	1	1	1	8	0	0	0	0	0	0	0	0	0	50%	Accepted
Total	20	18	18	18	18	19	19	19		10	8	12	9	10	7	4	7			

Index:

Very Difficult	General	Substantial	Easy	Very Easy
0 ≤ P ≤ 39	40 ≤ P ≤ 60	61 ≤ P ≤ 75	76 ≤ P ≤ 90	91 ≤ P ≤ 100

Index- C, Discrimination index- D (Objective Question)

S.N. Q.N.	Upper 27% students who have given correct response									Lower 27% students who have given correct response								D	Remarks	
	1	2	7	9	16	21	22	24	Total	4	14	18	19	20	25	27	28			Total
1	1	1	1	1	1	0	1	0	6	1	1	1	0	0	0	0	1	4	0.25	General
2	1	1	1	1	1	1	1	1	8	0	0	0	0	0	0	0	1	1	0.87	Very good
3	1	1	1	1	1	1	1	1	8	0	1	0	1	0	0	0	0	2	0.75	Very good
4	1	0	0	0	1	1	1	1	5	0	0	1	1	1	0	0	0	3	0.25	General
5	1	1	1	1	1	1	1	1	8	1	0	1	0	1	0	0	1	4	0.5	Very good
6	1	1	1	1	1	1	1	1	8	1	1	0	0	1	0	0	0	3	0.62	Very good
7	1	1	1	1	1	1	1	1	8	1	1	1	0	0	1	1	0	5	0.37	Good
8	1	1	0	1	1	1	1	1	7	1	0	1	1	0	0	0	0	3	0.5	Very Good
9	1	1	1	1	1	1	1	1	8	0	0	1	1	0	1	0	1	4	0.5	Very Good
10	1	1	1	1	1	1	1	1	8	0	1	0	1	1	0	0	0	3	0.62	Very Good
11	1	1	1	1	1	1	1	1	8	0	0	0	1	1	1	1	0	4	0.5	Very Good
12	1	1	1	1	1	1	1	1	8	1	1	1	1	0	0	0	0	4	0.5	Very Good
13	1	1	1	1	1	1	1	1	8	1	0	1	1	0	1	0	1	5	0.37	Good
14	1	1	1	1	0	1	0	1	6	0	0	1	0	1	0	0	0	2	0.5	Very Good

15	1	1	1	1	1	1	1	1	1	8	0	1	1	0	1	1	1	0	5	0. 37	Good
16	1	0	1	1	1	1	1	1	1	7	0	0	0	1	1	0	0	1	3	0. 5	Very Good
17	1	1	1	1	1	1	1	1	0	7	1	0	1	0	1	1	0	0	4	0. 37	Good
18	1	1	1	0	1	1	1	1	1	7	1	1	1	0	0	0	1	0	4	0. 37	Good
19	1	1	1	1	0	1	1	1	1	7	1	0	0	0	1	1	0	1	4	0. 37	Good
20	1	1	1	1	1	1	1	1	1	8	0	0	0	0	0	0	0	0	0	1	Very Good
To tal	2 0	1 8	1 8	1 8	1 8	1 9	1 9	1 9			1 0	8	1 2	9	1 0	7	4 7				

Index:

Negligible	General	Good	Very Good
$D \leq 0.19$	$0.20 \leq D \leq 0.29$	$0.30 \leq D \leq 0.39$	$D \geq 0.40$

Appendix-D

Computation of Reliability Coefficient

S.N.	Score on odd items(X)	Score on even items(Y)	XY	X ²	Y ²
1	28	27	756	784	729
2	23	25	575	529	625
3	26	20	520	676	400
4	24	25	600	576	625
5	21	24	506	441	576
6	55	28	1540	3032	784
7	45	52	2340	2025	2704
8	53	48	2544	2809	2304
9	100	94	9400	10000	8836
Total	∑X=375	∑Y=343	∑XY=18779	∑X²=20872	∑Y²=17583

$$\begin{aligned}
 \text{Correlation Coefficient } (R_{xy}) &= \frac{N\sum XY - \sum X\sum Y}{\sqrt{N\sum X^2 - (\sum X)^2} \cdot \sqrt{\sum Y^2 - (\sum Y)^2}} \\
 &= \frac{9 \times 18779 - 375 \times 343}{\sqrt{9 \times 20872 - (375)^2} \sqrt{9 \times 17583 - (343)^2}} \\
 &= 0.92 \\
 \text{Reliability Coefficient} &= \frac{2r_{xy}}{1+r_{xy}} \\
 &= \frac{2 \times 0.92}{1+0.92} \\
 &= 0.95
 \end{aligned}$$

Appendix-E

(Question of Pre-test and post-test)

Class:- V

F.M. - 30

Subject:- Mathematics

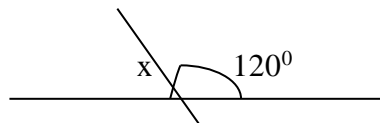
Time:- 1 hr.

Read the question carefully and tick (✓) the best answer.

Group-A

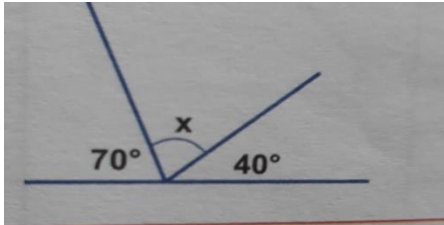
10×1=10

- How many degrees does the minute hand of a clock turn through in one hour?
 - 90°
 - 180°
 - 270°
 - 360°
- In the adjoining figure, choose the correct measures of x° .

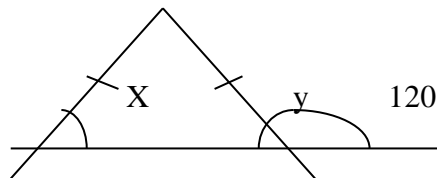


- 60°
 - 120°
 - 150°
 - 180°
- By what angle does a soldier turn when he takes an “about turn”?
 - 90°
 - 180°
 - 270°
 - 360°
 - If two complementary angles are equal what is the size of each?
 - 30°
 - 45°
 - 60°
 - 90°
 - A straight angle is equal to right angle.
 - one
 - two
 - three
 - four
 - How many parts does a triangle have?

3. If one of the acute angle of right angle triangle is 50° . Find the other angle.
4. Draw an angle of 60° with the help of protractor.
5. Find the sizes of unknown angle in the adjoining figure.



6. Find the sizes of unknown angle in the adjoining figure.



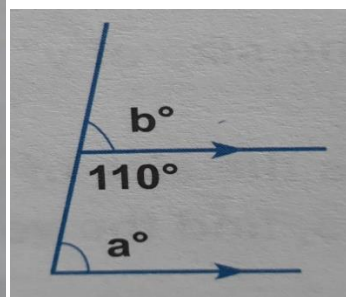
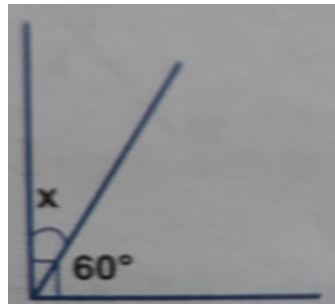
Group-C

$$4 \times 2 = 8$$

7. Write all the types of triangle with the basis of angle and sides.
8. Find the sizes of unknown angles in the following figure

a

b.



The End

Appendix-F**Score of Pre- test**

R.N.	Traditional Group	Experimental Group
1	17	15
2	19	17
3	24	18
4	27	19
5	21	18
6	15	29
7	18	24
8	17	8
9	14	17
10	7	18
11	12	13
12	3	21
13	13	2
14	12	17
15	14	15
16	9	14
17	14	3
18	19	16
19	21	12
20	21	11
21	14	13
22	14	15
23	15	17
24	9	19
25	8	21
26	17	5
27	4	5
28	19	8

Appendix- G
(Mean, Variance and Standard deviation)
Pre-Test

Mean (\bar{X})

1. Traditional Group

Marks(X)	Mid-value(x)	Frequency(f)	fx
0-10	5	4	20
10-20	15	18	270
20-30	25	6	150
Total		N=28	$\sum fx=440$

$$\begin{aligned} \text{Mean}(\bar{X}) &= \frac{\sum fx}{N} \\ &= \frac{440}{28} \\ &= 15.71 \end{aligned}$$

2. Experimental group

Marks(X)	Mid-value(x)	Frequency(f)	fx
0-10	5	3	15
10-20	15	18	270
20-30	25	7	175
Total		N=28	$\sum fx=460$

$$\begin{aligned} \text{Mean}(\bar{X}) &= \frac{\sum fx}{N} \\ &= \frac{460}{28} \\ &= 16.42 \end{aligned}$$

Variance (σ^2)**Pre test****1. Traditional group**Mean(\bar{X}) = 15.71

Marks	Mid-value(X)	Frequency(f)	(X - \bar{X})	(X - \bar{X}) ²
0-10	5	4	-10.71	114.70
10-20	15	18	-0.71	0.50
20-30	25	6	9.29	86.30
Total		N=28		$\sum(X - \bar{X})^2 = 201.5$

$$\begin{aligned} \text{Variance}(\sigma^2) &= \frac{\sum(X - \bar{X})^2}{N} \\ &= \frac{201.5}{28} \\ &= 7.19 \end{aligned}$$

2. Experimental groupMean(\bar{X}) = 16.42

Marks	Mid-value(X)	Frequency(f)	(X - \bar{X})	(X - \bar{X}) ²
0-10	5	3	-11.52	132.71
10-20	15	18	-1.42	2.01
20-30	25	7	8.58	73.61
Total		N=28		$\sum(X - \bar{X})^2 = 208.33$

$$\begin{aligned} \text{Variance}(\sigma^2) &= \frac{\sum(X - \bar{X})^2}{N} \\ &= \frac{208.33}{28} \\ &= 7.44 \end{aligned}$$

Standard deviation (σ)**Pre test****1. Traditional group**

Marks(X)	Mid-value(x)	Frequency(f)	d $= m$ $- A$	fd^2	fd
0-10	5	4	-10	400	-40
10-20	15	18	0	0	0
20-30	25	6	10	600	60
Total		N=28		$\sum fd^2=1000$	$\sum fd=20$

$$\begin{aligned}
 \text{Standard Deviation} &= \sqrt{\frac{\sum fd^2}{N} - \frac{(\sum fd)^2}{N^2}} \\
 &= \sqrt{\frac{1000}{28} - \frac{(20)^2}{(28)^2}} \\
 &= 5.93
 \end{aligned}$$

2. Experimental group

Marks(X)	Mid-value(x)	Frequency(f)	d $= m$ $- A$	fd^2	fd
0-10	5	3	-10	300	-30
10-20	15	18	0	0	0
20-30	25	7	10	700	70
Total		N=28		$\sum fd^2=1000$	$\sum fd=40$

$$\begin{aligned}
 \text{Standard Deviation} &= \sqrt{\frac{\sum fd^2}{N} - \frac{(\sum fd)^2}{N^2}} \\
 &= \sqrt{\frac{1000}{28} - \frac{(40)^2}{(28)^2}} \\
 &= 5.8
 \end{aligned}$$

Appendix-H**Pre –test****For t-test**

$$\bar{X}_1 = 15.71$$

$$\bar{X}_2 = 16.42$$

$$S_1 = 5.93$$

$$S_1^2 = 35.36$$

$$S_2 = 5.8$$

$$S_2^2 = 33.6$$

$$\text{Now, } t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$= \frac{15.71 - 16.42}{\sqrt{\frac{35.16}{28} + \frac{33.6}{28}}}$$

$$= -0.44 (= 0.44)$$

Appendix-I
Score of Post - test

R.N.	Traditional Group	Experimental Group
1	19	24
2	21	27
3	25	23
4	30	24
5	22	25
6	15	30
7	19	30
8	18	9
9	15	20
10	9	23
11	15	21
12	5	24
13	14	18
14	14	24
15	15	21
17	14	17
17	17	23
18	21	13
19	22	25
20	22	21
21	15	21
22	16	17
23	17	25
24	14	28
25	12	26
26	19	30
27	7	12
28	21	14

Appendix- J
(Mean, Variance and Standard deviation)

Post Test

Mean (\bar{X})

1. Traditional group

Marks(X)	Mid-value(x)	Frequency(f)	Fx
0-10	5	4	20
10-20	15	16	240
20-30	25	8	200
Total		N=28	$\sum fx=460$

$$\begin{aligned} \text{Mean}(\bar{X}) &= \frac{\sum fx}{N} \\ &= \frac{460}{28} \\ &= 16.42 \end{aligned}$$

2. Experimental group

Marks(X)	Mid-value(x)	Frequency(f)	Fx
0-10	5	1	5
10-20	15	8	120
20-30	25	19	475
Total		N=28	$\sum fx=600$

$$\begin{aligned} \text{Mean}(\bar{X}) &= \frac{\sum fx}{N} \\ &= \frac{600}{28} \\ &= 21.42 \end{aligned}$$

Variance (σ^2)**Post test****1. Traditional group**

$$\text{Mean}(\bar{X}) = 16.42$$

Marks	Mid-value(X)	Frequency(f)	$(X - \bar{X})$	$(X - \bar{X})^2$
0-10	5	4	-11.42	130.41
10-20	15	16	-1.42	2.01
20-30	25	8	8.58	73.63
Total		N=28		$\sum(X - \bar{X})^2 = 206.05$

$$\begin{aligned} \text{Variance}(\sigma^2) &= \frac{\sum(X - \bar{X})^2}{N} \\ &= \frac{206.05}{28} \\ &= 7.35 \end{aligned}$$

2. Experimental group

$$\text{Mean}(\bar{X}) = 21.42$$

Marks	Mid-value(X)	Frequency(f)	$(X - \bar{X})$	$(X - \bar{X})^2$
0-10	5	1	-16.42	269.61
10-20	15	8	-6.42	41.21
20-30	25	19	3.58	12.81
Total		N=28		$\sum(X - \bar{X})^2 = 323.63$

$$\begin{aligned} \text{Variance}(\sigma^2) &= \frac{\sum(X - \bar{X})^2}{N} \\ &= \frac{323.63}{28} \\ &= 11.55 \end{aligned}$$

Standard deviation (σ)**Post- test****1. Traditional group**

Marks(X)	Mid-value(x)	Frequency(f)	d $= m$ $- A$	fd^2	fd
0-10	5	4	-10	400	-40
10-20	15	16	0	0	0
20-30	25	8	10	800	80
Total		N=28		$\sum fd^2=1200$	$\sum fd=20$

$$\begin{aligned} \text{Standard Deviation} &= \sqrt{\frac{\sum fd^2}{N} - \frac{(\sum fd)^2}{N^2}} \\ &= \sqrt{\frac{1200}{28} - \frac{(20)^2}{(28)^2}} \\ &= 6.39 \end{aligned}$$

2. Experimental group

Marks(X)	Mid-value(x)	Frequency(f)	d $= m$ $- A$	fd^2	fd
0-10	5	1	-10	100	-10
10-20	15	8	0	0	0
20-30	25	19	10	1900	190
Total		N=28		$\sum fd^2=2000$	$\sum fd=180$

$$\begin{aligned} \text{Standard Deviation} &= \sqrt{\frac{\sum fd^2}{N} - \frac{(\sum fd)^2}{N^2}} \\ &= \sqrt{\frac{2000}{28} - \frac{(180)^2}{(28)^2}} \\ &= 5.49 \end{aligned}$$

Appendix-K**Post –test****For t-test**

$$\bar{X}_1 = 16.42$$

$$\bar{X}_2 = 21.42$$

$$S_1 = 6.39$$

$$S_1^2 = 40.83$$

$$S_2 = 5.49$$

$$S_2^2 = 30.14$$

$$\text{Now, } t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$= \frac{16.42 - 21.42}{\sqrt{\frac{40.83}{28} + \frac{30.14}{28}}}$$

$$= -3.16 (= 3.16)$$

Appendix-L

Interview Questionnaire:

Social-Interaction

1. What do you do when you can't solve the geometry problem?
2. Do you discussed with your friend in class about geometry problem? Describe how you feel at that moment.
3. How could teacher do to help students in math's problem?

Self-Exploration

1. Angle and triangle are available even in school and home. Have you ever searched them?
2. What figures can you make from the figures given in the lesson of angle and triangle?
3. Is it easy to understand angle and triangle after going through the related figure of it? How do you search math's related problem in internet?

Appendix-M

Objective test items for pilot test

Class:- V

F.M. - 20

Subject:- Mathematics

Time:- 20 min

Read the question carefully and tick (✓) the best answer.

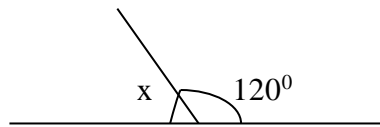
Group-A

20×1=20

1. How many degrees does the minute hand of a clock turn through in one hour?

- a. 90^0 b. 180^0 c. 270^0 d. 360^0

2. In the adjoining figure, choose the correct measures of x .



- a. 60^0 b. 120^0 c. 150^0 d. 180^0

3. The complement of an angle of 60^0 is

- a. 30^0 b. 60^0 c. 80^0 d. 90^0

4. By what angle does a soldier turn when he takes an “about turn”?

- a. 90^0 b. 180^0 c. 270^0 d. 360^0

5. Which type of angle has a measure that is smaller than a right angle?

- a. Acute b. right c. Obtuse d. Straight

6. The supplement of an angle of 100^0 is

- a. 70^0 b. 80^0 c. 90^0 d. 100^0

7. If two supplementary angles are equal what is the size of each?

- a. 60^0 b. 80^0 c. 90^0 d. 100^0

8. If two complementary angles are equal what is the size of each?

- a. 30° b. 45° c. 60° d. 90°

9. Each of the following is smaller than a straight angle, except

- a. acute angle b. right angle c. obtuse angle d. reflex angle.

10. A straight angle is equal to right angle.

- a. One b. two c. three d. four

11. 70° is an acute angle then 120° is an.....

- a. right angle b. obtuse angle c. straight angle d. reflex angle

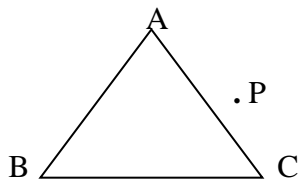
12. The triangular piece in an instrument box are called

- a. Protractor b. scale c. compass d. set-square

13. Which of the following cannot be the length of three sides of a triangle?

- a. 5cm, 6cm, 12cm b. 6cm, 7cm, 10cm c. 4cm, 5cm, 7cm d. 10cm, 11cm, 12cm

14. In the adjoining figure, the point P lies



- a. In the interior of $\triangle ABC$. b. in the exterior of $\triangle ABC$ c. on $\triangle ABC$ d. none of these

15. The angles in a right- angled isosceles triangle are

- a. 30° , 60° , 90° b. 45° , 45° , 90° c. 40° , 50° , 90° d. 40° , 40° , 100°

16. A triangle having all sides of different length is called

Appendix-N

Subjective test items for Pilot- test

Class:- V

F.M. - 30

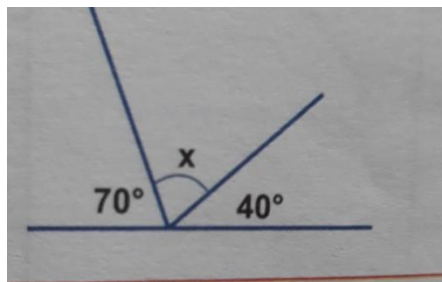
Subject:- Mathematics

Time:- 40 min

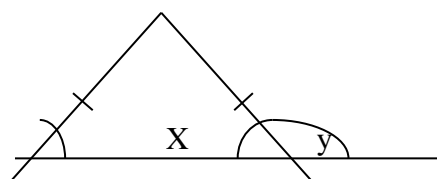
Group-B

 $9 \times 2 = 18$

1. Find the complements of 50° .
2. Find the supplements of 100° .
3. If z° and 110° is linear pair, find the size of z° .
4. If y° and 70° are pair of co-interior angle. Find the size of y° .
5. If one of the acute angle of right angle triangle is 50° . Find the other angle.
6. If a° , b° and c° are the sizes of three angles of a triangle. Find the sizes of a° , b° and c° .
7. Draw an angle of 60° with the help of protractor.
8. Find the sizes of unknown angle in the adjoining figure.



9. Find the sizes of unknown angle in the adjoining figure.



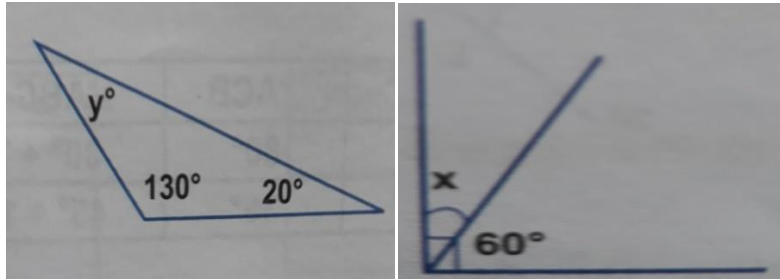
Group-C

$4 \times 3 = 12$

10. Write all the types of triangle with the basis of angle and sides.

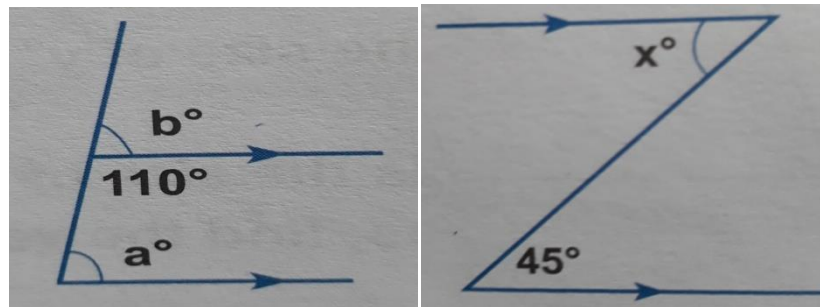
11. Find the sizes of unknown angles in the following figure.

a. b.



12. Find the sizes of unknown angles in the following figure.

a. b.



Appendix-O

(Sample of Lesson Plan)

Teaching Episode: 1

Class- V

Time- 40

min

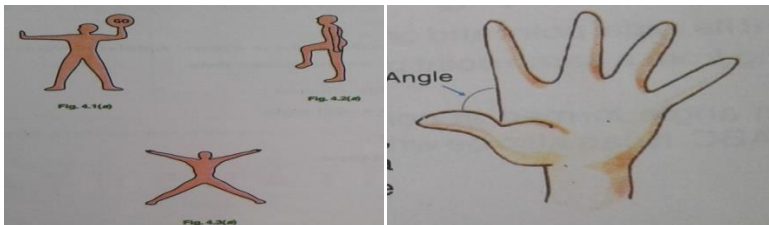
Topic: -Angle (Meaning and identification of angle -1)

Objective:

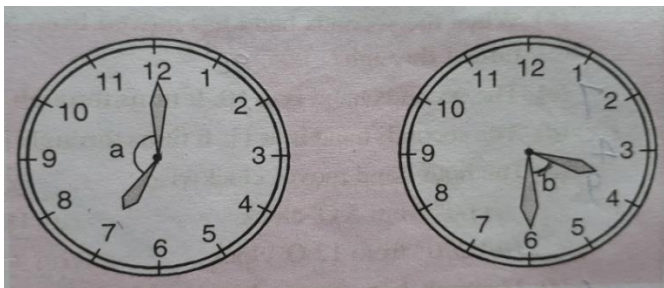
- Locate and color the given angle in a diagram.
- State the different types of angle by name and identify them.

1 Introduction Task (10 min)

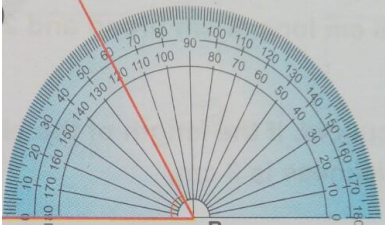
- Ask them if they know the angle.
- Ask them demonstrate different angle by using hand, finger and other flexible modei.



- Ask them to discuss about the different angle formed by clock hand.

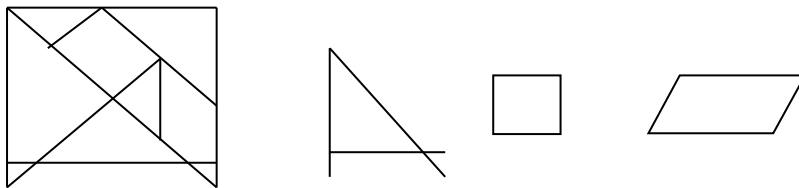


- Ask them to cite the name of the instrument to measure the angle?
- Ask what we do this instrument.

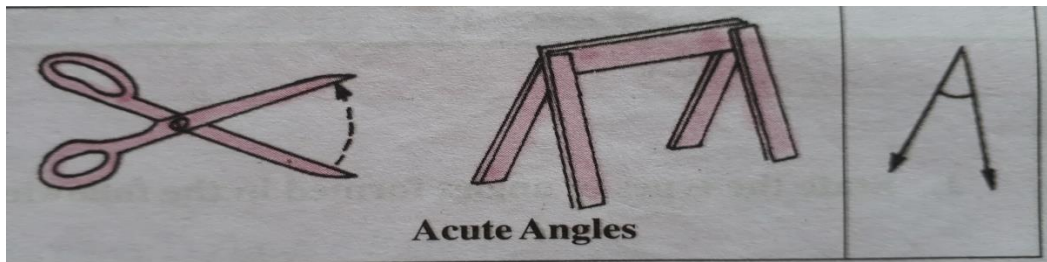


2 Exploration on their own or into groups(action) 20min

- Have them investigate where and what types of angle present in the tangram pieces.

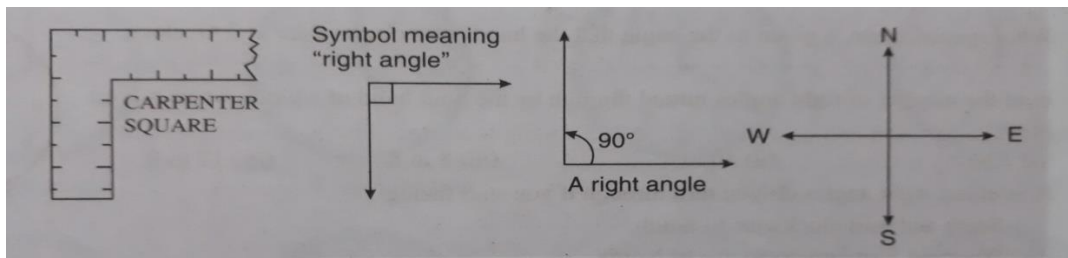


- The measure of an angle lies between 0° and 90° is called acute angle.



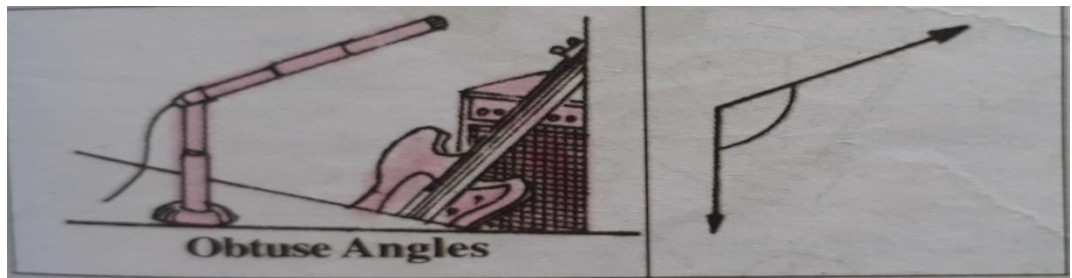
Again,

- The angle whose measure is exactly 90° is called right angle.



Similarly,

- The measure of an angle lies between 90 and 180 is called obtuse angle.



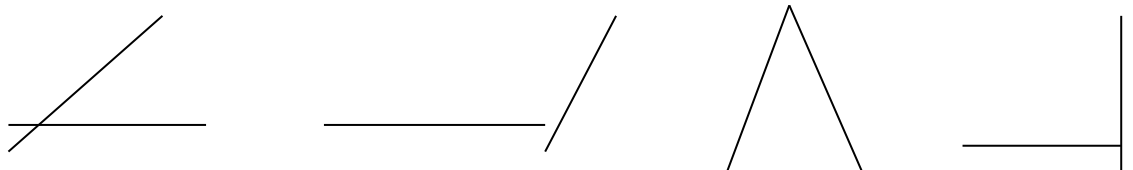
Finally,

Give them protector and ask the following question.

- By showing 20° , which angle is this?
- By showing, 75° , which angle is this?
- By showing 90° , which angle is this?
- By showing 115° , which angle is this?

Extended Task:

- By using your arm and hand make different types of angles like acute, right and obtuse angle.
- Make and compare a variety of polygons and state how the sides and angles are related.
- Some angles are given below. Let them arrange in ascending order by measurement.



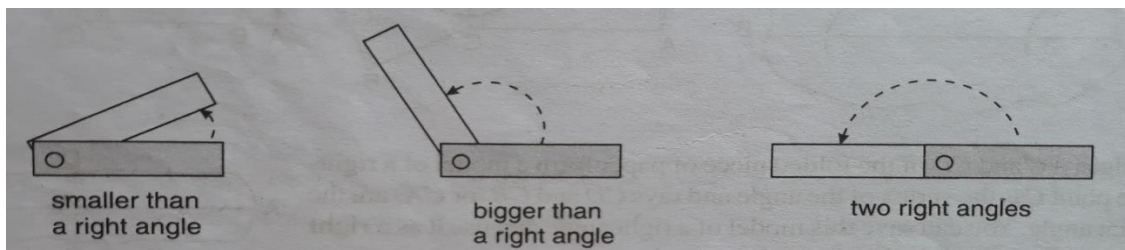
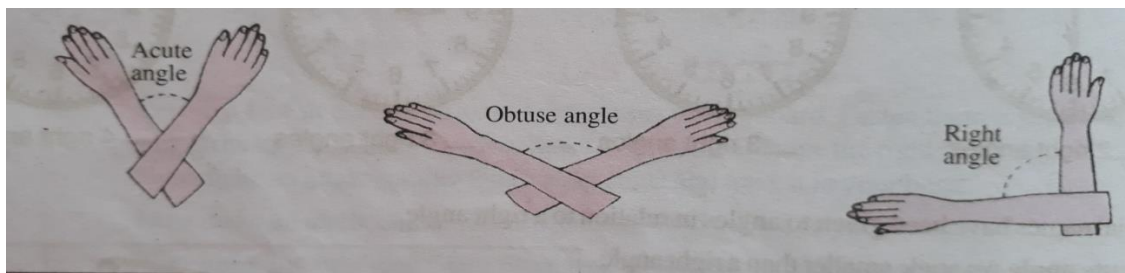
3 Summarizing (Reflection)

- More open space is greater angle than less open.

Angle:

- Lies between 0° and 90° are called acute angle.
- Exactly 90° is called right angle.
- Lies between 90° and 180° are called obtuse angle.

Figure:

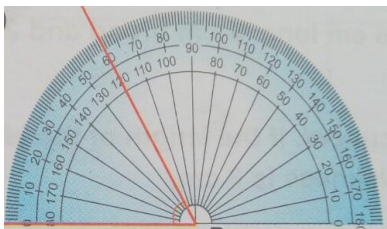


Teaching Episode: 2**Class- V****Time- 40****min****Topic: -Angle**(Meaning and identification of angle -2)**Objective:**

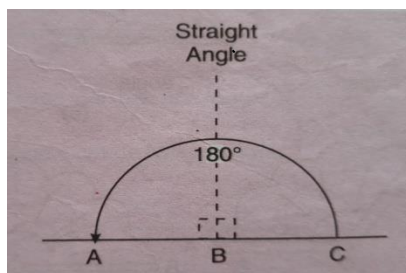
- Locate and color the given angle in a diagram.
- State the different types of angle by name and identify them.

1 Introduction Task (10 min)

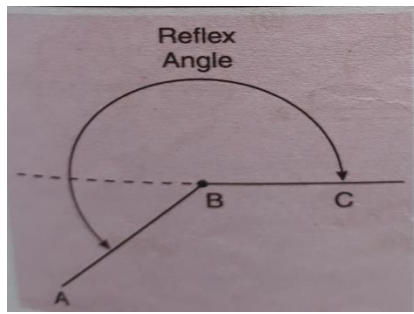
- Ask them if they know the angle.
- Ask them demonstrate different angle by using hand, finger and other flexible model.
- Ask them to discuss about the different angle formed by clock hand.
- Given an angle and ask them to color it.
- Ask them to cite the name of the instrument to measure any angle?
- Ask what we do this instrument.

**2 Exploration on their own or into groups(action) 20min**

- The angle whose measure is exactly 180° is called right angle.

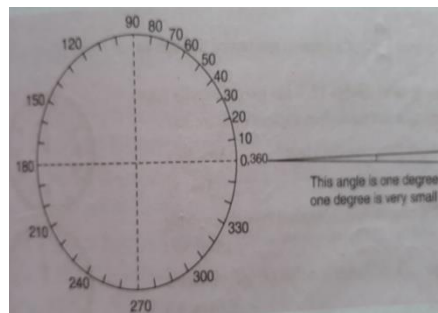


- The measure of an angle lie between 180^0 and 360^0 is called reflex angle.



Again,

- The angle whose measure is exactly 360^0 is called right angle.



Give them 2 protractor (arrange in circular form) and ask the following question.

- By showing 180^0 , which angle is this?
- By showing $200^0 (=180^0+20^0)$, which angle is this?
- By showing $315^0 (=180^0+135^0)$, which angle is this?
- By showing whole circle, which angle is this?

Extended Task:

- By using your arm and hand make different types of angles like straight angle, reflex angle and angle of complete turn.

3 Summarizing (Reflection)

Angle:

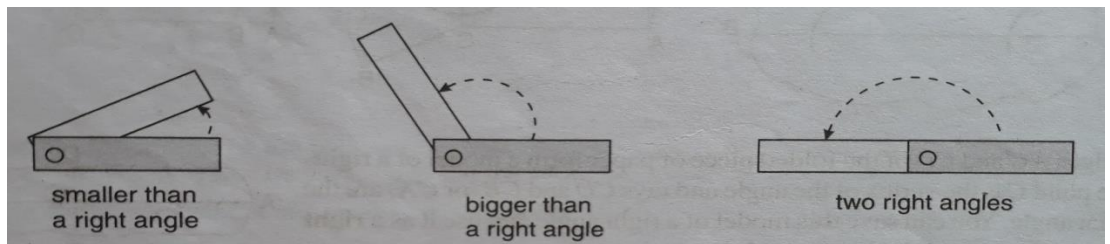
- Exactly 180° are called straight angle.
- Lies between 180° and 360° are called obtuse angle.
- Exactly 360° are called an angle of complete turn.
- Sum of two right angles is equal to straight angle.
- Sum of four right angles is equal to an angle of complete turn.
- Also, the sum of two straight angle is equal to an angle of complete turn.

Teaching Episode: 3**Class-V****Time- 40****min****Topic – Angle (Pairs of angle -1)****Objective:**

- State and identify the complementary and supplementary angle.
- To find the complementary and supplementary angle of given angle.

1 Introduction task(10 min):

- Ask them whether they know something about complementary angle, supplementary angle, adjacent angle and vertically opposite angle.
- Provide the student tangram and flexible model.
- Let them combine the model to make 90° , 180° , 360° etc.

**2 Exploration on their own or into groups(Actions)**

- Work in pair let them find the pair of angles whose sum is 60, 90, 120, 180 using tangram and flexible model.
- Given following angles and let them find out the pair of angles whose sum is 90.

$$10^\circ, 20^\circ, 30^\circ, 40^\circ, 50^\circ, 60^\circ, 80^\circ, 90^\circ$$

- Given following angles and let them find out the pair of angles whose sum is 180.

$$30^\circ, 50^\circ, 60^\circ, 70^\circ, 80^\circ, 100^\circ, 120^\circ, 150^\circ, 160^\circ$$

- Ask them to solve Ex16.3, Sec- B, and Q.N. 3. a, b, c and Q.N.4. a, b, c

Extended Task:

- Let them to draw a clock showing different in which hour, minutes and second hand makes the sum of 90° and 180° .

3 Summarizing (Reflection):

- Complementary angles:

Sum of two angles is 90° .

- Supplementary angle:

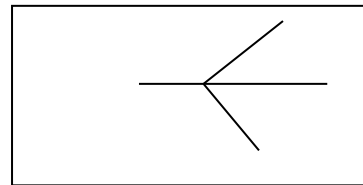
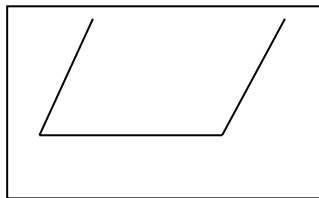
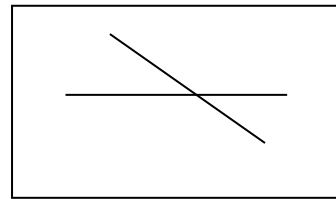
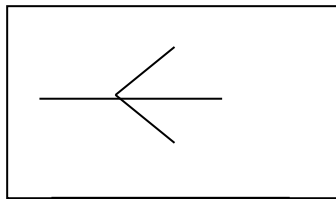
Sum of two angles is 180° .

Teaching Episode: 4**Class-V****Time- 40****min****Topic – Angle** (Pairs of angle -2)**Objective:**

- State and identify the adjacent angle and investigate its properties.
- State and identify the vertically opposite angle and investigate its properties.

1 Introduction Task(10 min):

Show the different chart papers.



- Let them investigate the common and difference among the angles made in the figures.

2 Exploration on their own or into groups(Actions)

Work in a group.

- Let them to write different angles from the given figure.
- Let them write an angle and ask to write another angle which has got common arm to the given angle.

- Let them discuss and explore why the third figure has not got common arm as well as common vertex.
- Let them copy the like figure No. 2 and ask to measure it then to write the result with their views.

Extended Task:

- Ask to collect the models/examples of scissor and other like models.
- Ask them to solve Ex16.3, Sec- B, and Q.N. 9. e, f, m, n.

3 Summarizing (Reflection)

Adjacent angle:

- Common arm
- Common vertex
- Angle on either sides of the common arm.

Vertically opposite angle:

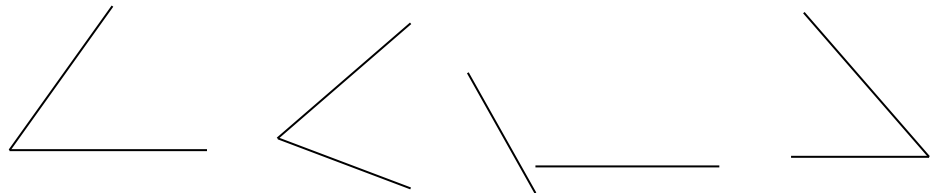
- Non adjacent.
- Always equal.

Teaching Episode: 5**Class – V****Time- 40****min****Topic - Angles (Construction of Angles)****Objective:**

- Measure the given angle by using protector.
- Construct a given angle with the help of protector.

1 Introduction task(10 min):

- Ask them to name and uses of instrument in geometrical box.
- Ask them which instrument can be used to measure the given angle and describe how to use?
- Ask them which instrument can be used to construct the given angle and describe how to use?
- ask them to measure the following angle using protector (working in a pair)

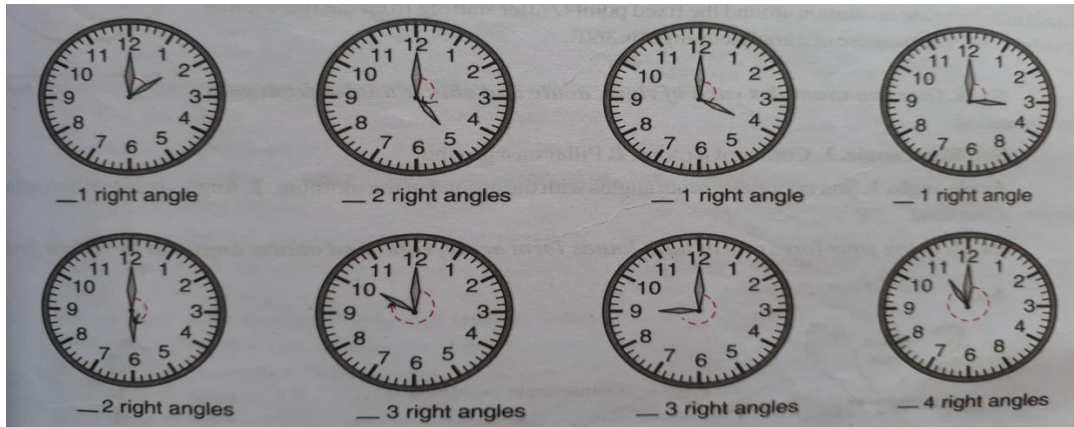


- Ask them to construct the following angles by using protector:

30° , 60° , 120° ,

2 Exploration on their own or into groups(Actions)

- Let them investigate the angles found in set square.
- Let them investigate the size of different angles found on their desk, bench, chairs, note book and note copy etc.
- Let them investigate the different angles made by the hands of a clock.



Extended Task:

- Discussion about the importance of measurement and construction of angle.
- Ex. 16.1, sac- B, Q.N. 2: b, d, e, g, i.

3 Summarizing (Reflection)

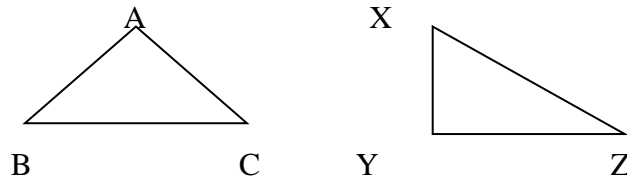
- When we measure the angle, the vertex should be placed at the centre of protractor and one arm on the base line of protector.
- When we construct the angle, the vertex should be fixed and put the vertex at centre of protector and draw the angle.

Teaching Episode: 6**Class – V****Time- 40****min****Topic** –Triangle (Introduction and Identification of triangle)**Objective:**

- State and identify the different shape of triangle.
- State and identify the form of triangle.

1 Introduction Task(10 min):

Show the different chart papers.

**2 Exploration on their own or into groups(Actions)**

Work in a group.

- Let them to play with set square.
- Let them to use different triangular shape from tan gram.
- Let them to make different shape of triangle in geo-board with rubber band.
- Let them to know three vertices, sides AB, BC and angles.
- Let them to make different triangular shape by paper cutting.

Extended Task:

- Ask them, how many parts does the triangle have?
- Ask them to say different triangular shape surrounding near about you.
- Ask them to collect different triangular shape and list their name.

3 Summarizing (Reflection)

- Triangle is a closed and bounded plane figure which is made by three sides.

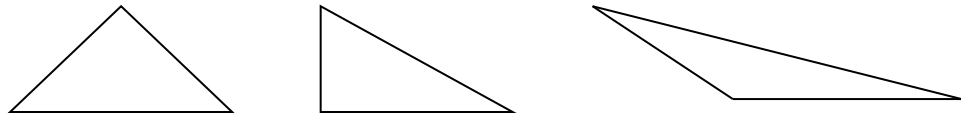
- Triangle has six parts: three angles and three sides.

Teaching Episode: 7**Class- V****Time-40****min****Topic-**Triangle (Properties of triangle by angle)**Objective:**

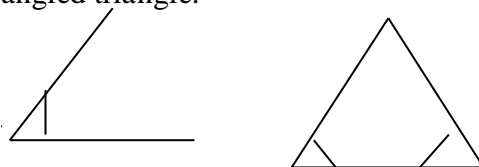
- Identify and state the different types of triangle by angle.
- Sum of the angle of triangle is 180.

1 Introduction task(10 min):

- Ask them about an acute angle.
- Ask them about right angle.
- Ask them about an obtuse angle
- Ask them if they know about set square?
- What does it mean?
- Ask them to demonstrate a piece of triangle from tangram

**2 Exploration on their own or into groups(Actions)**

- Tell them to make any acute angle.
- Tell them to join 2 end points of the arms.
- Finally, tell them, a triangle whose measures of all angles are acute is called acute angled triangle.



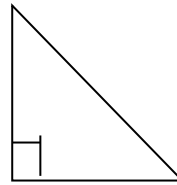
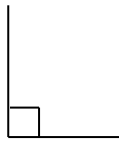
Ask the following question.

- Measures all the angles by using protractor?

- Is all the angles of triangle are acute angle?

Again,

- Tell them to make right angle.
- Tell them to join 2 end points of the arms.
- Finally, tell them a triangle whose measure of 1 angle is right angle is called right angled triangle.

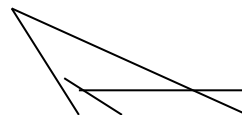


Ask the following question.

- Measures all the angles by using protractor?
- How many right angled are there?
- How many acute angles are there?

Similarly,

- Ask them about an obtuse angle.
- Tell them to make any obtuse angle.
- Tell them to join 2 end points of the arms.
- Finally, tell them a triangle whose measures of one angle are obtuse is called obtuse angled triangle.



Ask the following question.

- Measures all the angles by using protractor?
- How many obtuse angles are there?

- How many acute angles are there?

Extended Task:

By using match stick, make different types of triangle with the basis of angle.

3 Summarizing (Reflection)

Triangle:

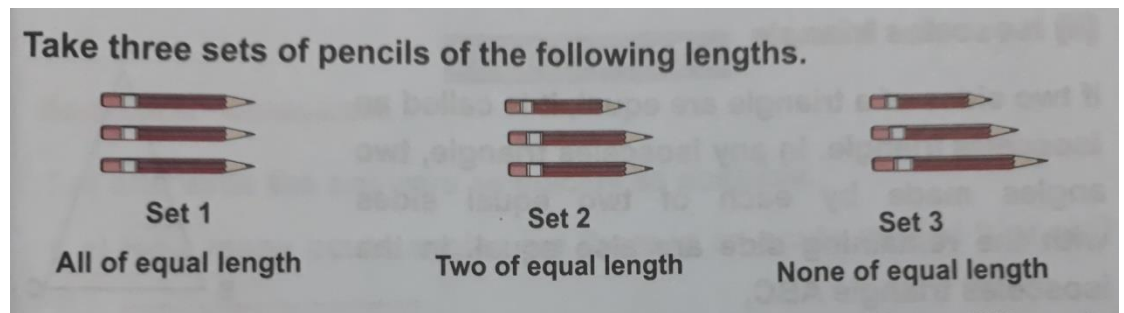
- Having all angles are acute is called acute angled triangle.
- Having 1 angle is right is called right angled triangle.
- Having 1 angle is obtuse is called obtuse angled triangle.
- Sum of the angle of triangle is 180.

Teaching Episode: 8**Class- V****Time- 40****min****Topic:-**Triangle (Types of triangle with the basis of sides)**Objective:**

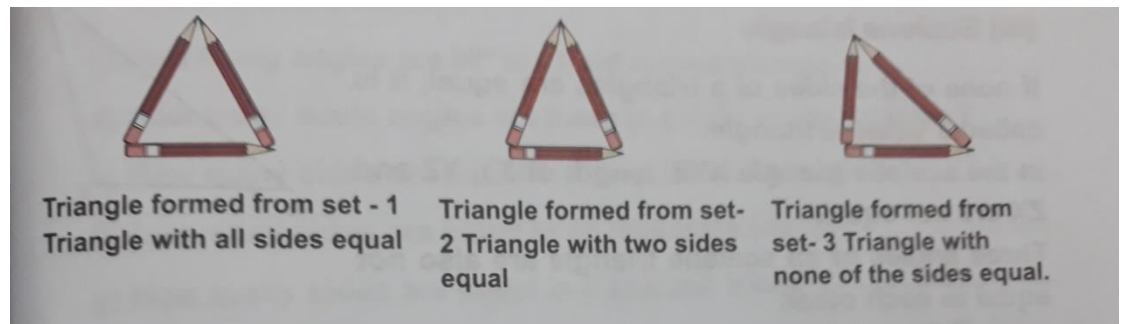
- State and identify the different triangles with sides.
- State and identify the properties of triangle with base.

1. Introduction Task(10 min):

Show the different length of pencil.



Let them to arrange each set of these pencils to make three different shapes of triangle.

**2 Exploration on their own or into groups(Actions)**

Work in a group.

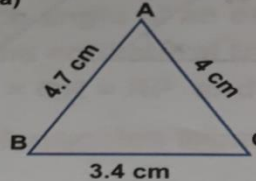
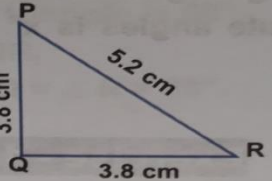
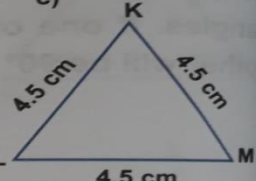
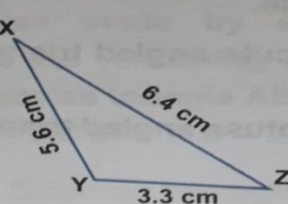
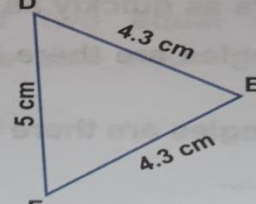
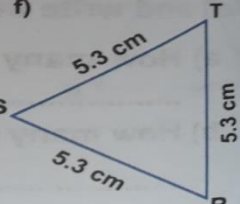
- Let them to use three sets of pencil. Whereas set-1: all pencil are equal, set-2: only two pencils are equal and set-3: none of the pencil are equal.

- Let them to arrange each set of these pencils to make three different shape of triangle.
- Let them discuss about three different set of triangle.
- Let them to discuss first set of triangle is Equilateral triangle, second set of triangle is Isosceles triangle and third set of triangle is scalene triangle.

Extended Task:

- Ask to make different types of triangle with the basis of sides.

1. Observe the length of sides of each triangle. Make a separate list of equilateral, isosceles and scalene triangles.

<p>a)</p> 	<p>b)</p> 	<p>c)</p> 
<p>d)</p> 	<p>e)</p> 	<p>f)</p> 

3 Summarizing (Reflection)

- Equilateral triangle: - Having all sides are equal.
- Isosceles triangle: - Having two sides are equal.
- Scalene triangle: - None of the sides are equal.

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