# THE EFFECT OF APPLICATION OF COOPERATIVE LEARNING MODELS *THINK PAIR SHARE* (TPS) TYPE TO MATHEMATICS COMMUNICATION ABILITY OF STUDENTS CLASS VIII JUNIOR HIGH SCHOOL ADABIAH PADANG

### THESIS

Submitted in Partial Fulfillment of the Requirements for the Bachelor Degree (Sarjana Pendidikan -S.Pd.) in Mathematics Education Program



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Dengan ini menyatakan bahwa Skripsi saya dengan judul "Pengaruh Penerapan Model Pembelajaran Kooperatif Tipe *Think Pair Share* (TPS) Terhadap Kemampuan Komunikasi Matematis Siswa Kelas VIII SMP Adabiah Padang" adalah benar merupakan hasil karya saya dan bukan merupakan plagiat dari karya orang lain atau pengutipan dengan cara-cara yang tidak sesuai dengan etika yang berlaku dengan tradisi keilmuwan. Apabila suatu saat nanti saya terbukti plagiat maka saya bersedia diproses dan menerima sanksi akademis maupun hukum yang sesuai dengan hukum dan ketentuan yang berlaku, baik di institusi Universitas Negeri Padang maupun di masyarakat dan Negara.

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### ABSTRACT

## Chintya Tifani : The Effect Of Application Of Cooperative Learning Models Think Pair Share (TPS) Type To Mathematics Communication Ability Of Students Class VIII Junior High School Adabiah Padang

Mathematical communication skills are one of the objectives of learning mathematics which are expected to be mastered by students in learning mathematics. However, the reality found that the mathematical communication skills of the eighth grade students of SMP Adabiah Padang were still low. One of the factors that causes this to happen is that the learning applied by the teacher has not been able to facilitate students to develop students' mathematical communication skills properly and students are not directly involved in finding One effort that can be used to improve students' mathematical concepts. communication skills is to apply the Think Pair Share (TPS) type cooperative learning model in the mathematics learning process. This study aims to see the differences in the mathematical communication skills of students whose learning uses the TPS cooperative learning model with the mathematical communication skills of students who learn using conventional learning, as well as to describe the development of the achievement of students' mathematical communication skills during the TPS type cooperative learning model applied to students class VIII SMP Adabiah Padang.

This type of research is a quasi-experimental with research design Static Group Design. The population in this study were all students of class VIII SMP Adabiah Padang. Sampling was done by random sampling technique, with class VIII<sub>1</sub> being selected as the experimental class and class VIII<sub>2</sub> as the control class. The instrument used was the final test in the form of essay questions to see students' mathematical communication skills which were analyzed using the t-test.

Based on the results of data analysis, it was obtained P-value = 0.019 with  $\alpha$  = 0.05. Because the P-value  $<\alpha$ , then H<sub>0</sub> is rejected. This means that the mathematical communication skills of students who learn using the TPS-type cooperative learning model are better than students who learn using conventional learning in students class VIII of SMP Adabiah Padang. It can be concluded that the TPS-type cooperative learning model to improve students' mathematical communication skills was successfully implemented during the research, especially in class VIII<sub>1</sub> of SMP Adabiah Padang.

#### FOREWORD

بشرواللوالترخطن الترجب بمر

Praise to Allah SWT for giving His grace and gifts so that the thesis entitled " The Effect of the Application of the Think Pair Share (TPS) Cooperative Learning Model on the Mathematical Communication Ability of Class VIII Students of SMP Adabiah Padang " was finally completed. This thesis is one of the requirements for obtaining a Bachelor of Education in the Mathematics Department of the State University of Padang.

The completion of this thesis cannot be separated from the assistance and guidance from various parties. For that, the researcher would like to express his sincere gratitude to the honorable ones:

- 1. Mr. Dr. Irwan, M.Si, Supervisor I as well as Academic Advisor and Head of the Mathematics Education Study Program of FMIPA UNP.
- 2. Mrs. Riry Sriningsih, S.Si., M.Sc, Advisor II.
- 3. Mr. Prof. Dr. Ahmad Fauzan, M.Pd., M.Sc, Mrs. Dra. Media Rosha, M.Si, and Mrs. Mirna, S.Pd., M.Pd, Team of examiners.
- 4. Mr. Muhammad Subhan, M.Si, Head of the Department of Mathematics, FMIPA UNP.
- Mrs. Dra. Dewi Murni, M.Si, Secretary of the Department of Mathematics, FMIPA UNP.
- 6. Teaching Staff of the Department of Mathematics and Sciences, UNP.
- 7. Mr. Prana Jaya, SE, Principal of SMP Adabiah Padang.

- Mrs. Sri Utami, S.Pd, Mathematics Teacher of Junior High School Adabiah Padang.
- Deputy Principal, Teacher Council, and Administrative Staff of SMP Adabiah Padang.
- 10. Class VIII's students of SMP Adabiah Padang.
- 11. Parents, family, and the closest people of the researchers who never tire of reminding and encouraging during the study, so that researchers can confidently complete this study and thesis.
- 12. Fellow Students, especially Mathematics Education 2011.
- 13. All parties who have helped in completing this thesis that cannot be mentioned one by one.

Researchers realize that this thesis is far from perfect. Therefore, constructive criticism and suggestions are expected from all parties for the perfection of this thesis. Hopefully this thesis is useful for readers, especially for researchers themselves. Aamiin.

Padang, January 2018

Researcher

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### CHAPTER I PRELIMINARY

### A. Baclground

Education is a process that humans go through in an effort to change their behavior as a result of an experience gained from training. Education plays an important role in the progress of a nation and country. In addition, in this era of globalization, humans really need education to face the challenges of the times which are filled with increasingly stringent competencies.

Mathematics is a subject that has an important role in education. Mathematics is needed in every aspect of human life. Therefore every study program chosen by students cannot be separated from mathematics lessons. This is because mathematics is a compulsory subject that must be followed by every level of education in schools and has specific goals. The objectives of learning mathematics according to Ministry of Education and Culture Regulation Number 58 of 2014 are as follows:

- 1. Understand math concepts..
- 2. Using patterns as guesswork in solving problems, and being able to make generalizations based on existing phenomena or data.
- 3. Using reasoning in nature, performing mathematical manipulation both in simplification, and analyzing the components that exist in problem solving in the context of mathematics and outside mathematics (real life, science, and technology) which includes the ability to understand problems, build mathematical models, solve models and interpret the solutions obtained, including in order to solve problems in everyday life (real life).

- 4. Communicating ideas, reasoning and being able to compile mathematical proofs using complete sentences, symbols, tables, diagrams, or other media to clarify a situation or problem.
- 5. Having an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, concern, and interest in studying mathematics, as well as being resilient and confident in problem solving.
- 6. Have attitudes and behaviors that are in accordance with the values in mathematics and learning, such as abiding by principles, being consistent, upholding agreement, being tolerant, respecting the opinions of others, polite, democratic, tenacious, tough, creative, respecting universality (context, environment), cooperation, fair, honest, thorough, careful, flexible and open, have a willingness to share feelings with others.
- 7. Perform motor activities that use mathematical knowledge.
- 8. Using simple props and technological results to carry out mathematical activities. These skills or abilities are closely related, which both strengthen and need the other.

Therefore, the learning process should be integrated and refer to all of these goals. Where one of the goals is that students are expected to have good mathematical communication skills. Students are expected to be able to communicate ideas with symbols of tables, diagrams or other media that clarify the situation or problem.

Communication is a way to share ideas and clarify understanding both orally and in writing. In the teaching and learning process, communication can occur from a teacher to students, students with other students or from students to teachers. Communication in mathematics learning has an important role because it includes the ability to communicate concepts, reasoning and problem solving. Communication in mathematics learning helps teachers know the extent to which students' ability to accept and understand the mathematical concepts and processes they are learning. When students are able to convey ideas or ideas on a mathematical topic well, it can be seen that these students have been able to understand the mathematical concepts they are learning quite well.

Therefore, it is hoped that teachers can create a learning process that can support the improvement of students' mathematical communication skills. Teachers must be able to manage classes and master subject matter so that teaching and learning activities are effective. In addition, teachers are also expected to apply a learning model that can facilitate students to develop their mathematical communication skills.

Associated with the low learning outcomes caused by students' mathematical communication skills, the same thing happened in Adabiah Padang Middle School. Based on observations made in class VIII SMP Adabiah Padang on November 14 to 18, 2016 in the 2016/2017 academic year, it can be seen that the learning that is applied by teachers in schools is still lacking in facilitating students to develop their mathematical communication skills. The teacher starts the lesson by asking the students homework (PR). When there are students who have difficulty doing their homework, the teacher asks students who can answer the questions then the teacher explains. If no student asks questions, the teacher immediately continues to the next material.

In this activity, the teacher begins the lesson by explaining the concept of the material being discussed. Then students are given examples of questions and their solutions. Furthermore, students are asked to make notes of the material being studied. After that students are asked to do practice questions. During the observation it was seen that the students' ability to understand concepts was good as seen in the picture, but students still had not written their answers using good mathematical communication skills when they were given the communication skills test.

If viewed from the questions given, the questions tested are all mathematical communication questions that represent several indicators, namely: 1) Stating situations, pictures, diagrams or real objects into the language of symbols, ideas, or mathematical models; 2) Explaining an idea, situation or mathematical relation through pictures; 3) Perform mathematical manipulations; and 4) Provide logical and correct reasons or evidence for the solution. When viewed from the results of the initial test answers given, students' communication skills are not optimal. Most students have difficulty solving it. Of the four indicators, on the student answer sheets it can be seen that most students are less able to solve problems related to indicators 2) and 3).

The Questions given are :

1. Explain each with one example what is meant by the injective function, the subjective function and the objective function!

One of the students' answers can be seen in Figure 1 below.



**Figure 1. Student Answers to Indicator 1** 

Judging from the students' answers in working on questions about explaining what the injective, surjective and wise functions are, students generally have understood the concept shown in Figure 1 above. In explaining the requested function, students are able to explain the injective, surjective and wise functions along with each one with an example. In Figure 1, it can be seen that students have been able to use the right procedures in working on questions. It can be concluded that the students' ability to understand concepts is good. When students are faced with other questions that require communication skills, most students have difficulty solving these problems. The following questions require mathematical communication skills.

2. A bullet was fired vertically upwards. The height of the bullet after t seconds is  $(8t - 2t^2)$  meters, so the formula for the function h is  $h(t) = 8t - 2t^2$  with domain  $Dh = \{t \mid 0 \le t \le 4\}$ .

Determine the maximum height that can be reached by the bullet (Explain your answer using the graph) !

One of the students' answers can be seen in Figure 2.



Figure 2. Student Answers to Indicator 2

In Figure 2 students are asked to explain the problem using pictures / graphs, here it can be seen that the students were correct in entering the t value into the result area (h(t)) in the h function table. However, students do not paint the requested graphic. This means that students are still unable to explain mathematical ideas or situations through pictures in the given problem. Based on these problems, it can be seen that the students' mathematical communication skills are still low. This was supported by the answers of other students, such as question 3 below.

3. Known that a rectangle has a circumference of 20 cm. Find the area of the rectangle if its area is expressed as a function of the form x (L(x))!

One of the students' answers can be seen in Figure 3 below.



Figure 3. Student Answers to Indicator 3

Of the 32 students who did the exercises, there were only 5 students who answered correctly and 14 people who answered not according to the actual steps and structure and 13 students who answered incorrectly. From the students' answers, it can be seen that the students have not been able to manipulate mathematics by assuming that the length of the rectangle is x and the width of the rectangle is y.

Based on the results of observations and evidence found during observations, it appears that students are able to understand the problems given. However, students have not been able to communicate their mathematical ideas correctly to clarify the problems given, even though the final results they get are correct. Based on the facts found during the observation it can be said that the mathematical communication of the eighth grade students of SMP Adabiah Padang is still low.

Teachers need a solution in overcoming this to be able to arouse students' enthusiasm in learning and students are required to develop opinions in groups. This aims to make learning more enjoyable and students can benefit from learning mathematics itself and achieve learning goals well. One way to make this happen is to apply a learning model that can guide students to develop mathematic abilities.

One of learning model that is thought to be able to guide students to develop their mathematical abilities is the *Think Pair Share* type of cooperative learning model. *Think Pair Share* is a type of cooperative learning model designed to influence student interaction patterns and provide opportunities for each student to demonstrate their participation to others. *Think Pair Share* is also a learning model with small groups. The number of group members consisting of only 2 people (in pairs) can optimize the active role of each student in the group, give good thinking time for students who have moderate or slow abilities and make it easier for students to work together and exchange ideas in pouring and discussing ideas mathematics which he has in both spoken and written form. With this learning model students are trained how to express opinions and students also learn to respect the opinions of others while still referring to the material or learning objectives.

In this model there are three stages of learning, namely: *Think*, *Pair*, *and Share*. At the *Think* stage, students are asked to think about questions or issues raised by the teacher. While at the *Pair* stage, students discuss with their partners what they have thought at the Think stage, then at the *Share* stage students are asked to present the results of their discussion to the class. The *Think Pair Share* type of cooperative learning model is expected to be able to solve the problems that occur at SMP Adabiah Padang, reinforced by the opinions of Dessy Witta (2011) and Arfia Lestari (2015). He argued that the *Think Pair Share* type of cooperative learning model can improve students' activities, learning outcomes and understanding of mathematical concepts. Meanwhile Hidayatur Rahmi (2015) who conducted research at SMPN 13 Padang also revealed that the *Think Pair Share* type of cooperative learning model can also improve students' mathematical communication skills.

Based on these problems, the author wants to research and apply the *Think Pair Share* learning model to seek to improve the metematic communication skills of grade VIII students of SMP Adabiah Padang. This effort is manifested in a study entitled:

"The Effect Of Application Cooperative Learning Models *Think Pair Share* (TPS) Type To Mathematic Communication Ability Of Students Class VIII Junior High School Adabiah Padang".

### **B.** Problem Identification

Based on the background that has been explained, the following problems were identified:

- 1. Learning activities are still conventional and have not been able to guide students to develop their mathematical communication skills.
- 2. Students have not been able to solve the problems given based on the proper structure and procedures.
- 3. Students' mathematical communication skills are still low.

### C. Problem Limits

Based on the problem identification that has been stated, the problem in this study is limited to the low mathematical communication skills of the eighth grade students of SMP Adabiah Padang. This is overcome by applying the *Think Pair Share* type of cooperative learning model.

### **D.** Problem Formulation

Based on the limitation of the problem, the problem formulation of this study is: "Is the mathematical communication ability of students who learn to use the *Think Pair Share* type cooperative learning model better than conventional learning?"

### E. Research Objectives

This study aims to see the effect of the application of the *Think Pair Share* type cooperative learning model on the mathematical communication skills of the VIII grade students of SMP Adabiah Padang.

#### F. Research Benefits

This research is expected to be useful for :

- 1. Students, can improve their mathematical communication skills through the application of the Think Pair Share type of cooperative learning model.
- 2. Teachers, can increase knowledge about how to teach good mathematics and also as an alternative to variations in teaching using the cooperative learning model Think Pair Share and provide input in implementing the learning process so that the quality of learning is better.

3. Researchers, for additional knowledge and experience that researchers can apply in carrying out the teaching profession later.

### CHAPTER II THEORETICAL FRAMEWORK

#### A. Theory Study

#### **1.** Mathematics Learning

Learning is closely related to learning. Learning is an activity carried out by a person to achieve a change in behavior. The change in question is in the context of knowledge, skills and attitudes. This is in line with Oemar Hamalik's opinion which states that "learning is a process of changing behavior through interaction with the environment" (Sa'adah, 2010: 9). Furthermore, Fontana argues that "learning is a process of changing behavior which is relatively constant as a result of an experience" (Suherman, 2003: 7). Based on this description, it can be concluded that learning is a person's activity based on his interaction with the environment as an experience resulting in changes in knowledge, skills and attitudes.

Learning is a two-way interaction process between teachers and students as well as theory and practice. According to Fontana (Suherman, 2003: 7) argues that "learning is an effort to organize an environment that provides a nuance for the learning program to grow and develop optimally". Furthermore, Oemar Hamalik (Sa'adah, 2010: 17) argues that "learning is a combination of human, material, facilities, equipment and procedures that influence each other in achieving learning goals". Based on this opinion, it can be concluded that learning is an effort made to develop learning programs, so that learning objectives can be achieved. In this case, learning does not only require teachers and students but also procedures that will support the learning process to occur. Therefore, the materials, facilities and strategies used by teachers in teaching need to be considered.

The implementation of the learning process in the classroom is regulated in a standard process. Permendiknas Number 41 Year 2007 states that "Process standards are national education standards related to the implementation of learning in educational units to achieve graduate competence". Learning is meant a learning process in which students are required to be more active during learning (student center). In this case the teacher is required to condition the learning environment in such a way that the learning process that occurs can motivate students to take an active role in learning, including in mathematics lessons.

According to Ruseffendi (Suherman, 2003: 22) mathematics studies about regular patterns, organized structures. It starts with undefined elements (undefined terms, basic terms, primitive terms), then the elements defined into axioms / postulates and finally the theorems. Mathematical concepts are arranged hierarchically, structurally, logically and systematically starting from the simplest concepts to the most complex concepts. Based on this opinion, it can be concluded that mathematics is a science that contains concepts that are related to one another and learns about regular patterns so that people who master them can think logically, organize their thoughts and increase their intelligence. Based on the above definitions, it can be concluded that mathematics learning is an effort made to master the concepts and structures of mathematics and to find the relationship between these concepts and structures.

In essence, learning mathematics will train creative, systematic and logical thinking processes. To achieve this essence there are several mathematics learning objectives that must be met as stated in Permendikbud Number 58 of 2014 as follows :

- 1. Understand mathematical concepts.
- Using patterns as guesswork in solving problems, and being able to make generalizations based on existing phenomena or data.
- 3. Using reasoning in nature, performing mathematical manipulation both in simplification, and analyzing the components that exist in problem solving in the context of mathematics and outside mathematics (real life, science and technology) which includes the ability to understand problems, build mathematical models, solve models and interpreting the solutions obtained, including in order to solve problems in everyday life (real world).
- Communicating ideas, reasoning and being able to compile mathematical proofs using complete sentences, symbols, tables, diagrams, or other media to clarify a situation or problem.

- 5. Having an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, concern, and interest in studying mathematics, as well as being resilient and confident in problem solving.
- 6. Having attitudes and behaviors that are in accordance with the values in mathematics and learning, such as obeying principles, being consistent, upholding agreement, being tolerant, respecting the opinions of others, polite, democratic, tenacious, tough, creative, respecting universality (context, environment ), cooperation, fair, honest, conscientious, thorough, flexible and open, have a willingness to share feelings with others.
- 7. Perform motor activities that use mathematical knowledge.
- 8. Using simple props and technology results to carry out mathematical activities. The skills or abilities are closely related, which one strengthens and needs the other.

Based on some opinions of the experts above, it can be concluded that mathematics learning is a process or activity carried out by the teacher using symbolic language regarding concepts that are interrelated with ideas (ideas) to achieve certain goals. Through mathematics learning, students are expected to be able to communicate ideas with symbols, tables, diagrams, or other media to clarify a situation or problem.

### 2. Mathematical Communication Skills

Communication is an important part of learning mathematics. Communication is a way of expressing ideas with words, symbols and diagrams. Through communication one's ideas can be mirrored, published and developed. Therefore, in learning mathematics, good communication skills are needed, so that mathematical problems can be answered clearly and every individual who has an interest in mathematics really needs communication in providing information. With communication, a person can achieve his goals, including success in learning, so that is why communication skills are one of the goals that must be achieved in the educational process.

Mathematical communication is an important skill in mathematics. According to *The Intended Learning Outcomes* in Armiati (2009: 2) mathematical communication is the ability to coherently express mathematical ideas to friends, teachers, and others through spoken and written language. This means that with the existence of mathematics communication the teacher can better understand the students' ability to interpret and express their understanding of the concepts they are learning. Communication in mathematics education can be developed by giving students various opportunities to listen, speak, write, read, and present mathematical ideas.

Teachers can develop students' communication skills by listening, asking for responses, assessing, presenting mathematical notations, and monitoring students. By communicating, students can improve vocabulary, develop speaking skills, write ideas down systematically, and have better learning abilities. From the description above, it can be concluded that mathematical communication skills are the ability to communicate mathematical ideas to others, in oral, written or diagrammatic forms so that others can understand them. As previously described, mathematical communication skills include oral and written communication skills. To see written communication skills, Ross (National Mathematics Seminar: 71) suggests the following:

- Describe the problem situation and state the problem solution using pictures, chart charts and algebraically.
- b. Declare the results in writing.
- c. Use comprehensive representations to express mathematical concepts and solutions.
- d. Create mathematical situations by providing ideas and information in written form.

According to the Ministry of National Education (2004: 65) indicators that show communication skills include :

- a. Present oral, written, pictorial, and diagrammatic mathematical statements.
- b. Make a guess.
- c. Perform mathematical manipulations.
- d. Draw conclusions, compile evidence, provide reasons or evidence against the freedom of solutions.
- e. Draw conclusions from statements.
- f. Checking the validity of an argument.
- g. Find patterns / properties of mathematical phenomena to make generalizations..

Sumarmo (2005: 7) suggests that the indicators of students' mathematical communication skills include :

- a. Connect real objects, pictures and diagrams into mathematical ideas.
- Explain mathematical ideas, situations and relations, orally / in writing with real objects, graphs and algebra.
- c. Express everyday events in mathematical language / symbols.
- d. Listen, discuss and write about mathematics.
- e. Read with the understanding of a percentage of written mathematics.
- f. Making conjectures, compiling arguments, formulating definitions and generalizations.

The indicators of mathematical communication skills put forward by Satriawati (Algorithm vol.1: 111) are :

- a. Written Text, which is providing answers using your own language, modeling situations or problems using spoken, written, concrete, graphical and algebraic, explaining and making questions about mathematics that have been studied, listening, discussing, and writing about mathematics, making conjectures, composing arguments and generalizations.
- b. Drawing, which is reflecting real objects, pictures and diagrams into mathematical ideas.
- c. Mathematical Expression, which expresses mathematical concepts by expressing everyday events in language or mathematical symbols

Based on the above studies, it can be concluded that mathematical communication skills are the ability to communicate mathematical ideas to others, be it in oral, written or diagrammatic form, so that other people can understand them. The indicators of mathematical communication skills used in this study are:

- a. Converting real situations, pictures, diagrams, or objects into language, symbols, ideas, or mathematical models.
- b. Explain an idea, situation, and mathematical relation through pictures.
- c. Perform mathematical manipulations.
- d. Provide logical and correct reasons or evidence for the solution.

To achieve these mathematical communication indicators, the teacher needs to design a lesson that can explore the potential of students' communication skills. One way is to use the *Think Pair Share* type of cooperative learning model.

### 3. Think Pair Share Type Cooperative Learning Model.

The *Think Pair Share* (TPS) type of cooperative learning model or thinking, pairing and sharing is a learning model where students work together in small groups and is a type of structural approach to the cooperative learning model designed to influence student interaction patterns. The *Think Pair Share* (TPS) type of cooperative learning model was first developed by Frank Lyman from the University of Maryland in 1985. This type gives students time to think and respond and help each other. Think Pair Share is a type of cooperative learning designed to influence student interaction patterns. *Think Pair Share* is cooperative or group learning that gives students more time to think, answer, and help each other. So that this type of *Think Pair Share* cooperative learning has a strong potential to empower students' thinking skills. Increasing students' thinking abilities will improve their learning outcomes or academic achievement. Students are trained to think critically to be able to solve problems given by the teacher. The teacher also gives students the opportunity to answer with their own thoughts, then in pairs to discuss the results of the answers which will later be discussed together in front of the class. In this *Think Pair Share* type learning group members consist of 2 people in one group. According to Lie (2002: 45) the advantages of the paired group are: :

- a. Increase student participation
- b. Suitable for simple tasks
- c. More opportunities for individual group member contributions
- d. Easier interaction
- e. It's easier and faster to form groups

In general, there are six main steps in cooperative learning. The six steps are summarized in table 1 below :

<u> </u>	0
Phase	Teacher Behavior
Phase 1: present goals and	Explain learning objectives and prepare
set	students to be ready to learn
Convey goals and prepare	
students	
Phase 2: present information	Presenting information to students verbally
Presenting information	
Phase 3: Organize students	Provide an explanation to students about the
into learning teams	procedures for formation groups to make an
Organizing students into	efficient transition
learning teams	
-	

**Table 1. Syntax for Cooperative Learning Model**
Phase 4: assist team work	Helping learning teams as long as students do		
and study	their work		
Helping teamwork and			
learning			
Phase 5: test on the material	Evaluating Test students' knowledge of various		
	subject matter or groups presenting their work		
Phase 6: provide recognition	Prepare a way to recognize individual and		
Give recognition or	group efforts and accomplishments		
appreciation			

Ibrahim (2000: 26) suggests three steps in Think Pair Share, namely :

- a. Thinking stage (thinking), the teacher asks a question or issue related to the lesson, then students are asked to think about the question or issue independently for a few moments. In this case the teacher can guide students by using Student Worksheets (LKS).
- b. Pairing stage (pairing), the teacher asks students to pair up with others to discuss what they have thought in the first stage. Interaction at this stage is expected to be a problem that has been tried to be thought of by students themselves, if there is difficulty, students can discuss it with a partner so that students can think together. Usually the teacher gives 4 -5 minutes to pair up.
- c. In the Sharing stage, the teacher asks students to share with the whole class what they have talked about. This is effectively done by taking turns pair by pair.

So, based on the stages of *Think Pair Share*, it is expected that students' mathematical communication indicators are achieved.

Based on the description above, there are three main steps as a characteristic of the *Think Pair Share* type of cooperative learning, namely *think, pair, and share*. Activities at the *think* stage can be seen from the process of students reading the problems given and making answers from what they read or understand. Thus students have the opportunity to think about their answers individually.

In addition, teachers can reduce the problem of having students chat because each student has a task to do on his own. In the *pair* stage, each student discusses the pair about the results of their previous answers so that the final result is better. At the *share* stage, each pair has the opportunity to present the results of their discussion to all pairs. Thus it can improve students' mathematical communication skills orally or in writing. Student grouping in the *Think Pair Share* type of cooperative learning can be done based on the level of students' academic abilities. According to Lie (2002: 41), as for the steps to form groups based on academic abilities, namely:

- a. Sort students by academic ability. Students are sorted from high proficiency level to low proficiency level.
- b. Form the groups.

### 4. Conventional Learning

Conventional according to Poerwadarminta (1988: 522) is what is usually done or that has become a habit. This states that something is said to be conventional if something is already common and commonly used, used, and done. If conventional concerns about learning, then this means that learning is usually done by teachers in class. So it can be concluded that conventional learning is learning that is commonly used by teachers in the learning process.

The learning process is governed by process standards. Process Standards are standard criteria regarding the implementation of learning in educational units to achieve Graduate Competency Standards (Permendiknas Number 23 of 2006).

In the observations made, the scientific approach applied by the teacher was not optimal. Although the process of this scientific approach has been applied by the teacher, it has not been implemented properly. The teacher combines a scientific approach with expository learning. Gulo (2002: 11) states that "An expository teaching-learning strategy in which the teacher processes the message / material thoroughly before it is delivered in class so that students just accept it". So, in this conventional learning, students seem to be less active in the learning process.

The learning that researchers will do in the control class is conventional learning using the expository method. By using the expository method the teacher speaks at the beginning of the lesson, explains the material and sample questions.

## **B.** Relevant Research

The research that is relevant to this research is the research conducted by Dessy Witta with the title "The Application of the *Think Pair Share* Type Cooperative Learning Model in Mathematics Learning in Class XI IPA Students of SMA Negeri 2 Padang Panjang, 2010/2011 Academic Year". From this research, it can be concluded that the activities and results of mathematics learning of students who learn with the *Think Pair Share* type of cooperative learning model are better than students who learn using conventional learning. The difference between this study and Dessy Witta's research is the dependent variable and the school being studied. The research conducted by Dessy Witta was to see the activities and learning outcomes of students, while the research conducted by researchers was to see that the mathematical communication skills of students who learn to use the *Think Pair Share* type cooperative learning model are better than conventional learning in class VIII students of SMP Adabiah Padang.

Another research that is also relevant is research conducted by Arfia Lestari with the title "The Effect of the Application of the *Think Pair Share* Type Cooperative Learning Model on the Understanding of Mathematical Concepts in Class VII Students of SMPN 4 Padang". The difference between the above research and the research conducted is that this research will be conducted in class VIII SMP Adabiah Padang. In addition, this study looks at students 'conceptual understanding abilities, while researchers will look at students' mathematical communication skills.

Another relevant research that also looks at students' mathematical communication skills is a study conducted by Hidayatur Rahmi entitled "The Effect of the Application of the *Think Pair Share* Type Cooperative Learning Model on the Mathematical Communication Ability of Class VII Students of SMPN 13 Padang Academic Year 2014/2015". Based on the results of the research conducted, it was found that students' mathematical communication

skills were getting better. The difference with the research conducted is that it lies in the school to be studied and the class being studied.

However, even though there have been many studies that have examined students 'mathematical abilities, in reality students' mathematical abilities are still low and students still have difficulty developing their mathematical communication skills in problem solving and do not have the courage to convey their ideas or opinions regarding problem solving according to their thinking patterns.

Thus it is still necessary to do research on students 'mathematical communication skills in order to improve this situation and make students' mathematical communication skills even better. One of them is by applying the *Think Pair Share* type cooperative learning model.

## C. Conceptual Framework

Permendikbud No 41 of 2007 concerning process standards is a reference for teachers in implementing the learning process in the classroom. The learning process regulated in this standard process is student-based learning (student center). This regulation expects students to participate and be actively involved in the learning process and students are expected to learn independently without full assistance from the teacher. In this case the teacher only acts as a facilitator who will facilitate and direct students to construct their own understanding of the material they are learning. However, in reality, students are still passive and the learning process is teacher centered. This also applies to mathematics. Mathematics learning should invite students to interact actively with their friends in class. This interaction provides opportunities for students to convey and develop students' abilities in communicating their ideas and ideas. All students are expected to be able to actively participate in the learning process, so that the objectives of learning mathematics can be achieved properly. However, most students are only passive so the learning process is teacher-centered. In the learning process, the teacher should only be a facilitator, mediator, and motivator who is able to move students to be active in the learning process. Therefore, in learning mathematics the teacher must pay attention to students' mathematical communication skills, because without mathematical communication skills students will become passive in the learning process.

One of the way that teachers can do is to use the *Think Pair Share* type of cooperative learning model. *Think Pair Share* is a learning model that gives students more time to think, answer, and share with students so as to foster effective communication. Thus students' mathematical communication skills can improve. The *Think Pair Share* type of cooperative learning model is a student-centered cooperative learning. The advantage of this *Think Pair Share* technique is the optimization of student participation. This technique provides more opportunities for students to participate actively. This is because in the *Think Pair Share Share* steps, students work alone and collaborate with others.

#### **D.** Research Hypothesis

The hypothesis of this study is: the mathematical communication skills of grade VIII students of SMP Adabiah Padang who learn using the *Think Pair* 

*Share* type of cooperative learning model are better than the mathematical communication skills of grade VIII students of SMP Adabiah Padang who learn using conventional learning.

## CHAPTER III RESEARCH METHODS

#### A. Types and Research Design

In accordance with the research problem and the stated research objectives, this type of research is a quasi-experimental research (quasiexperimental). According to Campbell and Stanley in Arikunto (2010: 123) quasiexperimental research is often seen as an experiment that is not true. According to Mulyatiningsih (2012: 86), "Quasi-experimental research is chosen if the researcher wants to implement an action or treatment with human subjects". Actions can be in the form of new work models, strategies, methods or procedures to increase the efficiency and effectiveness of work so that the results are more optimal.

In accordance with the type of research, the research design used is *Static Group Design*, namely the population is divided into two groups, namely the control class group and the experimental class group. The research design is as follows:

Groups	Treatment	Posttest
Experiment	Х	Т
Control	-	Т

 Table 2. Research Design Static Group Design

Source : Seniati (2011: 125)

Information :

- X : The treatment given to the experimental class is the *Think Pair Share* type of cooperative learning model.
- T : Test of mathematical communication skills given to the experimental class and control class at the end of the lesson.

#### **B.** Population and Sample

#### **1.** Population

Population is the whole object or subject that is in an area and fulfills certain requirements related to the research problem. The population in this study were all students of class VIII SMP Adabiah Padang Academic Year 2017/2018. The distribution of the number of students for each class can be seen in table 3.

I adding in the 2017/2010 academic year				
No	Class	Number of Student		
1	VIII <sub>1</sub>	30		
2	VIII <sub>2</sub>	28		
3	VIII <sub>3</sub>	28		
4	VIII <sub>4</sub>	26		
5	VIII <sub>5</sub>	26		
6	VIII <sub>6</sub>	26		
Total		164		

 Table 3. Distribution of Number of Class VIII Students of SMP Adabiah

 Padang in the 2017/2018 academic year

(Source: Adabiah Padang Middle School Administration)

## 2. Sample

Given the large enough population, a sample selection was carried out. The sample chosen must be representative so that it describes the overall characteristics of a population. In accordance with the problem under study, it takes 2 sample classes consisting of the experimental class and the control class. Sampling in this study was carried out in the following steps:

a. Collecting data on Semester II Mathematics Exam scores for grade VIII students of SMP Adabiah Padang at the end of the semester for the 2016/2017 academic year. This value can be seen in appendix 1.

b. Perform the Average Similarity Test

The average similarity test aims to see whether the population has an average similarity or not. For this reason, first the normality and homogeneity of the population were tested.

1) Normality Test

The normality test aims to see whether the population is normally distributed or not. The normality test was carried out by the Anderson-Darling test. The hypothesis in this normality test is:

H<sub>0</sub> : normally distributed data

H<sub>1</sub> : data is unnormally distributed

In this study, the normality test was carried out using the MINITAB software. The population is normally distributed if the P-*value* obtained is greater than the real level ( $\alpha$ ) defined, namely  $\alpha = 0.05$ .

Class	P-value
VIII <sub>1</sub>	0,273
VIII <sub>2</sub>	0,631
VIII <sub>3</sub>	0,230
VIII <sub>4</sub>	0,498
VIII <sub>5</sub>	0,520
VIII <sub>6</sub>	0,306

Table 4. P-value of each class in the population

Based on Table 4 above, it can be seen that the P-value of each class is greater than the real level ( $\alpha$ ) = 0.05. This means that the population is normally distributed. Complete analysis can be seen in Appendix 2.

#### 2) Variance Homogeneity Test

The variance homogeneity test aims to determine whether the population has a homogeneous variance or not. Homogeneity test was carried out by using the Bartlett test. The hypothesis in this homogeneity test is:

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_6^2$$

H<sub>1</sub> : At least the two variances are unequal.

The population has a homogeneous variance if the P-value obtained is greater than the real level (which is determined, namely = 0.05. Based on the results of the analysis with the help of MINITAB software, the P-value obtained in the Bartlett test is 0.659. This means that the P-value is greater. From the value, it can be concluded that the population has a homogeneous variance or accept H0.The results of the variance homogeneity test can be seen in Appendix 3.

## 3) Perform the average similarity test

This test is done to see whether the population has the same mean or not. If the population is normally distributed and has homogeneous variance, then the average equality test is carried out using the one-way analysis of variance (ANOVA) test. The average similarity test was carried out with the help of MINITAB software. The test criterion is if the P-value> the real level ( $\alpha$ ), namely = 0.05, then the population has the same average.

The hypothesis in the average similarity test is as follows:

$$H_0 : \mu_1 = \mu_2 = \dots = \mu_6$$

H<sub>1</sub> : at least two means are not the same.

Based on the analysis results, the obtained P-value = 0.997. So, it can be concluded that the populations have a similar average. The results of the average similarity test can be seen in Appendix 4.

c. Taking two class of sample

After obtaining that each class has the same average value, the sampling is done randomly using *simple random sampling* technique. The drawing is carried out by taking a roll of paper in which the names of classes VIII<sub>1</sub> to VIII<sub>6</sub> are written. The class resulting from the first taking becomes the experimental class, namely class VIII<sub>1</sub>, while the class from the second taking becomes the control class, namely class VIII<sub>2</sub>.

## C. Variable and Data

## 1. Variable

Variable is what is the point of attention of a study. The research consisted of 2 variables, namely the independent variable and the dependent variable.

a. Independent Variable

The independent variable in this study is the treatment given to the experimental class students, namely mathematics learning with the *Think Pair Share* type cooperative learning model.

b. Dependent Variable

The dependent variable in this study is the students' mathematical communication skills.

## 2. Data

The data used in this study are :

- Primary data is data that is directly obtained from the sample under study, namely data on students' mathematical communication skills obtained after the treatment is given.
- b. Secondary data is data taken indirectly from other parties. Secondary data from this study is the data on the second semester test scores of mathematics and the number of students obtained from the mathematics teacher at Adabiah Padang Middle School

## **D.** Research Procedures

In general, the research procedure can be divided into three parts, namely: the preparation stage, the implementation stage and the completion stage.

## **1.** Preparation Stage

- Manage research permits to the faculty and proceed to SMP Adabiah
   Padang. Permits can be seen in attachment 26.
- b. Determine the place and schedule of research and the subjects to be studied. This research was conducted at Adabiah Padang Junior High School from 24 July 2017 to 10 August 2017 with the material of Number Patterns. The research schedule can be seen in appendix 5.
- c. Requesting data on the final examination scores for the second semester of mathematics for seventh grade students of SMP Adabiah Padang for the 2016/2017 academic year to see student learning outcomes before

the research was conducted. The final exam scores for the second semester of mathematics are accumulated in the class VIII student absences which can be seen in Appendix 1.

- d. Determining the population and research sample, namely the experimental class and the control class.
- e. Prepare learning tools consisting of Learning Implementation Plans (RPP) and Student Worksheets (LKS). The complete RPP can be seen in attachment 7, the worksheets in attachment 9 and the question sheets can be seen in attachment 12.
- f. Prepare all research instruments in the form of a test of mathematical communication skills given at the end of the subject matter, by first compiling a grid of tests of mathematical communication skills.
  Mathematical communication skills test grid can be seen in appendix 10.
- g. Validating research tools and instruments to determine whether the devices are valid or fit for use. The research tools and instruments were validated by two mathematics lecturers, namely Prof. Dr. Ahmad Fauzan, M.Pd., M.Sc and Mrs. Mirna, S.Pd., M.Pd. Toolkit validation can be seen in Appendix 6 and 8. The instrument validation sheet can be seen in Appendix 11 which was validated by two lecturers.

## 2. Implementation Stage

The implementation of this research was carried out in the two sample classes by carrying out learning according to the plan that had been prepared and using a different approach. The experimental class uses the *Think Pair Share* type of cooperative learning model, while the control class uses learning using conventional learning. The design of learning activities in the experimental class and control class can be seen in Table 5.

Experiment Class	Control Class
1	2
<ul> <li>A. Introduction</li> <li>The teacher prepares students to be ready to receive lessons</li> <li>The teacher gives apperception by giving examples of questions related to prerequisite material</li> <li>The teacher provides motivation so that students are enthusiastic about learning</li> <li>The teacher conveys the learning objectives</li> <li>The teacher conveys learning techniques using the <i>Think Pair Share</i> model</li> </ul>	<ul> <li>A. Introduction</li> <li>The teacher prepares students to be ready to receive lessons</li> <li>The teacher gives apperception by giving examples of questions related to prerequisite material</li> <li>The teacher provides motivation so that students are enthusiastic about learning</li> <li>The teacher conveys the learning objectives</li> </ul>
<ul> <li>B. Core Activities</li> <li>With the help of math textbooks and other learning resources, students are expected to be able to find material concepts through worksheets that the teacher will distribute later. <ul> <li>a. Think</li> <li>Students begin to think and answer the questions on the LKS individually (observing, asking, reasoning)</li> <li>b. Pair</li> <li>Students exchange ideas with their partners in groups to discuss the answers they have worked on before. (ask, try, communicate)</li> <li>c. Share</li> <li>Students are asked to present the results of their discussion in front of the class. The pair that will appear are selected by bulging. At this stage, students share what they understand with classmates</li> </ul> </li> </ul>	<ul> <li>B. Core Activities</li> <li>The teacher delivers or presents material to students with the Question and Answer method so that students find their own concepts learned (observing, asking questions)</li> <li>After the teacher delivers the material, students are given guided exercises (reasoning, trying)</li> <li>The teacher checks students' understanding by asking a few questions and providing feedback (communicating)</li> <li>After delivering information and guided exercises, students are then given further assignments or tests on the material that has been studied</li> </ul>

**Table 5. Design of Sample Class Learning Activities** 

•	(communicate) The teacher gives appreciation for the efforts made by students and the teacher emphasizes important concepts.	
С. •	<b>Closing</b> Students and the teacher conclude the material that has been studied. Students are given homework and information related to upcoming activities	<ul> <li>C. Closing</li> <li>Students together and the teacher conclude the material that has been studied.</li> <li>Students are given homework and information related to upcoming activities</li> </ul>

## 3. Completion Stage

The completion stages of this research are :

- a. Give a final test of mathematical communication skills in the two sample classes, namely the experimental class and the control class to find out the results of the treatment that has been given to the two classes.
- b. Process data from the results obtained from both samples.
- c. Draw conclusions from the results obtained in accordance with the data analysis techniques used.

## E. Research Instrument

In accordance with the problems in this study, the instrument used is a learning outcome test that measures mathematical communication skills. The test was given at the end of the study. The test used is in the form of an essay test. To measure students' mathematical communication skills, this study uses a modified assessment rubric from the performance assessment developed by Iryanti (2004: 14) which can be seen in Table 6.

N.T.	T 1 4	Scale			
NO	Indicator	0	1	2	3
1	Convey real situations, pictures, diagrams or objects into the language of symbols, ideas, or mathematical models.	Not answering question	Real situations, pictures, diagrams or objects that are expressed in language, symbols, ideas, or mathematical models are misrepresented and many important descriptions are not written down.	Situations, pictures, diagrams or real objects that are expressed in language, symbols, ideas, or mathematical models that are made incomplete but the answers are mostly correct.	Situations, pictures, diagrams or real objects are expressed in complete, correct and clear language, symbols, ideas or mathematical models.
2	Explain an idea, situation, or mathematical relation through pictures.	Don't make a picture	The picture is wrong and the answer is wrong too	The picture is correct but the answer is wrong or the picture is wrong but the answer is correct.	Answer questions with pictures and the answer is correct.
3	Perform mathematical manipulations.	Does not create mathematic al symbols or models	The symbol or mathematical model created is incomplete and the answer is wrong	The symbol or mathematical model created is incomplete, but the answer is correct	Complete and correct symbols or mathematical models
4	Provide logical and correct reasons or evidence for the solution	Not answering the questions	Wrong reasons, proving that the flow is incomplete and the calculations are incorrect	The reasons or evidence given are not accurate but the calculations are correct.	The reasons or evidence provided are complete, precise and logical and the calculations are correct.

 Table 6. Scoring Rubric for Mathematical Communication Ability Test

Source: Modification of Performance Assessment Puji Iryanti (2004)

The steps taken in making students' final test questions are as follows :

- 1) Formulate a test grid based on indicators of mathematical communication skills which can be seen in Appendix 10.
- 2) Arrange tests based on the grid that has been made. The final test questions that have been prepared can be seen in Appendix 12.
- Validating the test. The final test questions that have been made were validated by two lecturers, namely Prof. Dr. Ahmad Fauzan, M.Pd., M.Sc and Mrs. Mirna S.Pd., M.Pd as well as a mathematics teacher for grade VIII SMP Adabiah Padang, namely Mrs. Sri Utami, S.Pd.
- 4) Conduct final test trials.
- 5) Analyze test trial results. The analysis carried out includes :

#### a) Distinguishing Power

The distinguishing power of the questions is determined by calculating the distinguishing index of the questions. The item difference index is a number that shows the difference between the high and low groups. To calculate the distinguishing power of the problem, the following steps are carried out:

- 1. Sort data from the highest value to the lowest value.
- Taking 27% of the number of students belonging to the high group and
   27% of the number of students belonging to the low group.

$$n_t = n_r = n = 27\% \times N$$

3. Calculating the degress of freedom with the formula:

 $df = (n_t - 1) + (n_r - 1)$ 

4. Determining the distinguishing power of the problem using the formula

stated by Prawironegoro (1985: 11) as follows:

$$I_p = \frac{M_t - M_r}{\sqrt{\frac{\sum x_t^2 + \sum x_r^2}{n(n-1)}}}$$

Information :

 $I_{p} = \text{problem differentiating index}$   $M_{t} = \text{high average group score}$   $M_{r} = \text{low average group score}$   $\sum x_{t}^{2} = \text{the sum of the squares of the high group score deviations}$   $\sum x_{r}^{2} = \text{the sum of the squares of the low group score deviations}$  n = 27 % x N N = banyaknya peserta tes

The question has a significant differentiation index if the count  $\geq$  Ip table at

the predetermined degrees of freedom.

IP test questions can be seen in table 7

Num of question	Count I <sub>P</sub>
1a	2,71
1b	2,72
2a	3,12
2b	2,88
3	2,71
4	4,60

 Table 7. Distinguishing Index for Test Items

From Table 7 above, it can be concluded that the four items tested all have a significant index of difference because  $I_P count \ge I_p table$ . In this study, it was obtained  $d_f = 12$  dan  $I_p table = 2,18$ . The complete calculation results can be seen in Appendix 16.

#### b) Problem Difficulty Index

The item difficulty index is calculated to find out whether the questions arranged are in the easy, medium, or difficult categories. A good question is one that is neither too easy nor too difficult. In order for the test to be widely used, each question must be investigated for its degree of difficulty. To determine the difficulty index, the formula stated by Prawironegoro (1985: 14) can be used as follows :

$$I_k = \frac{D_t + D_r}{2mn} \times 100\%$$

Keterangan:

 $I_{k} = \text{Difficulty index}$   $D_{t} = \text{number of high group scores}$   $D_{r} = \text{number of low group scores}$  m = score for each question if correct n = 27% x NN = Many test takers

With criteria:

- a) Problem is difficult, if  $I_k < 0.27$
- b) Medium problem, if  $0.27 \le I_k \le 0.73$
- c) Easy problem, if  $I_k > 0.73$

The results of the calculation of the difficulty index of the test items can be

seen in Table 8.

. Question	Ik	Description	
a	66,67%	Medium	
1b	54,76%	Medium	
2a	69,05%	Medium	

 Table 8. Difficulty Index for Trial Items

2b	52,38%	Medium
3	66,67%	Medium
4	64,29%	Medium

Based on Table 8, it can be concluded that the results of the difficulty index analysis of the test items made have moderate difficulty criteria. The results of the difficulty index calculation can be seen in Appendix 17.

c) Question Acceptance Criteria

The questions that have been analyzed are classified into groups that can be used, corrected, or replaced. According to Prawironegoro (1985: 16), the grouping is as follows:

- 1. Problems are still used if  $I_p$  significant and  $0 < I_k < 1$
- 2. Problem is corrected if:
  - a)  $I_p$  significant and  $I_k = 0$  or  $I_k = 1$
  - b)  $I_p$  insignificant and  $0 < I_k < 1$
- 3. Problem is replaced if  $I_p$  insignificant and  $I_k = 0$  or  $I_k = 1$

The criteria for receiving the questions for each item can be seen in Table 9

No.	IP	Information	<b>I</b> <sub>k</sub> (%)	Description	Classification
1a	2,71	Significant	66,67	Medium	Used
1b	2,72	Significant	54,76	Medium	Used
2a	3,12	Significant	69,05	Medium	Used
2b	2,88	Significant	52,38	Medium	Used
3	2,71	Significant	66,67	Medium	Used
4	4,60	Significant	64,29	Medium	Used

Table 9. Results of Analysis of Test Items in Trial

Based on the results of the test analysis of questions number 1 to number 4, it is  $I_p$  insignificant and  $0 < I_k < 1$ , then all questions are suitable for use as an instrument of this research. The classification of question acceptance can be seen in attachment 18.

#### d) Reliabilitas Tes

Test reliability is a measure that determines the test is reliable and produces consistent results. This means that a test is said to be reliable if the test is used to repeatedly measure the results are relatively the same or fixed. To determine the reliability coefficient of essay questions, the Alpha formula can be used as stated by Arikunto (2012: 100-123), as follows:

$$r_{11} = \left(\frac{k}{k-1}\right) \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right)$$

With :

$$\sigma_i^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N}$$

Description:

 $r_{11}$  = reliability sought  $\sum \sigma_i^2$  = the amount of variance in the score of each item  $\sigma_t^2$  = total variance k = number of question N = number of follower of the test  $\sum X$  = total score of each item  $\sum x^2$  = the sum of the squares of the score for each item

Reliability criteria are as follows:

- $0.8 < r_{11} \le 1.0$  : ver high
- $0,6 < r_{11} \le 0,8$  : high
- $0,4 < r_{11} \le 0,6$  : medium.

- $0,2 < r_{11} \le 0,4$ : low
- $0,0 < r_{11} \le 0,2$  : very low.

From the analysis results obtained the reliability value  $r_{11} = 0.6132$ . So, the test questions in this study have high reliability. Therefore this test can be used. Reliable calculations can be seen in appendix 19.

#### F. Data Analysis Technique

The data analysis aims to test the correctness of the hypothesis proposed in this study. The analysis was carried out by comparing the average scores of students' mathematical communication skills test results in the experimental class and the control class. To answer the existing problem formulations, a hypothesis test was carried out using the t test on the condition that the data must be normally distributed and homogeneous. Therefore, before testing the hypothesis, the normality and homogeneity tests are first carried out

a. Normality Test

Normality test is aim to find out whether the data is normaly distributed or not. This test has been carried out by Anderson-Darling. The calculation is done by using *software* MINITAB. The hipothesis used in this normality test are :

- H<sub>0</sub>: Final result of the class sample of students' mathematical communication skills of normal distribution
- H<sub>1</sub>: Final result of the class sample of students' mathematical communition skills of unnormal distribution
- b. Homogenity test

This homogenity test aims to determine the similarity of the variance of the two data groups whether it has homogeneous variance or not. The test used is the F-test with the help of MINITAB software with the criteria that if the P-value obtained is smaller than the real level, then reject it and accept it vice versa. The hypothesis in this test is:

$$H_0: \sigma_1^2 = \sigma_2^2$$
$$H_1: \sigma_1^2 \neq \sigma_2^2$$

**Description**:

 $\sigma_1^2$  = the variance of the final test results for the group of students who use the cooperative learning model *Think Pair Share*.

 $\sigma_2^2$  = variance of students' final group test results using conventional learning

c. Hypothesis test

Hypothesis testing aims to determine whether the research hypothesis is accepted or rejected. Hypothesis testing is carried out with the help of MINITAB software with the criteria that if the P-value obtained is smaller than the real level  $\alpha$ , then Ho is rejected. Based on the research that has been done, it is obtained that the samples are normally distributed and have homogeneous variances, so a statistical test is carried out, namely the t-test with the statistical hypothesis:

$$H_0: \mu_1 = \mu_2$$
  
 $H_1: \mu_1 > \mu_2$ 

Description:

- $\mu_1$ : The average result of the final test of the students' mathematical communication skills using the *Think Pair Share* cooperative learning model.
- $\mu_2$ : The average final test result of students' mathematical communication skills using conventional learning.

The results of hypothesis testing are discussed further in CHAPTER IV

#### **CHAPTER IV**

## **RESEARCH RESULTS AND DISCUSSION**

This chapter contains an explanation of the research results that have been obtained from the implementation of learning by applying the *Think Pair Share* cooperative learning model in the experimental class, then the results are compared with the results obtained from the implementation of learning by applying conventional learning in the control class. In sequence, data description, data analysis, and discussion of research results are discussed as follows:

## A. Research Result

#### **1.** Description of Data

This research was conducted on July 24 to date August 10, 2017. The research was conducted in six meetings and one final test in the form of a test of students' mathematical communication skills with the subject of number patterns.

The test data for students' mathematical communication skills were obtained after the final test was given to the two sample classes consisting of 4 questions in the form of an essay with a time allocation of 2 x 40 minutes in classes VIII1 and VIII2. The implementation of the final test was attended by 28 students from the experimental class (there were 2 students who did not take the test) and 24 students from the control class (there were 4 students who did not take the test). The results of data analysis on the test of students' communication skills in the experimental class and control class can be seen in Table 10 below:

Class	Number of Student	Lowest Score ( <i>x<sub>min</sub></i> )	Highest Score (x <sub>max</sub> )	Average	Standard Deviation (S)
Experiment	28	0	3	73,41	15,14
Control	24	0	3	62,27	17,87

 Table 10. Data Analysis Results of Mathematical Communication Ability

 Tests

Table 10 shows that the average value of the experimental class is higher than the average value of the control class. The average score for the experimental class was 73.41, while the average value for the control class was 62.27. The standard deviation of the experimental class is lower than the control class, this shows that the scores in the experimental class are more uniform. Complete data can be seen in Appendix 20 for the experimental class and Appendix 21 for the control class.

The test data of students' mathematical communication skills in the sample class can also be seen in more detail through each item of the test questions in accordance with the indicators of mathematical communication skills being studied. The students' abilities in each indicator of mathematical communication skills were given a score of 0, 1, 2, or 3 for the highest score according to the criteria based on the scoring rubric of the mathematical communication ability test (Table 6).

Students' mathematical communication skills increase in the cooperative learning model of this TPS type because this learning model is in accordance with the characteristics of class VIII students of SMP Adabiah Padang, namely in the first syntax at the think stage, students are directed to think for themselves about the problem given. Furthermore, in the pair stage, students match the results of the answers obtained at the think stage, and the last syntax is the share stage, students present the results of the answers obtained at the pair stage in front of the class and at this stage, the teacher guides and provides reinforcement to students to get the correct answer to the problem given to students. The following data regarding the percentage of indicators of students' mathematical communication skills in the sample class can be seen in Table 11 and Table 12 below:

 Table 11. Number of Students in the Experiment Class who Received a Score

 According to the Mathematical Communication Ability

 Indicators

Indicators	No. Of Question	Number	Average Score per Indicator			
		Score 0	Score 1	Score 2	Score 3	
1	1a	1	9	10	8	2,29
	1b	0	4	1	23	
2	2a	0	0	10	18	2,54
	2b	0	3	10	14	
3	3	1	10	10	7	1,83
4	4	3	8	10	7	1,75

## Table 12. Number of Control Class Students Who Received a ScoreAccording to the Mathematical Communication AbilityIndicators

Indicator	No. Of Question	Number o	Average Score per Indicator			
		Score 0	Score 1	Score 2	Score 3	
1	1a	0	9	1	14	1,96
	1b	0	13	5	6	
2	2a	0	9	12	3	1,73
	2b	0	10	11	3	
3	3	0	5	7	12	2,30
4	4	8	1	9	6	1,54

Description :

1 : Express real situations, pictures, diagrams or objects into the language of mathematical symbols, ideas or models.

2 : Explaining an idea, situation, or mathematical relation through pictures.

3 : Perform math manipulation.

4 : Provide logical and correct reasons or evidence for the solution.

Based on Table 11 and Table 12 above, it can be seen that for indicator 3 the number of students who get a score of 3 in the experimental class is less than the percentage of students who get a score of 3 in the control class. This means that, the students' communication skills in performing mathematical manipulation in the control class are better than the students in the experimental class, namely 12 students in the control class get a score of 3 on this indicator, while in the experimental class only 7 students get a score of 3 and as many as 10 students in the experimental class obtained a score of 1 and a score of 2 for indicator 3.

In indicator 4, students in the experimental class and control class obtained a score that was almost the same for score 3 with 7 students in the experimental class and 6 students for the control class. This shows that most students in the

experimental class and control class are still unable to provide logical and correct reasons or evidence for the solution, and it can be seen that students in the experimental class get the dominant score, namely on a score of 2 with 10 students. While in the control class, 9 students got a score of 2 and 8 students got a score of 0. From the description of indicator 4 above, it can be seen that the students 'mathematical communication skills in the experimental class were better than the students' mathematical communication skills in the control class. the average of the experimental class is higher than the control class.

Furthermore, on indicators 1 and 2 students in the experimental class have shown good communication skills. This can be seen from the number of students who get a score of 3 for each of these indicators. The number of students who obtained a score of 3 for indicator 1 in the experimental class was 8 students in question number 1a and 23 students for question 1b. Meanwhile in the control class, for the number of students who got a score of 3, there were 14 students in question number 1a and 6 students in question 1b, then in question number 2 for indicator 2 students also showed quite good communication skills, as seen from The number of students who obtained a score of 3 in the experimental class and control class respectively, namely 18 people and 3 students in question number 2a then were 14 students and 3 students for question 2b, although the students in the control class were more dominant in obtaining a score 2 in indicator 2 with 12 students in question number 2a and 11 people in question number 2b. In indicator 2, students in the control class are mostly still unable to explain an idea, situation, or mathematical relation through pictures. This can be seen from the number of

students who get a score of 2 on this indicator which is more dominant, namely 12 students for question number 2a and 11 students for question number 2b.

Regarding the description of the overall indicators for mathematical communication skills above, it can be said that in general, students 'mathematical communication skills in the experimental class are better than students' mathematical communication skills in the control class. This can be seen from the percentage of the number of students and the average score of each indicator.

## 2. Data analysis

This final test result data analysis aims to test the research hypothesis. The hypothesis in this study is "The mathematical communication skills of students who learn using the *Think Pair Share* type cooperative learning model are better than students who learn using conventional learning in class VIII SMP Adabiah Padang". To find out whether the hypothesis is accepted or rejected, the results of the mathematical communication skills test between the experimental class and the control class are compared. To test the hypothesis, first the normality and homogeneity tests were carried out with the help of MINITAB software.

## a. Normality Test

The normality test for both samples was carried out using the *Anderson Darling* test with the following hypotheses :

- $H_0$ : The data from the final test of mathematical communication skills in the sample class were normally distributed.
- $H_1$ : Data from the final test of mathematical communication skills for the sample class is not normally distributed.

Based on the results of the final test normality, the experimental class P-value was 0.401 and the control class P-value was 0.580. Because the P-value obtained by the sample class is greater than  $\alpha = 0.05$ , it can be concluded that the final test data is normally distributed (accept H0). The results of the sample class normality test analysis can be seen in Appendix 22.

#### b. Homogenity Test

The homogeneity test of variance aims to determine whether the two final test results of the sample class have homogeneous variance or not. The final test data for the two sample classes are normally distributed, so the variance homogeneity test carried out is the F-test with the following hypotheses :

$$H_0 : \sigma_1^2 = \sigma_2^2$$
$$H_1 : \sigma_1^2 \neq \sigma_2^2$$

Based on the results of the homogeneity test of the variance of the final test data, a P-value was obtained of 0.408. Because the P-value of the sample class is greater than the significant level  $\alpha = 0.05$ , it can be concluded that the final test data has homogeneous variance (accept H0). The results of the sample class homogeneity test analysis can be seen in Appendix 23.

#### c. Hypothesis test

From the results of the normality test and homogeneity test, it is known that the sample classes are normally distributed and have homogeneous variances. The hypothesis in this study are :

$$H_0: \mu_1 = \mu_2$$
  
 $H_1: \mu_1 > \mu_2$ 

with :

- $\mu_1$ : The average result of the final test of the students' mathematical communication skills using the *Think Pair Share* cooperative learning model.
- $\mu_2$ : The average final test result of students' mathematical communication skills using conventional learning.

The hypothesis is carried out using the t-test. Based on the hypothesis test, it was obtained P-value = 0.019 at the real level = 0.05. Because of the P-value, then reject it. That is, the mathematical communication skills of students who learn using the *Think Pair Share* type of cooperative learning model are better than the mathematical communication skills of students who learn using conventional learning. The results of the sample class hypothesis test analysis can be seen in Appendix 24.

#### **B.** Discussion

Based on the results of the descriptions and data analysis that has been done, the average mathematical communication ability of the experimental class students is 73.41 and the control class is 62.27. From the results of hypothesis testing, it is found that H1 is accepted with the real level  $\alpha = 0.05$ . Thus, it can be said that the mathematical communication skills of the experimental class students are better than the control class students' mathematical communication skills. This is because the experimental class applies a *Think Pair Share* type of cooperative learning model that involves students actively in the learning process through three stages contained in it.

Through these three stages, at the Thinking stage, the teacher asks questions or issues related to the lesson, then students are asked to think about these questions or issues independently for a few moments. Then in the Pairing stage, the teacher asks students to pair up with others to discuss what they have thought in the first stage. Interaction at this stage is expected to be a problem that has been tried to be thought of by students themselves, if there is difficulty, students can discuss it with a partner so that students can share together. And finally the Sharing stage, the teacher asks students to share with the whole class what they have talked about. This is in accordance with the opinion of Ibrahim (2000: 26) that based on the stages of *Think Pair Share* it is expected that students' mathematical communication indicators are achieved.

The cooperative learning model of the *Think Pair Share* type is an effective way to create a variety of class discussion atmosphere. This is in accordance with Arends' theory (in Trianto 2012: 81) that the *Think Pair Share* learning model can give students time to think, to respond and help each other. In this case students have more time to think about answers to questions / problems posed by the teacher, students are given the opportunity to respond to answers put forward by their peers, and students are trusted to help their friends on various occasions, both in completing assignments and in understanding subject matter

*Think Pair Share* is a simple technique with a wide advantage, which can improve students' ability to remember information and a student can also learn from other students and share ideas for discussion before submitting them to the class. This is in accordance with Arends' theory (in Khaerudin, 2006: 26) which states that thinking in pairs is an effective way to change discourse patterns in the classroom. With this learning model, students are trained how to express opinions and students also learn to respect the opinions of others by still referring to the material / learning objectives.

From the description above, it can be interpreted that the cooperative learning model of the *Think Pair Share* type is able to have an influence on students' mathematical communication skills. Because in learning, the teacher does not directly provide concepts to students but students get concepts from the material being studied with their understanding or the results of their own thinking. Students are said to have good mathematical communication skills if in the learning process students can show indicators of mathematical communication skills. From the data from the final test results, each indicator of students' mathematical communication skills will be discussed in 4 items in the final test and there are four indicators of mathematical communication skills in it. Among them: expressing situations, pictures, diagrams or real objects into the language of symbols, ideas, or mathematical models, explaining a mathematical idea, situation or relation through pictures, performing mathematical manipulations and providing logical and correct reasons or evidence for solutions.

Although in general students' mathematical communication skills in the experimental class are better, there is one indicator for mathematical communication skills which shows students in the control class have better mathematical communication skills than students in the experimental class. The mean score of students in the control class for indicator 3 was 2.30, while the students' average score in the experimental class was 1.83. This shows that for

indicators of doing mathematical manipulation, the *Think Pair Share* type is less influential.

The effect of the *Think Pair Share* cooperative learning model on students' mathematical communication abilities is seen in indicators 1, 2 and 4. The average scores for this indicator in the experimental class are 2.29, 2.54 and 1.75 respectively. while the average scores for the control class were 1.96, 1.73, and 1.54, respectively.

The following is an example of student answers to questions based on the observed indicators, namely:

# 1. Expressing real situations, pictures, diagrams or objects into the language of symbols, ideas, or mathematical models.

In this indicator, students are expected to be able to express situations, pictures, diagrams or real objects into the language of symbols, ideas, or mathematical models of the material being studied. In the final test questions, this indicator is found in question number 1, namely 1a and 1b. Based on tables 11 and 12, it can be seen that the number of students who obtained a score of 3 in the experimental class related to this indicator was higher than the number of students in the control class with the average score of students' mathematical communication skills in the experimental class, namely 2.29 and 1.96 in the experimental class. Control class. The following are questions along with examples of student answers related to indicator 1.

## Question

Tono memiliki kelereng dan ia ingin menyusun kelereng tersebut dengan susunan yang teratur seperti gambar berikut :



- a) Tentukanlah banyaknya kelereng Tono pada susunan ke-8 !
- b) Berapakah jumlah kelereng Tono pada susunan ke-15?

The following is an example of a student's answer to question No. 1



Figure 4. Examples of Answers from Experimental Class Students for Indicator 1 in Problem Number 1

Based on the results of the students' answers in Figure 4 above, it can be seen that students in the experimental class have been able to express situations, pictures, diagrams or real objects into the language of symbols, ideas, or mathematical models of the problems given, the calculations made are also
correct, and It can be understood that students in the experimental class have shown good mathematical communication skills for this indicator. It can be seen from the students' answers to questions number 1a and 1b, as many as 8 and 23 students in the experimental class obtained a score of 3 in solving these problems. Whereas in the control class, although there are students who show good mathematical communication for indicator 1, in general students are still wrong in solving the problems given as shown in Figure 5 below:

Diket : Tono memiliki kelereng dan ia Ingin menyusun tersebut dengan susunan yang teratur Kelereng Seperti gambar berikut: 800 O 00 2 1 0000 4 a). Tentukanlah banyaknya kelereng tono Ditanya : Susunan Ke-8 Pada : b). Berapakah Jumlah Kelereng tono pada  $un = n^{2} = n \times n = n^{2}$   $8 \cdot 8^{2} = 8 \times 8 = 64$   $Un = n^{2} = n \times n = n^{2}$   $IS = IS^{2} = IS \times IF$ KP - 15 Jusunan a). Tawab 6): Score

Figure 5. Examples of Answers from Control Class Students for Indicator 1 in Problem Number 1

From Figure 5, it can be seen that students in the control class are still wrong in solving the problems given. This happens because students in the control class do not understand the material about the problem, namely they equate the formula to determine the number of the nth term and determine the number of the nth term of a pattern in a given sequence of numbers. It can be seen that as many as 14 and 6 students in the control class got a score of 3 for questions number 1a and 1b, meanwhile there were 9 and 13 students respectively getting a score of 1 for this indicator in questions number 1a and 1b.

#### 2. Explain an idea, situation, or mathematical relation through pictures.

Indicator 2 contains questions number 2a and 2b. Students are asked to explain an idea, situation, or mathematical relationship through a picture of the problem given. Where in this problem students are asked to draw and determine the number of nth terms of the pattern in a known sequence of numbers. In general, students in the experimental group were able to solve problems correctly. The following are questions along with examples of student answers in the experimental class and control class for indicator 2.

#### Question

Seorang pekerja bangunan ingin menyusun batu bata dengan susunan yang rapi dan teratur. Agar terlihat menarik, pekerja bangunan itu mengelompokkan batu bata tersebut dengan susunan 1, 3, 6, 10, ... dst.

- a) Gambarkanlah susunan masing masing batu bata dari soal di atas !
- b) Gambar dan tentukanlah banyaknya batu bata pada susunan ke-5 dan ke-6!

#### Students' Answer

The following is an example of a student's answer to question no 2.



Figure 6. Examples of Answers from Experimental Class Students for Indicator 2 in Problem Number 2

Figure 6 shows that students in the experimental class have been able to explain an idea, situation, or mathematical relation through pictures of the problems given. The picture made is also correct and the answer is correct. It can be seen that the students have shown good mathematical communication skills for this indicator. A total of 18 and 14 students in the experimental class got a score of 3 in solving problems in questions 2a and 2b, 10 students got a score of 2 for question number 2a and 10 students in question number 2b, then there were 3 students who got a score of 1 for questions number 2b, and no student gets a score of 0 on this indicator.

Whereas in the control class, although there are students who show good communication skills for indicator 2, in general students are still wrong in drawing according to the pattern on the requested number sequence, as shown in Figure 7 below:



Figure 7. Examples of Answers from Control Class Students for Indicator 2 in Problem Number 2

From Figure 7, it can be seen that students in the control group are still wrong in describing bricks according to the pattern in the known sequence of numbers, it can be seen from the picture above that students in the control class describe the shape of bricks in the form of a circle. This happens because students in the control class do not understand and communicate the problems given and they just draw without analyzing the questions on this indicator.

Of the 24 students who took the test in the control class, 9 and 10 students got a score of 1 for questions number 2a and 2b respectively, 3 students got a score of 3 for questions number 2a and 2b, then no student got a score of 0 on this indicator and the rest get a score of 2 with the most number of students for this question in the control class with a total of 12 students for question number 2a and 11 people for question number 2b.

## **3.** Perform mathematical manipulation.

In indicator 3, both the experimental class and the control class already have students who are able to perform mathematical manipulations appropriately. In this indicator, students are given the problem of determining the nth syllable of a known arithmetic sequence. The following are questions along with examples of student answers related to indicator 3.

## Question

Suku ke-4 dan suku ke-9 suatu barisan aritmatika berturut-turut adalah 110 dan 150. Tentukanlah suku ke-30 dari barisan bilangan tersebut!!

## Students' Answer

#### **Experiment Class**

2 3. U4 = a+3b = 110 Ug = a tab = 150	
a + 3b = 110 -> a = 110 -	3b = 110 - 3b 110 - 3(8)
$\rightarrow 110 - 36 + 86 = 150$	85
10+56 2150	a+(n-1)b
56 = 40	a + 29b ab + 29(a)
	86 + 232 318. Skor 2





Figure 8. Examples of Student Answers for the Two Sample Classes in Problem Number 3 for Indicator 3

Figure 8 shows that students in the experimental class and control class are able to perform mathematical manipulations appropriately. On this indicator, as many as 12 students in the control class obtained a score of 3 which means that students in this class have good mathematical communication skills, while in the experimental class only 7 students get a score of 3. While the lowest score obtained by students in the control class is a score of 1, and the lowest score obtained by students in the experimental class is a score of 0. This causes that for indicator 3 students 'mathematical communication skills in the control class are better than the students' mathematical communication skills in the experimental class.

#### 4. Provide logical and correct reasons or evidence for the solution.

The last indicator is indicator 4. In this indicator, students are asked to provide logical and correct reasons or evidence for the solution to the problem given. For indicator 4, both students in the experimental class and control class are able to provide logical and correct reasons or evidence for the correct solution to the problem given. Following are questions along with examples of student answers related to indicator 4.

#### Question

Seorang Ibu membagikan permen kepada 5 orang anaknya dengan aturan semakin muda usia anak semakin banyak permen yang diperolehnya. Jika permen yang diterima anak kedua 11 buah dan anak keempat 19 buah, periksalah apakah benar jumlah seluruh permen yang dibagikan Ibu tersebut kepada 5 anaknya sebanyak 75 buah permen. Jelaskan jawaban Ananda !

### Student Answer

#### **Experiment Class**

4. $U_2 = 11 \iff a + (2-1) \implies a + 1 \implies 11$ $U_4 = 19 \iff a + (4-1) \implies (a + 3 \implies 15$	···· (W)
subshihisikon nilai b=4 -	
a + 1b = 11 a = 11 - 16 a = 11 - 1(y) a : 11 - y	
materi Jumlah Permen yang dibagikan upitu	Ibu kepada s-anal nya





Figure 9. Examples of Student Answers for the Two Sample Classes in Problem Number 4 for Indicator 4

Figure 9 shows that students in the experimental class and control class are able to provide logical and correct reasons or evidence for the solution of the problem given. In this indicator, it can be seen that as many as 7 students in the experimental class and 6 students in the control class got a score of 3, the highest score for the experimental class was also the same as the control class, namely 2 with the number of students in the experimental class namely 10 students and 9 people. students in the control class. However, for this indicator students in the control class obtained a score of 0 with a large number of students, namely 8 students.

Although on this indicator the experimental class has the same highest score as the control class, namely 2, but students in the experimental class are said to have better mathematical communication skills than students in the control class for indicator 4 because the average score of students' mathematical communication skills in the class The experimental class was higher than the control class with an average of 1.75 for the experimental class and 1.54 for the control class.

Based on the discussion of indicators for mathematical communication skills above, it is known that for indicators 1, 2 and 4 students in the experimental class have shown much better mathematical communication skills than students in the control class. This is influenced by the application of the think pair share cooperative learning model in the learning process. So, based on the description above, it can be concluded that overall students 'mathematical communication skills in the experimental class are better than students' mathematical communication skills in the control class. This can be achieved because students are able to build their own knowledge by learning independently and are willing to cooperate with their peers during the learning process.

#### C. Research Constraints

During the research, there were several obstacles that the researchers encountered in implementing the learning process using the think pair share cooperative model. These obstacles include :

- 1. Because at the time of this research the researchers started in the new academic year, so the first 2 weeks of learning was still not effective, because there were still students who moved locally and the lesson schedule was still not fixed and changed frequently.
- 2. When conducting research, at the first meeting students were still unfamiliar with the applied learning, because so far they were used to the learning described by the teacher and passive students in the learning process and there were several groups who did not read the instructions contained in the LKS so they tended to ask questions what is the order and takes a relatively long time. For that, it is necessary to remind each group to first read the instructions contained in the LKS given, then discuss the answers. However, at the next meeting, students were able to adjust to the applied learning.
- 3. At the time of group formation, when they were asked to form groups most of them were still playing and joking around turning chairs or tables and there were students who did not fit in with the group mates set by the teacher. However, after being given an explanation of the benefits they will get, they can cooperate well with their group friends

- 4. Time limitations, this can be seen when students spend a lot of time solving problems that exist in the given worksheets. In addition, when one of the groups was asked to present the results of their discussion they were not confident, so it took a long time to ask students to present the results of the discussion in front of the class so that the time for group presentations was less effective.
- 5. Another obstacle faced in the learning process was the presence of students who did not pay attention and did not participate when the group presented the results of the discussion in front of the class. To overcome this, a warning is given to students who do not pay attention to the group whose presentation will be marked with their names and their scores deducted. This is also useful for them to motivate and further increase their activeness in the learning activities carried out.

#### **CHAPTER V**

#### CLOSING

#### A. Conclusion

Based on the results of the data analysis and discussion that has been carried out, it can be concluded that :

- Mathematical communication skills of class VIII students of SMP Adabiah Padang in the 2017/2018 academic year who learn using the *Think Pair Share* (TPS) type of cooperative learning model are better than the mathematical communication skills of students who learn with conventional learning.
- 2. Mathematical communication skills of students who learn using the TPStype cooperative learning model have generally increased for each student's mathematical communication indicator at each meeting during the study. This indicates that the TPS type of cooperative learning model affects students' mathematical communication skills.

#### B. Suggestion

Based on the above conclusions, the following are suggested :

- 1. Learning that is carried out should not only aim to provide learning concepts, but also to train students in developing their mathematical communication skills as well.
- 2. Students' mathematical communication skills can be developed, one of which is by using the TPS cooperative learning model, so that this model should be implemented more frequently in mathematics learning in schools

because students' mathematical communication skills are something that students really need in facing challenges in the future.

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## **ATTACHMENT 1**

# DISTRIBUTION OF EVEN SEMESTER FINAL EXAM SCORE CLASS VIII MATHEMATICS LESSON

ADABIAH JUNIOR HIGH SCHOOL PADANG IN ACADEMIC YEAR 2017/2018

VIII 1	VIII 2	VIII 3	VIII 4	VIII 5	VIII 6
33	48	15	80	75	45
84	55	63	75	55	80
55	70	80	68	35	58
73	61	58	63	58	55
70	64	35	50	45	80
80	56	43	48	43	70
25	50	50	45	58	65
75	45	45	48	75	38
43	65	60	65	80	43
64	45	83	33	55	50
82	25	28	75	55	75
70	20	65	63	60	15
73	40	68	40	65	50
40	50	75	85	48	25
85	71	78	33	65	63
67	78	70	63	30	40
60	60	71	35	70	15
60	75	50	58	33	70
45	80	55	70	85	83
88	32	40	53	80	65
30	55	40	78	53	78
25	68	72	43	55	85
33	70	75	65	48	80
40	45	60	55	73	30
74	65	65	40	35	45
67	82	50	80	78	63
50	55	75			
65	80	70			
50					
55					

#### **ATTACHMENT 2**

## NORMALITY TEST OF EVEN SEMESTER FINAL EXAM SCORE CLASS VIII MATHEMATICS LESSON ADABIAH JUNIOR HIGH SCHOOL PADANG IN ACADEMIC YEAR 2017/2018













## HOMOGENITY TEST OF EVEN SEMESTER FINAL EXAM SCORE CLASS VIII MATHEMATICS LESSON ADABIAH JUNIOR HIGH SCHOOL PADANG IN ACADEMIC YEAR 2017/2018



## **ATTACHMENT 4**

# POPULATION AVERAGE EQUITY TEST

## One-way ANOVA: C10 versus KELAS

Source KELAS Error Total	e DF 5 158 163	SS 98 48626 48724	MS 20 308	F 0.06	P 0.997				
S = 17	.54	R-Sq =	0.20%	R-Sq (	adj) =	0.00%			
Indivi Pooled	dual 9 StDev	95% CIs 7	For Me	an Base	d on				
Level	Ν	Mean	StDev		+	+		+	+
VIII 1	. 30	58.70	18.84		(		*		)
VIII 2	28	57.50	16.36	(			_*		)
VIII 3	3 28	58.54	16.97		(		*		)
VIII 4	26	58.12	15.76	( –			*		)
VIII 5	5 26	58.15	15.83	( –			*		)
VIII 6	5 26	56.38	20.84	(		*_			)
52.0	-+ 56	+ 5.0	60.0	-+ 64	+ .0	-			

Pooled StDev = 17.54

## **ATTACHMENT 5**

## **RESEARCH TIME TABLE**

Monting	DAYS/DATES	
Meeting	Experiment Class	Control Class
1	Monday / 24 Juli 2017	Tuesday / 25 Juli 2017
	Time : 10.10 – 11.30 WIB	Time : 10.50 – 12.10 WIB
		Break
		13.10 – 13.50 WIB
2	Tuesday / 25 Juli 2017	Thursday / 27 Juli 2017
	Time : 07.10 – 09.10 WIB	Time : 07.10 – 08.30 WIB
3	Monday / 31 Juli 2017	Tuesday / 01 Agustus 2017
	Time : 10.10 – 11.30 WIB	Time : 10.50 – 12.10 WIB
		Break
		13.10 – 13.50 WIB
4	Tuesday / 01 Agustus 2017	Thursday / 03 Agustus 2017
	Time : 07.10 – 09.10 WIB	Time : 07.10 – 08.30 WIB
5	Monday / 07 Agustus 2017	Tuesday / 08 Agustus 2017
	Time : 10.10 – 11.30 WIB	Time : 10.50 – 12.10 WIB
		Break
		13.10 – 13.50 WIB
6	Tuesday / 08 Agustus 2017	Thursday / 10 Agustus 2017
	Time : 07.10 – 09.10 WIB	Time : 07.10 – 08.30 WIB

#### LEARNING IMPLEMENTATION PLAN VALIDATION SHEET

Education units	: SMP Adabiah Padang
Subject	: Matematika
Class / Semester	: VIII / I
Main Subject	: Specifies a pattern in a sequence of numbers or object configuration sequence.

## **Assessment Instructions**

Put a check mark ( $\sqrt{}$ ) in the assessment column below with the assessment criteria

as follows:

Answer column 1: Disagree

Answer column 2: Less agree

Answer column 3: Agree

Answer column 4: Strongly Agree

No	No Components / Indicators		sessi	Note		
INO			2	3	4	note
I. Gei	neral					
Α	Arranged for each KD which can be					
	implemented in one or more meetings.					
В	RPP components: subject identity, KI, KD,					
	indicators of competency achievement,					
	learning objectives, teaching materials,					
	time allocation, learning methods, learning					
	activities (introduction, core, cover),					
	assessment of learning outcomes and					
	learning resources.					
II. Ex	xplanation of RPP Components					
Α	RPP identity					
	Includes educational units, classes,					
	semesters, subjects, number of meetings.					
В	KI dan KD					
	The KI and KD that are developed are					
	interrelated.					
С	Indicator	•	•			

	1	Indicators are developed in accordance					
		with the characteristics of students					
		with the characteristics of students,					
		subjects, educational units, and regional					
		potential.					
	2	Indicators are formulated using					
		measurable and observable operational					
		verbs that include knowledge, skills					
		and attitudes.					
	3	Indicators are used as a basis for					
		developing assessment tools.					
	4	Each KD is developed into several					
		indicators.					
D	L	earning objectives	1		1	1	
	D	escribe the process and learning					
	οι	atcomes that are expected to be achieved					
	by students in accordance with basic						
	co	ompetencies./					
Ε	T	eaching Materials					
	1	Contains relevant facts, concepts,					
		principles and procedures.					
	2	The material coverage is in accordance					
		with the competencies to be achieved.					
F	T	ime Allocation					
	1	In accordance with the needs for					
		learning load.					
G	T	hink Pair Share Type Cooperative Lear	ning				
	1	In accordance with the situation and					
		conditions of students.					
	2	In accordance with the characteristics					
		of the indicators and competencies to					
		be achieved in each subject.					

	3	Activities in each stage involve active					
		student participation.					
	4	RPP contains all stages of cooperative					
		learning type think pair share.					
Н		earning Activities	1				
	I	Preliminary					
		Initial activities to generate motivation					
		and focus the attention of students to					
		actively participate in the learning					
		process.					
		Core activities					
		a. Is a learning process to achieve					
		learning objectives using the					
		cooperative learning model think pair					
		share.					
		a. Learning activities have been carried					
		out systematically.					
		b. Performed interactively, inspiring,					
		fun, challenging, motivating students to					
		participate actively and providing					
		Assessment of Learning Outcomes					
	sufficient space for initiative, creativity,						
		and independence according to the					
		talents, interests, and physical and					
		psychological development of students.					
	3	c. Done systematically using cooperative	e le	arnii	ng t	ype	think pair
		share.					
		Closing					
		a. Reflect on activities to end learning			<u> </u>		
		activities					
		b. Make a summary or conclusion and					

	judgment.					
Ι	Assessment of Learning Outcomes					
	1 The procedures and instruments for assessing the process and learning outcomes are adjusted to the indicators of competency achievement.					
J	Learning Resources					
	Determination of learning resources is					
	based on KI, KD, teaching materials,					
	learning activities, and indicators of					
	competency achievement.					

## **General Assesment**

Assessment	assessment criteria
1. Not Good	Not yet usable (still requires consultation)
2. Not so good	Can be used with multiple revisions
3. Good Enough	Can be used with minor revisions
4. Good	Can be used without revision

## Validator Recommendations for RPP :

Padang, July 2017 Validator,

( ..... )

#### **ATTACHMENT 7**

#### LEARNING IMPLEMENTATION PLAN VALIDATION SHEET

Education units	: SMP Adabiah Padang
Subject	: Matematika
Class / Semester	: VIII / I
Main Subject	: Pola Bilangan

Allocation of Meeting Time : 15 x 40 minutes (6 meeting)

### A. CORE COMPETENCIES

- 1 : Living and practicing the teachings of the religion they adhere to.
- 2 : Respect and appreciate honest behavior, discipline, responsibility, care (tolerance, mutual cooperation), courteous, self-confidence, in interacting effectively with the social and natural environment within the range of associations and existence.
- 3 : Understand knowledge (factual, conceptual, and procedural) based on his curiosity about science, technology, art, culture, related phenomena and visible events.
- 4 : Trying, processing, and presenting in the realm of the concrete (using, unraveling, arranging, modifying, and making) and the abstract realm (writing, reading, counting, drawing, and composing) in accordance with what is learned in school and other sources similar to point of view / theory.

#### **B. BASIC COMPETENCIES**

- 1.1 Living and practicing the teachings of his religion.
- 2.1 Demonstrating a logical, critical, analytic, consistent, thorough, responsible, responsive, and not easy to give up in solving problems.
- 2.2 Have curiosity, confidence and interest in mathematics and have a belief in the power and usefulness of mathematics, which is formed through learning experiences.
- 2.3 Having an open, polite, objective attitude, respecting the opinions and work of friends in group interactions and daily activities.
- 3.1 Specifying a pattern in a number sequence or configuration sequence of objects.
- 4.1 Solving problems related to patterns in the sequence of numbers or

configuration of objects.

## C. INDICATORS OF COMPETENCY ACHIEVEMENT

The indicators of competency attainment by students are :

#### LESSON -1

- 1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.
- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.1 Finding patterns in a sequence of numbers.
- 3.1.2 Determine the pattern of square numbers.
- 4.1.1 Solve real problems related to patterns in a sequence of numbers.
- 4.1.2 Solving real problems related to square number patterns.

#### LESSON - 2

- 1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.
- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.3 Specifying a rectangular number pattern.
- 3.1.4 Determine the triangular number pattern.
- 4.1.3 Solve real problems related to rectangular number patterns.
- 4.1.4 Solving real problems related to triangular number patterns.

#### LESSON - 3

- 1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.
- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.5 Determine the pattern of odd number sequences.
- 3.1.6 Determining the pattern in even number sequences.
- 4.1.5 Solve real problems related to patterns in odd number sequences.
- 4.1.6 Solving real problems related to patterns in even numbers.

#### LESSON - 4

- 1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.
- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.7 Determining the pattern in the Pascal triangle number sequence.
- 3.1.8 Determining the pattern on the Fibonacci number sequence.
- 4.1.7 Solving real problems related to the pattern in the Pascal sequence of numbers.
- 4.1.8 Solving real problems related to patterns in the Fibonacci sequence.

#### LESSON-5

1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.

- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.9 Determine the pattern in the sequence of cubes.
- 3.1.10 Determining the pattern in the row number blocks.
- 4.1.9 Solving real problems related to the pattern in the sequence of cubes.
- 4.1.10 Solving real problems related to the pattern in the sequence of blocks.

#### LESSON-6

- 1.1.1 Increase gratitude for the mind given by God so that they can learn patterns in the sequence of numbers that are useful in everyday life.
- 2.1.1 Shows a meticulous attitude in studying pattern material in the sequence of numbers.
- 2.1.2 Shows a responsible attitude in solving problems about patterns in the sequence of numbers.
- 2.2.1 Shows curiosity in studying pattern material on a number sequence.
- 2.2.2 Shows a confident attitude in presenting the results of the discussion in front of the class regarding the pattern material in the number sequence.
- 3.1.11 Determine the number pattern of an arithmetic sequence.
- 3.1.12 Calculating the nth term of the arithmetic sequence.
- 3.1.13 Determining the number pattern of a geometric sequence.
- 3.1.14 Calculating the nth term of a geometric sequence.
- 4.1.11 Solving real problems related to arithmetic sequences.
- 4.1.12 Solving real problems related to geometric sequences.

## **D. LEARNING OBJECTIVES**

After participating in the learning process using the think pair share type learning model, it is expected :

## Lesson -1

- a) Students are able to find patterns in a sequence of numbers correctly.
- b) Students are able to determine the correct polabarisan of square numbers.
- c) Students are able to solve problems related to number sequence patterns correctly.
- d) Students are able to solve real problems related to the pattern of squares sequence numbers correctly.

## Lesson –2

- a) Students are able to determine the pattern of rectangular sequence numbers correctly.
- b) Students are able to determine the pattern of the triangular sequence numbers correctly.
- c) Students are able to solve problems related to the pattern of rectangular sequence numbers correctly.
- d) Students are able to solve problems related to the triangular sequence pattern correctly.

## Lesson – 3

- a) Students are able to determine the pattern of odd number sequences correctly.
- b) Students are able to determine the pattern of even numbers correctly.
- c) Students are able to solve problems related to the odd number sequence pattern correctly.
- d) Students are able to solve problems related to the even number sequence pattern correctly.

## Lesson-4

- a) Students are able to determine the correct pattern of the Pascal triangle number sequence.
- b) Students are able to determine the pattern of the Fibonacci sequence numbers correctly.

- c) Students are able to solve problems related to the Pascal triangle number sequence pattern correctly.
- d) Students are able to solve problems related to the pattern of the Fibonacci sequence numbers correctly.

#### Lesson - 5

- a) Students are able to determine the pattern of the sequence of cube numbers correctly.
- b) Students are able to determine the pattern of the sequence of block numbers correctly.
- c) Students are able to solve problems related to the sequence pattern of the cube numbers correctly.
- d) Students are able to solve problems related to the sequence pattern of block numbers correctly.

#### Lesson - 6

- a) Students are able to determine the pattern of the arithmetic sequence numbers correctly.
- b) Students are able to calculate the nth term of the arithmetic sequence correctly.
- c) Students are able to determine the sequence pattern of geometric numbers correctly.
- d) Students are able to calculate the nth term of the geometric sequence correctly.
- e) Students are able to solve problems related to arithmetic sequence patterns correctly.
- f) Students are able to solve problems related to geometric number sequence patterns correctly.

#### E. LEARNING MATERIALS

Main Subject : Specifies a pattern in a sequence of numbers.

## LESSON - 1

#### 1) FACT

#### a. Pattern in a Sequence of Square Numbers

- i. Many of the terms in the sequence are written with the symbol n.
- ii. The nth term in the sequence of squares is written with the symbol Un.

iii. The number of the first term in the sequence of numbers is written with the symbol Sn.

#### 2) CONCEPT

- a. Number pattern is an arrangement of numbers that have an orderly shape from one form to the next.
- b. A sequence of numbers is a set of numbers that have been ordered and have a certain pattern.
- c. A sequence of numbers is a sequence of numbers forming a square pattern.

#### 3) PRINCIPLE

#### A sequence of square numbers

a) Determine the nth term of a square number.

To determine the nth term of the sequence of squares, the formula:  $Un = Un = n^2$ 

b) Determine the number of the first n terms of a square number. To determine the number of the first n terms in the sequence of squares, the formula:  $Sn = Sn = \frac{1}{6}n(n + 1)(2n + 1)$ 

## 4) **PROCEDURE**

To determine the nth term and the number of the first n terms of a square number sequence, it is necessary to determine the value of n first, then you can directly enter the value of n into the existing formula.

#### <u>LESSON -2</u>

### 1. FACT

#### a. <u>Rectangular sequence of numbers</u>

- i. Many terms in a rectangular sequence are written with the symbol n.
- ii. The nth term in a rectangular sequence is written with the symbol Un.
  - iv. The number of the first term in the rectangular sequence is written with the symbol Sn.

#### b. Triangular sequence

- i. Many of the terms in the triangular sequence are written with the symbol n.
- ii. The nth term in the sequence of triangular numbers is written with the symbol Un.
- iii. The number of the first term in the triangle sequence is written with the symbol Sn.

## 2. CONCEPT

- 1. A rectangular sequence of numbers is a sequence of numbers forming a rectangular pattern.
- 2. A triangular number sequence is a sequence of numbers forming a triangular number pattern.

## **3. PRINCIPLE**

## a. <u>Rectangular sequence of numbers</u>

- a) Determine the nth term of a rectangular number.
  - To determine the nth term of a rectangular sequence of numbers, the formula is used: Un = n (n + 1)
- b) Determine the number of the first n terms of a rectangular number.

To determine the number of the first n terms in a rectangular sequence, the formula is used: Sn = n (n + 1) (n + 2)

## b. Triangular sequence

a. Find the nth term of a triangular number.

To determine the nth term in the triangular sequence, the formula is used: Un = Un =  $\frac{n(n+1)}{2}$ 

b. Determine the number of the first n terms of a triangular number.

To determine the number of the first n terms in the triangular sequence, the formula:  $Sn = \frac{1}{6}n(n+1)(n+2)$ 

#### 4. PROCEDURE

To determine the nth term and the number of the first n terms of the rectangular and triangular sequence, it is necessary to determine the value of n first, then you can directly insert the value of n into the existing formula.

## $\underline{LESSON-3}$

## 1) FACT

## a) <u>An odd number sequence</u>

- i. Many terms in an odd number sequence are written with the symbol n.
- ii. The nth term in an odd number sequence is written with the symbol Un.
- iii. The number of the first term in an odd number sequence is written with the symbol Sn.

## b) An even number sequence

- i. Many terms in an even number sequence are written with the symbol n.
- ii. The nth term in an even number sequence is written with the symbol Un.
- iii. The number of the first syllable in the even number sequence is written with the symbol Sn.

## 2) CONCEPT

- a. An odd number sequence is a sequence of numbers made up of odd numbers.
- b. An even number sequence is a sequence of numbers formed from even numbers.

## 3) **PRINCIPLE**

## a. Odd number sequence

a). Determine the nth term of an odd number.To determine the nth term in an odd number sequence, the

formula is used: Un = 2n - 1

b). Find the total of the first n terms of an odd number. To determine the number of the first n terms in an odd number sequence, a formula is used:  $\mathbf{Sn} = \mathbf{n}^2$ 

## b. Even number sequence

a) Determine the nth term of an even number.

To determine the nth term in an even number sequence, the formula is used: Un = 2n
b) Determine the number of the first n terms of an even number. To determine the number of the first n terms in an even number sequence, the formula: Sn = + n is used

## 4) **PROCEDURE**

To determine the nth term and the number of the first n terms of the odd and even number sequence, it is necessary to determine the value of n first, then you can directly enter the value of n into the existing formula.

## $\underline{LESSON-4}$

## 1. FACT

#### a. <u>Pascal's Triangle sequence</u>

- i. Many of the terms in the Pascal sequence are written with the symbol n.
- ii. The nth term in the Pascal sequence of numbers is written with the symbol Un.
- iii. The number of the first term in the Pascal triangle number sequence is written with the symbol Sn.

## b. Fibonacci sequence of numbers

- i. Many of the terms in the Fibonacci sequence are written with the symbol n.
- ii. The nth term in the Fibonacci sequence is written with the symbol Un.
- iii. The number of the first term in the Fibonacci sequence is written with the symbol Sn.

## 2. CONCEPT

- a) The sequence of numbers for the Pascal triangle is the sequence of numbers formed from the numbers of the Pascal triangle.
- b) A Fibonacci sequence is a sequence of numbers where the sum of the numbers after is the result of the sum of the two previous numbers.

#### 3. PRINCIPLE

#### a. <u>Pascal's Triangle sequence</u>

a) Determine the number of nth numbers from a sequence of Pascal triangles.

b) To determine the number of nth numbers from a sequence of Pascal triangles, the formula:  $Sn=2^n - 1$ 

#### a. Fibonacci sequence of numbers

- a) Determine the nth term of a Fibonacci number.
  - To determine the nth term in the Fibonacci sequence, the formula is used: Un = Un 1 + Un 2
- b) Determine the number of the first n terms of a Fibonacci number. To determine the number of the first n terms in the Fibonacci sequence, the formula is used:  $Sn = 2Un + U(n - 1) - U_2$

#### 4. PROCEDURE

- a) To determine the number of a sequence of Pascal triangles, it is necessary to determine the value of n first, then directly enter the value of n into the existing formula.
- b) To determine the nth term and the number of the first n terms of the

Fibonacci sequence, it is necessary to determine the value of n first,

then you can directly enter the value of n into the existing formula.

#### LESSON - 5

#### 1) FACT

#### a) The sequence of cubes (cubic)

- i. Many of the terms in the cube sequence are written with the symbol n.
- ii. The nth term in the cube sequence is written with the symbol Un.
- iii. The number of the first term in the cube sequence is written with the symbol Sn.

#### b) The sequence of block numbers

- i. The number of terms in the block number sequence is written with the symbol n.
- ii. The nth term in the sequence of block numbers is written with the symbol Un.
- iii. The number of the first term in the block number sequence is written with the symbol Sn.

#### 2) CONCEPT

- a. A cube (cubic) sequence is a sequence of numbers made up of cubic numbers (multiply by the number itself three times).
- b. A row of block numbers is a sequence of numbers made up of block numbers.

#### 3) PRINCIPLE

## a) <u>A sequence of cubes</u>

i. Find the nth term of a cube sequence.

To determine the nth term in the cube sequence, the formula is used:  $\text{Un} = \mathbf{n}^{3}$ 

ii. Determines the number of the first n terms of a cube sequence.

To determine the number of the first n terms in the cube sequence, the formula is used:  $Sn = \frac{1}{4}n^2(n+1)^2$ 

#### b) The sequence of block numbers

- i. Find the nth term of a sequence of block numbers. To determine the nth term in a row of block numbers, the formula: Un = n(n+1)(n+2)
- ii. Determine the sum of the first n terms of a sequence of block numbers.

To determine the number of the first n terms in the block number sequence, the formula: Sn  $=\frac{1}{4}$  n(n+1)(n+2)(n+3)

#### 4) **PROCEDURE**

To determine the nth term and the number of the first n terms of the cube number sequence and block number sequence, it is necessary to first determine what the value of n is, then you can directly enter the value of n into the existing formula.

## LESSON - 6

#### 1. FACT

#### a) Arithmetic sequence

- 1. The initial term in the arithmetic sequence is written with the symbol a.
- 2. Differences in the arithmetic sequence are written with the symbol b.
- 3. Many of the terms in the arithmetic sequence are written with the symbol n.
- 4. The nth term in the arithmetic sequence is written with the symbol Un.
- 5. The number of the first syllable in the arithmetic sequence is written with the symbol Sn.

#### b) Geometry number sequence

- 1. The initial term in a geometric sequence is written with the symbol a.
- 2. The ratio in the geometric sequence is written with the symbol r.
- 3. Many terms in a geometric number sequence are written with the symbol n.
- 4. The nth term in the geometric sequence is written with the symbol Un.
- 5. The number of the first term in the geometric number sequence is written with the symbol Sn.

## 2. CONCEPT

- a) Arithmetic sequence is a sequence of numbers where the difference between two adjacent numbers is always the same.
- b) Geometry Sequence is a sequence whose terms are obtained by multiplying one fixed number to the previous term.

## 3. PRINCIPLE

#### a) Arithmetic Sequences

a. Determine the nth term of an arithmetic sequence. To determine the nth term in the arithmetic sequence of numbers, the formula is used: Un = a + (n-1) b b. Determines the sum of the first n terms of an arithmetic sequence.

To determine the number of the first n terms of the arithmetic sequence, the formula is used: Sn = (a + Un) or Sn = (2 a + (n - 1) b)

#### b) Barisan Geometri

- a. Determine the nth term of a geometric number sequence. To determine the nth term of a geometric sequence of numbers, the formula is used: Un = ar (n-1)
- b. Determines the sum of the first n terms of a geometric number sequence.To determine the number of the first n terms of a geometric

number sequence, the formula:  $Sn = \frac{a(1-r^n)}{1-r}$ 

#### 4. PROCEDURE

- a. To determine the nth term and the number of the first n terms of the arithmetic sequence, it is necessary to determine the initial value (a), the difference value (b), then directly enter the a and b values into the existing formula.
- b. To determine the nth term and the number of the first n terms of the geometric number sequence, it is necessary to determine the initial term (a), the ratio (r), then directly enter the a and r values into the existing formula.

Lesson Plan	Tim	TimeForms of activity						
Face to face	15	Х	40	Application of the Think Pair Share Type				
	min	utes		Cooperative Learning Model.				
Posttest	2	Х	40	Test	of	students'	mathematical	
	min	utes		comm	unicatio	on skills.		

#### F. TIME ALLOCATION

#### G. LEARNING MODELS AND METHODS

Learning model : cooperative, think pair share type.

Learning methods	:	discussion,	demonstration,	question	and	answer
and discovery.						
Learning approach	:	scientific ap	proach.			

## H. SOURCES AND TOOLS

- 1. Student Work Sheet (LKS).
- 2. The seventh grade student book revised 2014 curriculum 2013.
- 3. The class VIII teacher's book revised 2016 curriculum 2013.
- 4. Student books for class VIII revision of the 2013 curriculum.
- 5. Internet.

## I. LEARNING ACTIVITY STEPS

#### 1. Lesson-1 : $(2 \times 40 \text{ minutes})$

Activities	Activity description	Time
		Allocation
Preliminary	1. The teacher greets, invites students to pray and checks student attendance.	± 10 minutes
	2. The teacher checks the readiness of students to take part in today's learning process.	
	3. The teacher conveys the learning objectives to be achieved.	
	4. Apperception:	
	The teacher invites students to recall the previous material, namely numbers, such as integers, odd numbers, and even numbers, as follows:	
	"Previously, you have studied numbers, now have you heard of number patterns and number sequences?"	
	5. The teacher motivates students by exemplifying objects that have patterns found in everyday life such as the following:	

	<ul> <li>"Suppose you buy a lot of apples in the market, then you arrange the apples in an orderly and unique arrangement. Are the apples that you arranged in a pattern? Can you give any other examples? Now, by studying this number pattern material you will know the answer. "</li> </ul>	
	6. The teacher informs the learning method to be pursued, namely using the think pair share type of cooperative learning model and asking students to sit with their respective pairs.	
	7. The teacher provides an explanation that today's learning is about what is a pattern in a sequence of numbers and a pattern of square numbers.	
	8. The teacher gives worksheets to each student.	
Core	1. Students are directed to read and understand the problems contained in the LKS. (observe)	± 5 minutes
	2. Through question and answer, the teacher ensures that students understand the problems that have been given. (ask)	
	3. Students work on the worksheets that have been distributed individually. (reason, try)	
	<ul><li>4. The teacher goes around guiding and monitoring students while working on the worksheets.</li></ul>	
	5. The teacher instructs students to work on worksheets through the following process:	
	a. Think stage	± 15 minutes
	The teacher asks each student to answer the	
	questions in the column that has been	





	<ul> <li>partners in front of the class. (communicating)</li> <li>2) Students who do not appear are asked to pay attention to presentations, provide additions, suggestions, and criticism.</li> <li>3) The teacher provides reinforcement for the results of student discussions.</li> <li>4) Students are given exercises that are done individually.</li> </ul>
	The exercises given to students are:       ± 15 minutes         1. Look at the following number pattern!       ± 15 minutes         do       do
	(1) (2) (3) (4)
	The many dots in the 25th pattern are
	2. Given a sequence of numbers 1, 4, 9, 16,
	25, ± 10 minutes <i>a) Find the 36th term !!</i>
	b) What is the total of the first 15 numbers?
Closing	1. Students under the guidance of the teacher $\pm 10$ minutes summarize the learning material about number patterns and sequences in square numbers.
	<ol> <li>Students are asked to collect the exercises that have been done on the worksheets and if not finished they are made into homework.</li> </ol>
	3. Students are informed about the next material regarding rectangular and triangular number patterns.
	4. The teacher closes the lesson by saying greetings.

2.	Lesson-2	:	$(3 \times$	<b>40</b>	minutes)
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Activities	Activity description	Time
		Allocation
preliminary	<ol> <li>The teacher greets, invites students to pray and checks student attendance.</li> <li>The teacher checks the readiness of students to participate in the learning process.</li> <li>The teacher conveys the learning objectives to be achieved.</li> <li>Apperception:</li> </ol>	± 10 minutes
	Students are invited by the teacher to	
	recall the previous material regarding	
	number patterns and sequences in square	
	numbers, as follows:	
	"Previously, you have learned about	
	number patterns and sequences in square	
	numbers, who still remembers what	
	number and sequence patterns are in	
	square numbers?"	
	5. Motivation	
	"Have you ever played marbles? If you want to arrange the marbles into a unique arrangement, for example in the first part 2 marbles, then part two 6 marbles, third part 12 marbles, and so on. Can you know how many marbles there are in the 40th section? Well, this problem can be solved by	
	studying the concept of a rectangular	
	sequence of numbers, so that you can	
	easily determine the number of marbles in the 40th part".	
	6. The teacher informs the learning	
	method to be pursued, namely using the	

think pair share type of cooperative	
learning model and asking students to	
sit with their respective partners.	
<ol> <li>The teacher explained that today's lesson was to determine the rectangular number pattern and the number pattern in the triangle.</li> <li>Students understand the information about the rectangular and triangular number patterns given by the teacher in front of the class.</li> <li>The teacher gives worksheets to each student.</li> <li>The teacher instructs students to work on worksheets through the following process:</li> </ol>	± 10 minutes
<ul> <li>a) Think stage</li> <li>Students read and understand the problems contained in the worksheets regarding determining rectangular and triangular number patterns by filling in the columns that have been provided on stage think individually. (observe)</li> <li>The problem of determining the pattern of rectangular and triangular numbers is as follows :</li> </ul>	± 20 minutes
Problem 1	
Observe the following picture !! dst (1) (2) (3) (4) Based on the picture above, students are asked to observe patterns in a rectangular sequence of numbers and answer the	
	<ul> <li>think pair share type of cooperative learning model and asking students to sit with their respective partners.</li> <li>1. The teacher explained that today's lesson was to determine the rectangular number pattern and the number pattern in the triangle.</li> <li>2. Students understand the information about the rectangular and triangular number patterns given by the teacher in front of the class.</li> <li>3. The teacher gives worksheets to each student.</li> <li>4. The teacher instructs students to work on worksheets through the following process: <ul> <li>a) Think stage</li> </ul> </li> <li>Students read and understand the problems contained in the worksheets regarding determining rectangular and triangular number patterns by filling in the columns that have been provided on stage think individually. (observe)</li> <li>The problem of determining the pattern of rectangular and triangular numbers is as follows :</li> </ul> <b>Problem 1</b> Observe the following picture !! <ul> <li> dst</li> <li>(1)</li> <li>(2)</li> <li>(3)</li> <li>(4)</li> </ul>



working on worksheets.	
c) Share stage	
1) The teacher asks students to collect the	
worksheets that have been done.	
2) The teacher randomly selects several	+ 25 minutes
pairs who will present the results of their	
work with their partners.	
(communicating)	
3) Other students are given the opportunity	
to respond to explanations that have been	
given by their friends.	
4) The teacher confirms and provides	
reinforcement of the students' answers.	
5) The teacher gives praise to students who	
appear and to students who provide	
responses.	
6) Students are given exercises that are	
done individually.	
The exercises given to students are:	+20 minutes
1. Given a sequence of numbers 2, 6, 12,	$\pm 20$ minutes
$20, \dots$ etc.	
sequence !!	
b) What is the total of the first 25	
numbers?	
<b>2</b> . A piece of rope that is 1 meter long is cut	
into two equal lengths, the resulting pot is	
processed again and cut back in half, and so	
times the cutting process is	
<b>3.</b> Using a pattern like the one in the following	
triangular sequence !!	

	n = 1 2 3 4 5 n = 1 2 etc
Closing	1. Students are invited to conclude the $\pm 10$ minutes lesson with questions and answers about the pattern of rectangular and triangular numbers, then the teacher provides confirmation of the conclusions obtained by students.
	<ol> <li>Students are given homework on the material studied today.</li> <li>Students are given a brief description of the material at the next meeting, namely material on odd number patterns and even number patterns.</li> <li>The teacher closes the lesson by saying greetings.</li> </ol>

## 3. Lesson-3 : $(2 \times 40 \text{ minutes})$

Activity	Description of activity	Time
		allocation
Preliminary	1. The teacher greets, invites students to pray and checks student attendance.	± 10 minutes
	2. The teacher checks the readiness of students to participate in learning activities.	
	3. The teacher conveys the learning objectives to be achieved.	
	4. The teacher asks students about previous material that has not been understood or homework that cannot be completed if any.	
	5. Apperception:	
	Students are invited by the teacher to recall the previous material regarding rectangular and triangular number patterns. For example: how to determine	

	the nth term and the number of the first n terms in the rectangular number pattern and the triangular number pattern?	
	6. Students are motivated by the teacher by informing the usefulness of studying the topic in everyday life. For example:	
	"The committee of an event hall wants to arrange chairs for the show which will be held tonight. In the first row the committee wants to arrange two seats, the second row four seats, the third row six seats, and so on each row is added 2 seats. If the committee wants to arrange 80 rows of seats, do you know how many seats the event committee has to provide? Now, by studying the concept of even number sequences today, you can easily determine how many seats the event committee should provide".	
	7. The teacher informs the learning method to be pursued, namely using the think pair share cooperative learning model and asking students to sit with their respective partners.	
Inti	1. The teacher gives worksheets to each student.	$\pm 5$ minutes
	2. The teacher instructs students to work on worksheets through the following process:	
	a. Think Stage	15
	Students read and understand the	$\pm$ 15 minutes
	worksheets given by the teacher. (observe)	
	The problems in these worksheets, namely: <u><b>Problem 1</b></u>	
	Observe the image below. Write down the number of circles on each shape !!	



LKS.			
<ul> <li>LKS.</li> <li>c. Sha</li> <li>1) Students and of the disconstruction of the discon</li></ul>	are Stage re asked to pres- cussion with the in front of cating) who do not appe ion to presenta suggestions, and er provides rein determining of the studen determining of therms. are given exer idually.	sent the results heir respective the class. ar are asked to ations, provide criticism. aforcement for nts' discussion and even cises that are	± 15 minutes
The exercises g 1. There is a numbers 2, a) What sequen b) Find th	given to student a pattern in th 4, 6, 8,, 10. is the pattern ace? he sum of the fir	ts are : e sequence of n in the 10th est 25 terms !!	± 10 minutes
2. Look at the Grup ke- 1 2 3 4 a) If the a how ma 5th and b) How ma after the groups, groups, c) Explain between number	e following table Banyaknya Pesawat Banu 1 3 5 7 bove flight path ony planes will b of the group fligh pany aircraft a if the planes i have not landea what is the an aircraft g of aircraft in sp	yumlah pesawat di angkasa 1 4 9 16 tern continues, be flown on the ts? tre in the sky tre in the sky tre 5th and 6th in the previous t? te relationship group and the bace?	

Closing	1.	Students and teachers through question and answer summarize the learning material regarding odd and even number patterns and then the teacher provides confirmation of the conclusions obtained by students.	± 10 minutes
	2.	Students are asked to collect the exercises that have been done on the worksheets and if not finished they are made into homework.	
	3.	Students are given a brief description of the material at the next meeting, namely determining the number pattern in the Pascal and Fibonacci triangles.	
	4.	The teacher closes the lesson by saying greetings.	

## 4. Lesson-4 : $(3 \times 40 \text{ minutes})$

Activity	Activity Description	Time
licuity		Allocation
Preliminary	<ol> <li>The teacher greets, invites students to pray and checks student attendance.</li> <li>The teacher checks the readiness of students to participate in the learning process.</li> <li>The teacher conveys the learning objectives to be achieved.</li> <li>The teacher asks students about the previous material that the student has not understood or homework that cannot be completed if any.</li> <li>Apperception: Students are invited by the teacher to recall the previous material regarding odd number patterns and even number patterns. For example: In the previous meeting we discussed the odd number</li> </ol>	± 10 minutes

	pattern and the even number pattern.	
	"Can you tell me how to find the nth term	
	of the number pattern and what does it	
	mean?"	
	1. Students are motivated by the teacher by	
	informing them of the usefulness of	
	studying the topic in everyday life. For	
	example:	
	"Have you ever learned about Pascal's	
	triangle? what numbers are there on	
	each line? Can you determine the sum of	
	the numbers of each row of Pascal's	
	triangle?	
	2. So, by following today's lesson you can find out the answer "	
	The teacher informs the learning method	
	to be pursued, namely using the think	
	pair share type cooperative learning	
	model and asking students to sit with	
	their respective partners.	
	r i i i i i i i i i i i i i i i i i i i	
Inti	1. The teacher gives worksheets to each student	$\pm$ 10 minutes
	student.	
	2. The teacher instructs students to work on	
	worksheets through the following	
	process:	
	a. Think Stage	$\pm 20$ minutes
	students understand the information	
	Students are directed to read and	
	students are directed to read and	
	following LKS :	
	Problem 1	
	Consider the Pascal triangle number	
	pattern as follows :	



the worksheets.	$\pm 25$ minutes
<ul> <li>b. Pair Stage</li> <li>1) The teacher instructs students to discuss with their partners (who have been determined) about what has been thought in the first stage (think).</li> </ul>	
2) Students match and discuss their respective answers. (ask, reason, try)	
3) The teacher observes, goes around from one pair to another to provide motivation, control and guide and provide assistance as needed to students who have difficulty understanding the LKS.	
<ul><li>c. Share Stage</li><li>1) The teacher asks students to collect the worksheets that have been done.</li></ul>	± 25 minutes
2) The teacher randomly selects several pairs who will present the results of their work with their partners. (communicating)	
3) The teacher provides the opportunity for other students to respond to the pair's presentation and ask questions that are not understood.	
4) The teacher guides and guides students in discussing if there are errors about the results of the discussion presented towards the correct answer.	
5) The teacher gives praise to students who appear and to students who respond.	
6) Students are given exercises that are done individually.	

	The exercises given to students are:	$\pm 20$ minutes
	1. 1. There is a pattern in the sequence of	
	numbers in Pascal's Triangle 1, 2, 4, 8,	
	16, and so on.	
	a) Find the pattern in the 10th sequence <i>!!</i>	
	b) What is the number of the 9th term of	
	the number sequence !!	
	2. 2. A pattern is known in the Fibonacci	
	sequence of numbers 1, 1, 2, 3, 5, 8, 13,	
	21, 34, etc	
	a) Find the pattern in the 30th sequence	
	b) What is the number of the 24th term	
	of the sequence of numbers !!	
Closing	1. Students and teachers through question and answer summarize today's learning material and then the teacher provides confirmation of the conclusions obtained by students.	± 10 minutes
	2. Students are given homework about the material that has been studied.	
	3. The teacher gives a brief description of the material at the next meeting, namely material on cube and block number patterns.	
	4. The teacher closes today's lesson by saying greetings.	

## 5. Lesson-5 : $(2 \times 40 \text{ minutes})$

Activity	Activity Description	Time	
		Allocation	
Preliminar	1. The teacher greets, invites students to pray and	± 10	

У	checks student attendance.	minutes
	2. The teacher checks the readiness of students to participate in learning activities.	
	3. The teacher conveys the learning objectives to be achieved.	
	4. The teacher asks students about previous material that has not been understood or homework that cannot be completed if any.	
	5. Apperception:	
	Students are invited by the teacher to recall the previous material regarding the Pascal and Fibonacci triangular number patterns. For example: In the previous meeting, we have studied the pattern of the Pascal and Fibonacci triangles. " <i>Can you tell me what is the pattern of the Pascal and Fibonacci triangles and how to find the nth term of the sequence of numbers?</i> ".	
	6. Students are motivated by the teacher by informing the usefulness of studying the topic in everyday life. For example:	
	<ul> <li>"Have you ever heard of a sequence of cubes? do you know what a sequence of cubes is? If you have several milk cans and you want to arrange the milk cans in an orderly manner with the first milk cans as many as 1, then the second milk cans as many as 8 pieces, and the third milk cans as many as 27 pieces. How many milk cans are there in order 8? So, by following today's lesson you can find out the answer ".</li> <li>7. The teacher informs the learning method to be pursued, namely using the think pair share cooperative learning model and asking students to sit with their respective partners.</li> </ul>	
Inti	1. The teacher gives worksheets to each student.	± 5 minutes
	(observe) 2 The teacher instructs students to work on	
	worksheets through the following process:	



that the teacher has distributed individually		
first.		
(reason, try)		
4. Through question and answer, the teacher		
ensures that students understand the problems		
that have been given. (ask)		
The teacher goes around guiding and		
monitoring students while working on the		
worksheets.		
c. Pair Stage		
). The teacher instructs students to discuss with		
their negatives (who have been determined)		
about what has been done in the first stage		
(think)	±	15
(unitk).	minutes	
c) Students match and discuss their respective		
answers.		
(ask, reason, try)		
) The teacher observes, goes around from one		
pair to another to provide motivation, control		
and guide and provide assistance as needed to		
students who have difficulty understanding the		
LKS.		
d. Share Stage		
1) The teacher asks students to collect the		
worksheets that have been done.		
2) Several pairs were selected randomly to		
present the results of their discussion in		
front of the class.		
(communicating)		
3) Couples who do not appear, provide input,		
criticism and suggestions or ask the pairs		1 ~
who appear.	±	15
4) The teacher provides reinforcement with the	minutes	
results of student discussions.		
5) Students are given exercises that are done		
individually.		
he exercises given to students are :		

r		r	
	<ol> <li>Given a sequence of numbers 1, 8, 27, 64, etc</li> <li>a) Find the 35th term !!</li> <li>b) What is the total of the first 20 numbers?</li> <li>2. Given a sequence of numbers 6, 24, 60, 120, etc.</li> <li>a. Find the 17th term !!</li> <li>b. What are the first 20 numbers?</li> </ol>		
	b. what are the first 20 numbers:	± minutes	10
Closing	<ol> <li>Students and teachers through question and answer summarize the learning material and then the teacher provides confirmation of the conclusions obtained by students.</li> <li>Students are asked to collect the exercises that have been done on the worksheets and if they are not finished they are used as homework.</li> <li>Students are given homework to increase students' understanding of the material that has been studied.</li> <li>The teacher closes the lesson by saying greetings.</li> </ol>	± minutes	10

## 6. Lesson -6 : $(3 \times 40 \text{ minutes})$

Activity	Activity Description	Time
		Allocation
Preliminary	1. The teacher greets, invites students to pray and checks student attendance.	$\pm 10$ minutes

	-		
	2.	The teacher checks the readiness of	
		students to participate in the learning	
		process.	
	3.	The teacher conveys the learning	
		objectives to be achieved.	
	4.	The teacher asks students about the	
		previous material that the student has not	
		understood or homework that cannot be	
		completed if any.	
	5.	Apperception:	
		Students are invited by the teacher to	
		recall the previous material regarding the	
		cube number pattern and the block	
		number pattern For example: In the	
		previous meeting we discussed the cube	
		number pattern and the block number	
		number pattern and the block number	
		number pattern and what is the block	
		number pattern? Then how do you	
		determine the nth term of the number	
		acternation of the number	
	6	Students are motivated by the teacher by	
	0.	informing the usefulness of studying the	
		topic in everyday life For example:	
		"You will adoulate the 30th term of a	
		Tou will culculate the Soln term of a	
		sequence of numbers with previously	
		known terms with the same atjetence.	
		So, by jouowing loady's lesson you can	
		juna oui ine answer, what is the 30th	
	7	term of the sequence of numbers !!	
	1.	I ne teacher informs the learning method	
		to be pursued, namely using the think	
		pair share cooperative learning model	
		and asking students to sit with their	
		respective partners.	
Inti	1	. 1. The teacher gives worksheets to each	$\pm 10$ minutes
		student.	
	2	. 2. The teacher instructs students to	
		work on worksheets through the	
		work on workshoets unough the	





students who have difficulty understanding the LKS.	
c. Share Stage	
1. The teacher asks students to collect the worksheets that have been done	
<ul> <li>2. The teacher randomly chooses several pairs who will present their work with their partners.</li> <li>(communicating)</li> </ul>	± 25 minutes
3. Other students are given the opportunity to respond to explanations that have been given by their friends.	
4. The teacher confirms and provides reinforcement of the students' answers.	
5. The teacher gives praise to students who appear and to students who respond.	
6. Students are given exercises that are done individually.	
The exercises given to students, namely :	± 20 minutes
1. The 4th and 9th terms of an arithmetic sequence are 110 and 150, respectively. Find the 30th term of the sequence !!2.	
Diketahui barisan aritmatika dengan	
$U_5=8 dan U_9=20.$	
Suku ke-10 dari barisan bilangan	
tersebut adalah	
3. Find the formula for the nth term of the	
sequence of numbers 64, 32, 16, 8,!	
4. A geometric sequence has the 2nd term	
= 8 and the 5th term = 64.	
Calculate the 13th term of the	
geometric sequence !!	

Closing	1.	Students and teachers summarize the learning material with questions and answers and then the teacher provides confirmation of the conclusions obtained by students.	± 10 minutes
	2.	Students are asked to collect the exercises that have been done on the LKS.	
	3.	Students are given homework on the material studied today.	
	4.	The teacher reminds students that the next meeting will hold a posttest and it is hoped that students will study again at home.	
	5.	The teacher closes the lesson by saying greetings.	

## J. ASSESSMENT INSTRUMENTS

Assessment Techniques : Observation, Written Tests

Assessment Procedure :

No	Aspects assessed	Assessment technique	Time of assessment
1	Attitude : a) Carefully b) Responsibility c) Coriously d) Self Confidence	Observation	Learning Process
2	Knowledge	Exercise/Task	Complete exercise/task
3	Skills	Observation	Learning Prcess

Knowing, Headmaster Padang, Subject teachers

Prana Jaya, SE NIK. 1383-E-17

Chintya Tifani JIM. 1101234 2017

#### VALIDATION SHEET OF STUDENT WORKSHEET

Education Unit	: SMP Adabiah Padang
Subjects	: Mathematics
Class / Semester	: VIII / I
Main Subject	: Determining a pattern in a number sequence or object configuration sequence

## ASSESSMENT INSTRUCTIONS

If the answer is yes, please provide it on the scale:

- a. a. Check mark ( $\sqrt{}$ ) in column 1: Not good
- b. b. Check mark ( $\sqrt{}$ ) in column 2: Not so good
- c. c. Check mark  $(\sqrt{)}$  in column 3: Good enough
- d. d. Check mark ( $\sqrt{}$ ) in column 4: OK

#### 1) Format

No	Aspects to be Evaluated	Answer			
INU		1	2	3	4
1.	Clarity of material distribution.				
2.	Clarity of numbering system.				
3.	Room / layout arrangement.				
4.	Match type and font size.				
5.	Make it easy for students to use it.				

#### 2) Question

No	Aspects to be Evaluated	Answer			
110		1 2 3 4	4		
1	Conformity with learning objectives.				
2	Grouped in logical parts.				
3	Feasibility as a learning tool.				
4	Leads to mathematical communication skills.				
5	Compliance with the learning flow.				

## 3) Inquiry

Jo	Aspects to be Evaluated	Ans		swer		
NU		1	2	3	4	
1.	Fidelity for purpose.					
2.	Supporting concept.					
3.	Readability / language.					

## 4) Language

Jo	Aspects to be Evaluated Answer		r		
NU		1	2	3	4
1.	Easy for students to understand.				
2.	Provides practical instructions on how to.				
3.	Use good and correct Indonesian.				
4.	Use clear and simple sentences.				
5.	Simplicity of sentences with level of thinking and				
	reading ability and age of students.				

## 5) General assessment

Assessment	Assessment Criteria
1. Not Good	Not yet usable (still requires consultation)
2. Not so good	Can be used with multiple revisions
3. Good Enough	Can be used with minor revisions
4. Good	Can be used without revision

Comments and Suggestions

Padang, Juli 2017 Validator,

( .....)

# Student worksheet 1

Group

Member of Group

: .....

1. ..... 2. .....



#### **Basic competencies**

3.1 Specifying a pattern in a number sequence or configuration sequence of objects.

4.1 Solving problems related to the pattern in the sequence of numbers or object configuration sequences.

#### Indicator

3.1.1 Finding patterns in a sequence of numbers.

**3.1.2** Determine the pattern of square numbers.

**4.1.1** Solve real problems related to patterns in a sequence of numbers.

**4.1.2** Solving real problems related to square number patterns.



#### 1. Instructions:

1. Do the questions on this LKS individually first.

2. Discuss this assignment as a group with each pair.

3. Do the worksheets carefully and ask the teacher if there are things you do not understand.








Discuss and match all your different answers with your couple partners at the think stage, then write the results of your discussion in the column below !!



## 1. STAGE THINK

Work on the problems on this LKS individually first !

DETERMINING A SQUARE NUMBER
Problem 3 1) Observe the image below. Write down the number of small squares on each shape !!
2) Can you find regular patterns? With this pattern draw the next two shapes and write the number of small squares under the picture !!

3) Without drawing, can you find the number of small squares in the 20th shape?







**\*** To find the number of n first terms is:



## 2. STAGE PAIR

Discuss and match all your different answers with your couple partners at the think stage, then write the answers to the results of your discussion in the column below !!









## ACTIVITY 2

Given a sequence of numbers 1, 4, 9, 16, 25, .....

- a) a) Find the 36th term !!
- b) b) What is the total of the first 15 numbers?



## Student worksheet 11

Group	:
Member of group	•
1	·····
2	Ň

#### **Basic competencies**

- 3.1 Specifying a pattern in a number sequence or configuration sequence of objects.
- 4.1 Solving problems related to the pattern in the sequence of numbers or object configuration sequences.

#### Indicator

- **3.1.3 Specifying a rectangular number pattern.**
- **3.1.4 Determine the triangular number pattern.**
- 4.1.3 Solve real problems related to rectangular number

#### Instruction :



- 1. Do the questions on this LKS individually first.
- 2. Discuss this assignment as a group with each pair.
- 3. Do the worksheets carefully and ask the teacher if there are things you do not understand.



Look at the example below !!

Have you ever played marbles? If you want to arrange the marbles into a unique arrangement, for example in the first part 1 marble, then part two 4 marbles, third part 9 marbles, and so on.

Can you know how many marbles are in the 10th piece?

So, what is the number of marbles in the 20th section?



So, the number of marbles in the 20th section is  $10^2 = 100$ 

<u>To better understand the next problem, answer the questions on</u> <u>the sheet in problem 1 and problem 2 below with the instructions</u> <u>that have been set !!</u>



Work on the problems on this LKS individually first!

DETERMINING A SQUARE NUMBER PATTERN

.....









# 2. STAGE PAIR

Discuss and match with each partner about all your different answers at the think stage, then write the result of your discussion in the column below !!



. . . . . . . . . . . . . . . . . .





DETERMINING A TRIANGLE NUMBER

PROBLEM 2
2) Observe the following shape and count the next three shapes !!
3 6 10 15 ... etc
2) Count the number of dots (dots) in each of the triangle images above. Write in the following sequence !!

1, 3, 6, 10, 15 , .... , .... , .... , .... , .... , etC





Discuss and match all your different answers with you couple partners at the stage, then write the result of your discussion in the column below :





## 3. STAGE SHARE

Please understand what you have done in the pair stage, because each group will be randomly selected to present the results of the discussion to the class !! <u>CONCLUSION :</u>

The pattern of rectangular numbers is: ......

✤ To find the nth term in a rectangular number pattern the formula is: ..... ..... To find the sum of the first n terms, the formula is used: ◆ = ..... ✤ The triangular number pattern is: ..... ..... To find the nth term in a triangle number pattern the formula is: ..... To find the sum of the first n terms, the formula is used: = ..... LET'S PRACTICE 1. 1. Given a sequence of numbers 2, 6, 12, 20, ..... a) Find the 40th term of the number sequence !! b) What is the total of the first 25 numbers?





## Student worksheet III

#### Group : .....

Member of group :.....

- 1. .....
- 2. .....



#### **Basic competencies**

- 3.1 Specifying a pattern in a number sequence or configuration sequence of objects.
- 4.1 Solving real problems related to the pattern in the sequence of numbers or configuration of objects.

### Indicator

- 3.1.5 Determine the pattern of odd number sequences.
- **3.1.6 Determining the pattern in even number sequences.**
- 4.1.5 Solve real problems related to patterns in odd number sequences.
- **4.1.6 Solving real problems related to patterns pada barisan**

#### Instructions:

- 1. Do the questions on this LKS individually first.
- 2. Discuss this assignment as a group with each pair.
- Do the worksheets carefully and ask the teacher if there are things you do not understand..



\_ \_ \_ \_ \_ \_ \_ 3) Without drawing, can you determine the number of circles for the next shape? \_.\_.... 1, 3, 5, 7, ...., , ...., , ....., etc 4) Find the number of circles in the 30th figure !! Shape-1 2 ..... 30 3 4 ţ Number of Spheres 1 3 5 7 ••••• .... Your conclusion : a) So, the pattern in the odd number sequence is b) To find the nth term in the odd number sequence pattern, the formula is: *U<sub>n</sub>* =..... c) To find the sum of the first n terms, the formula is used: *S*<sub>n</sub>=..... \_ \_\_ \_\_



## 2. STAGE PAIR

Discuss and match all your different answers with your couple partners at this stage, then write the results of your discussion in the column below:

\_ \_ \_ \_ \_ \_ \_ The pattern on the odd number sequence is : ..... + To find the nth term in the odd number sequence pattern, the formula is:  $U_n =$ **4** To find the sum of the first n terms, the formula is used: *S*<sub>n</sub>=..... \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

## BACK TO THE STAGE THINK !!



Shape 1	2	3	4	•••••	28	
	Ļ	Ļ	Ļ	Ļ		Ļ
Number of Spheres	2	4	6	8	•••••	•••••

1. So, the pattern in the even number sequence is.....

•

- 2. To find the nth term in the even number sequence pattern, the formula is:
  - *U<sub>n</sub>* =.....
- To find the sum of the first n terms, the formula used is:
   S<sub>n</sub>=......



## 2. STAGE PAIR

Discuss and match with each partner about all your different answers at the think stage, then write the results of your discussion in the column below !!







Please understand what you have done in the pair stage, because each group will be randomly selected to present the results of the discussion to the class !!

## CONCLUSION

The pattern for the odd number sequence is:



1. 1. There is a pattern in the sequence of numbers 2, 4, 6, 8, ...., 10.

- a) What is the pattern in the 10th sequence?
- b) Find the sum of the first 25 terms !!

ANSWER :

### 2. Take a look for the table below !!

Grup ke-	Banyaknya Pesawat Baru	Jumlah pesawat di angkasa		
1	1	1		
2	3	4		
3	5	9		
4	7	16		

- a) If the above flight pattern continues, how many planes will be flown on the 5th and 6th group flights?
- b) How many aircraft are in the sky after the flight of the 5th and 6th groups, if the planes in the previous groups have not landed?
- c) Explain what is the relationship between an aircraft group and the number of aircraft in space?



## Students worksheet iv

•

### Group

Member of Group :....

- 1. .....
  - 2. .....



#### **Basic competencies**

- 3.1 Specifying a pattern in a number sequence or configuration sequence of objects.
- 4.1 Solving problems related to patterns in the sequence of numbers or configuration of objects.

### Indicator

- 3.1.7 Determining the pattern in the Pascal triangle number sequence.
- 3.1.8 Determining the pattern on the Fibonacci number sequence.
- **4.1.7** Solving real problems related to the pattern in the Pascal sequence of numbers.
- **4.1.8 Solving real problems related to patterns in the Fibonacci sequence.**

#### Instructions:

- 1. Do the questions on this LKS individually first.
- 2. Discuss this assignment as a group with each pair.
- 3. Do the worksheets carefully and ask the teacher if there are things you do not understand.



Work on the problems on this LKS individually first !



## Consider the Pascal triangle number pattern as follows :



a) Consider the Pascal Triangle number pattern above. Fill in the points in the number arrangement !!

b) What are the rules for filling the points?

c) If the array of numbers 1 is the 1st line, the arrangement of numbers 11 is the 2nd row, the arrangement of numbers 1 2 1 is the 3rd row, what are the numbers in the 6th row?



e) Make a table that states the sum of the numbers on each row of Pascal's triangle!!

Baris ke-	Penjumlahan Bilangan	Hasil Penjumlahan
1	1	$1 = 2^{1-1} = 2^0$
2	1 + 1	$2 = 2^{2-1} = 2^1$
3	1 + 2 + 1	$4 = 2^{3-1} = 2^2$
4	1 + 3 + 3 + 1	$8 = 2^{4-1} = 2^3$
5	1 + 4 + 6 + 4 + 1	= 2 =

f) Pay attention to the numbers that you have completed in the pattern above and pay attention to the number patterns that are arranged in italics. Write down the sequence of numbers !!

a)	• • • • • • • • • • • • • • • • • • • •
b)	
C)	
d)	
e)	
F)	
•	

g) Look at the following sequence pattern!!

1	1	1	1	1	1	1	1	1	1
1	2	3	4	5	6	7	8	9	10
1	3	6	10	15	21	28	36	45	
1	4	10	20	35	56	84	120		
1	5	15	35	70	126	210			
1	6	21	56	126	252				
1	7	28	84	210					
1	8	36	120						
1	9	45							
1	10								
1									

h) Is there a number pattern that you found? Compare this with the sequence you worked on in Activity f!!



From the above activities, it can be concluded that :



Discuss and match with each partner about all your different answers at the think stage, then write the answers of your discussion in the column below !!

c) So, Pascal's Triangle number pattern is :
d) To find the number of nth rows in the Pascal triangle number pattern, the formula is used:
S<sub>n</sub> =.....

## BACK TO STAGE THINK!!



1) 1) Pay attention to the number pattern on the left, fill in the blank in the number arrangement !!



2) Set the pattern for the 12th and 13th numbers!!!



3) The sequence of numbers can also be obtained by:


Write down the sequence of numbers that you have obtained

1,1,2,3,5,8,13,21, ...., ...., ...., ...., ...., ....., .....

**NOTE:** The pattern on the sequence of numbers 1,1,2,3,5,8,13,21, ..., is Called the Fibonacci sequence

From the above activities, it can be concluded that:





Discuss and match with each partner about all your different answers at the think stage, then write the answers of your discussion in the column below !!





b) To find the number of nth rows in Pascal's Triangle number formula the is used: pattern, ..... ..... c) So, the Fibonacci number pattern is: ..... ..... ..... ..... d) To find the number of nth terms in the Fibonacci number the formula is: pattern ..... ..... e) To find the number of the nth row in the Fibonacci number pattern the formula: ..... .....



There is a pattern in the sequence of numbers in Pascal's Triangle 1, 2, 4, 8, 16, ..... and so on

- a) Find the pattern in the 10th sequence !!
- b) What is the number of the 9th term of the number sequence !!





## Students worksheet v

•

Member of Gro	oup :
1.	
2.	



#### **Basic competencies**

3.1 Specifying a pattern in a number sequence or configuration sequence of objects.

4.1 Solving problems related to patterns in the sequence of numbers or configuration of objects.

#### Indicator

**3.1.9** Determine the pattern in the sequence of cubes.

**3.1.10** Determining the pattern in the row number blocks.

**4.1.9 Solving real problems related to the pattern in the sequence of cubes.** 

**4.1.10 Solving real problems related to the pattern in the sequence of blocks.** 

#### Instructions:

- 1. Do the questions on this LKS individually first.
- 2. Discuss this assignment as a group with each pair.
- 3. Do the worksheets carefully and ask the teacher if there are things you do not understand.



		G	A O O O
$( \cap$	a)	So, the pattern for the cube (cubic)	
		sequence is:	
	b)	To find the nth term in the cube (cubic)	
		sequence pattern, the formula is:	
	c)	To find the number of the first n	
		terms, the formula is used:	
		=	





Discuss and match with each partner about all your different answers at the think stage, then write the answers of your discussion in the column below !!





From the above activities, it Can be concluded that :

)	1) So, the pattern in the row of block numbers is:
1	
	2) To find the nth term in the block number sequence pattern, the formula is:
	3) To find the number of the first n terms, the formula
	used is : =







Discuss and match all your different answers with your Cauple partners at the stage, then write the results of your discussion in the Column below:



Please understand what you have done in the pair stage, because each group will be randomly selected to present the results of the discussion to the Class !!



### <u>CONCLUSION</u>

•	The	pattern	for	the	sequence	of	cubes	is:
••••			••••	•••••	•••••	•••••	•••••	
••••			•••••		•••••	•••••	•••••	•••••

• To find the nth term in the cube (cubic) sequence pattern, the formula is:

• To find the sum of the first n terms, the formula is used:

= .....

•	The	pattern	on	the	row	of	block	numbers	is:
							•••••	•••••	•••••
••••	•••••	••••••	•••••	•••••		•••••	•••••	•••••	•••••

• To find the nth term in the block number sequence pattern the formula is:

To find the sum of the first n terms, the formula is used:
=



## QUESTION 2

Given a sequence of numbers 6, 24, 60, 120, ..... a. Find the 17th term !! b. What are the first 20 numbers?



## Scudencs worksheet VI

•

### Group

Member of Group :..... 1. .... 2. ....



### **Basic competencies**

3.1 Specifying a pattern in a number sequence or configuration sequence of objects.

4.1 Solving problems related to the pattern in the sequence of numbers or object configuration sequences.

#### Indicator

3.1.11 Determine the number pattern of an arithmetic sequence.

**3.1.12 Calculating the nth term of the arithmetic sequence.** 

**3.1.13** Determining the number pattern of a geometric sequence.

**3.1.14 Calculating the nth term of a geometric sequence.** 

**4.1.11 Solving real problems related to arithmetic sequences.** 

#### Instructions:

- 1. Do the questions on this LKS individually first.
- 2. Discuss this assignment as a group with each pair.
- 3. Do the worksheets carefully and ask the teacher if there are things you do not understand.







Discuss and match with each partner about all your different answers at the think stage, then write result of your discussion in the column below !!



 $\succ \frac{U2}{U1} = \frac{\dots}{\dots} = \dots$  $\blacktriangleright \frac{U3}{U2} = \frac{\dots}{\dots} = \dots$ <u>Ratio</u>  $\blacktriangleright \frac{U4}{U3} = \frac{\dots}{\dots} = \dots$ From the above activities, it can be concluded that: > The ratio is: ..... ..... > The geometric sequence is: ..... > To find the nth term in a geometric sequence the formula is: ..... .....



2. STAGE PAIR

Discuss and match with each partner about all your different answers at the think stage, then write the answers of your discussion in the column below !!



							131
			3. 5	TAGE SH	ARE		Siap !
	Please	understand	l what y	you have	e done ir	the pair	stage,
	because	e each grou	ip will be	e random	ly selecte	ed to prese	nt the
•	results	of the disc	ussion to	o the Clas	SS !!		
•	••••	• • • • • • • • • • • •	<u>C(</u>	ONCLUS	ION	]	••••
	•	The diff	erences	are:	•••••		
					•••••		
	•	The	arith	metiC	se	equence	is:
		•••••			•••••		
	•	To find th formula	he nth t	erm in t is:	he arithr 	netic seque	ence the
		•••••	••••••	••••••	•••••		
	•	The r	atio	is:	•••••		•••••
					•••••		
		•••••					
	•	Geometry	sequen	ces are:	•••••		•••••
		•••••			•••••		





# ACTIVITY 3

Find the formula for the nth term of a number sequence 64, 32, 16, 8, ... !!

## ANSWER:



GOOD LUCK !!!

#### **ATTACHMENT 10**

#### TRIAL PROBLEMS TRIAL THE MATHEMATIC COMMUNICATION SKILLS TEST

Education Unit	: SMP Adabiah Padang
Subjects	: Mathematics
Class / Semester	: VIII / I
Material	: Number Patterns
Time Allocation	: 2 x 40 Minutes
Academic Year	: 2017/2018

#### **Basic competencies**

- 3.1 Specifying a pattern in a number sequence or configuration sequence of objects.
- 4.1 Solving problems related to patterns in the sequence of numbers or configuration of objects.

Basic competencies	Indicator of Mathematical Communication	Ouestion	Cognitive Level		
	Ability	Number	C3	C4	C5
3.1 Specifying a pattern in a number sequence or configuration sequence of objects.	Converting real situations, pictures, diagrams, or objects into language, symbols, ideas, or mathematical models.	1	V		
4.1 Solving problems related to patterns in sequence of		2	$\checkmark$		
numbers or configuration of	Explain an idea, situation, and mathematical	3	$\checkmark$		

objects.	relation through pictures.			
	Perform mathematical manipulations.	4		

### **Description :**

C3: Application

C4: Analysis

C5:

Assessment

### **ATTACHMENT 11**

#### VALIDATION SHEET TEST PROBLEMS TRY THE MATHEMATIC COMMUNICATION ABILITY TEST

Education Unit	: SMP Adabiah Padang
Subjects	: Mathematics
Class / Semester	: VIII / I
Material	: Number Patterns
Time Allocation	: 80 Minutes
Academic Year	: 2017/2018

#### **Basic competencies**

3.1 Specifying a pattern in a number sequence or configuration sequence of objects.

4.1 Solving problems related to patterns in the sequence of numbers or configuration of objects.

		Que	Cog	nitive I	Level	Validit	y			
Basic competencies	Indicator of Mathematical Communication Ability	stio n nu mbe r	C3	C4	C5	Valid	A little improvem ent	More improvem ent	Not Valid	Note
3.1Determining a pattern in a number sequence or a configuration object sequence.	Converting real situations, pictures, diagrams, or objects into language, symbols, ideas, or mathematical models.	1	$\checkmark$							
4.1 Solving problems	Explain an idea,	2								

related to the pattern in the sequence of numbers of	isituation,andfmathematicalrelationcthrough pictures.	
configuration o objects.	F Perform mathematical 3 <sup>1</sup> manipulations.	
	Provide logical and 4 correct reasons or evidence for the solution.	

Validator Recommendations for Test Questions :

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.....

.....

.....

Padang, July 2017

Validator,

( .....)

#### **ATTACHMENT 12**

# TRIAL QUESTION FOR THE MATHEMATIC COMMUNICATION ABILITY TEST

2	Subject	: Mathematics
,	Theory	: Number Patterns
(	Class/semester	: VIII/I
,	Time	: 2 x 40 minutes
	Time	· 2 x 40 minutes

#### **Instruction:**

- 1. Pray first before working on the problem!
- 2. Write the name and class first on your answer sheet!
- 3. Read the questions carefully before answering them!
- 4. First answer the questions that you think are easy!
- 5. Please check your answer sheet before submitting it to the supervisor!
  - 1. Tono has marbles and he wants to arrange them in an orderly manner as shown below:



- a) Find the number of Tono marbles in the 8th arrangement!
- b) What is the number of Tono marbles in the 15th arrangement?
- 2. A construction worker wants to arrange bricks in a neat and orderly manner. In order to make it look attractive, the construction worker grouped the bricks into an arrangement of 1, 3, 6, 10, ... and so on.
  - a) Draw the arrangement of each brick from the problem above!
  - b) Draw and determine the number of bricks in the 5th and 6th arrangement!
- 3. The 4th and 9th terms of an arithmetic sequence are 110 and 150, respectively. Find the 30th term of the number sequence!

4. A mother distributes candy to her 5 children with the rule that the younger the child is, the more candy she gets. If the second child received 11 candies and the fourth child 19 pieces, check whether the total number of candies that the mother distributed to her 5 children was 75 pieces of candy. Explain your answer!

LUCK

### **ATTACHMENT 13**

#### TEST PROBLEMS AND ANSWERS TRY THE MATHEMATIC COMMUNICATION ABILITY TEST

NO	INDICATOR	TEST QUESTION	ANSWER	SCORE
1	Converting real situations, pictures, diagrams, or	Tono has marbles and he wants to arrange them in an orderly manner as shown below :	<b>Is known :</b> Tono has marbles with the arrangement shown in the picture: 1, 4, 9, 16, etc.	3
	language, symbols, ideas, or mathematical models	(1) (2) (3) (4) and so on	<ul><li>a) Find the number of Tono marbles in the 8th arrangement !!</li><li>b) What is the number of Tono marbles in the 15th arrangement?</li></ul>	
		<ul><li>a) Find the Tono marbles in the 8th order !!</li><li>b) How many Tono marbles are in the</li></ul>	Answer: <u>SCORE 1</u>	
		15th arrangement ?	<ul> <li>a) The number of marbles in the 8th arrangement, namely: 8<sup>2</sup>=16</li> <li>b) The number of Table 15th arrangement is the 15th arrangement.</li> </ul>	
			b) The number of Tono marbles in the 15th arrangement, namely: $=\frac{1}{6} \cdot 15(15+1)(2.15+1)$	
			$=\frac{1}{6}(240)(31)$	

	= 1240	
	<u>SCORE 2</u>	
	<ul> <li>a) The number of marbles in the 8th arrangement, is :</li> <li>8<sup>2</sup> = 64</li> <li>b) The number of Tono marbles in the 15th arrangement is :</li> </ul>	
	$=\frac{1}{6}.15(15+1)(2.15+1)$	
	$=\frac{1}{6}.15(16)(31)$	
	$=\frac{1}{6}(240)(31)$	
	SCORE 3	
	a) The number of marbles in the 8th arrangement, namely:	
	Since the arrangement of the marbles in the problem	
	above is a pattern for square numbers, we use the	
	formula $U_n = n^2$ so that the number of marbles in the 8th	
	arrangement is: $U_n = n^2$	

		$S_n = \frac{1}{6}n(n+1)(2n+1) = \frac{1}{6}(1-1)$ $= \frac{1}{6}(1-1)$	$U_8 = 8^2$ = 64 So, the number of marbles in the 8th arrangement is 64 marbles. b) The number of Tono marbles in the 15th arrangement is : 1) = $\frac{1}{6} \cdot 15(15+1)(2.15+1)$ = $\frac{1}{6} \cdot 15(16)(31)$ 240)(31) 7440) = 1240 So, the number of Tono marbles in the 8th arrangement is 1240 marbles.	
2	Explain an idea, situation, and mathematical relation through pictures.	A construction worker wants to arrange bricks in a neat and orderly manner. In order to make it look attractive, the construction worker grouped the bricks into an	<ul> <li>Is known :</li> <li>The number of bricks in the 1st arrangement is 1 brick.</li> <li>The number of bricks in the 2nd arrangement is 3 bricks.</li> <li>The number of bricks in the 3rd arrangement is 6 bricks.</li> <li>The number of bricks in the 4th arrangement is 10 bricks.</li> </ul>	3

<ul> <li>arrangement of 1, 3, 6, 10, and so on.</li> <li>a) Draw the arrangement of each brick from the problem above!</li> <li>b) Draw and determine the number of bricks in the 5th and 6th arrangement!</li> <li>b) Draw and determine the number of bricks in the 5th and 6th arrangement!</li> <li>Answer:</li> <li>SCORE 1         <ul> <li>a) Draw the arrangement of each brick from the problem above!</li> <li>b) Draw and determine the number of bricks in the 5th and 6th arrangement!</li> </ul> </li> <li>Answer:</li> <li>SCORE 1         <ul> <li>a) Draw the arrangement of each brick from the problem above!</li> <li>b) Draw the arrangement of each brick from the problem above!</li> <li>c) Draw the arrangement of each brick from the problem above!</li> <li>a) Draw the arrangement of each brick from the problem above!</li> <li>b) Draw the arrangement of each brick from the problem above!</li> <li>c) Draw the arrangement of each brick from the question above!</li> <li>c) Draw the arrangement of each brick from the question above!</li> <li>c) Draw the arrangement of each brick from the question above!</li> </ul> </li> </ul>			
a) Draw the arrangement of each brick from the problem above!   b) Draw and determine the number of bricks in the 5th and 6th arrangement!   in the 5th and 6th arrangement! <b>SCORE 1</b> a) Draw the arrangement of each brick from the problem above!   b) Draw and determine the number of bricks   in the 5th and 6th arrangement! <b>SCORE 1</b> a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the problem above!   a) Draw the arrangement of each brick from the question above!   (1)   (2)   (3)		arrangement of 1, 3, 6, 10, and so on.	etc.
SCORE 1 a) Draw the arrangement of each brick from the problem above! (1) (2) (3) (4) SCORE 2 a) Draw the arrangement of each brick from the question above! (1) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4		<ul><li>a) Draw the arrangement of each brick from the problem above!</li><li>b) Draw and determine the number of bricks in the 5th and 6th arrangement!</li></ul>	<ul><li>Asked:</li><li>a) Draw the arrangement of each brick from the problem above!</li><li>b) Draw and determine the number of bricks in the 5th and 6th arrangement!</li><li>Answer:</li></ul>
a) Draw the arrangement of each brick from the problem above! (1) (2) (3) (4) <b>SCORE 2</b> a) Draw the arrangement of each brick from the question above!			SCORE 1
(1) (2) (3) (4) SCORE 2 (a) Draw the arrangement of each brick from the question above! (1) (2) (3)			a) Draw the arrangement of each brick from the problem above!
(1) (2) (3) (4) <b>SCORE 2</b> (a) Draw the arrangement of each brick from the question above! (1) (2) (3)			
(4) SCORE 2 a) Draw the arrangement of each brick from the question above! (1) (2) (3)			(1) (2) (3)
(4) SCORE 2 a) Draw the arrangement of each brick from the question above! (1) (2) (3)			
SCORE 2 a) Draw the arrangement of each brick from the question above! (1) (2) (3)			(4)
a) Draw the arrangement of each brick from the question above!			SCORE 2
			a) Draw the arrangement of each brick from the question above!
(1) (2) (3)			
			(1) (2) (3)


			(4)	
			b) Draw and determine the number of bricks in the 5th and	
			6th arrangements, namely :	
			our arrangements, namery .	
			(6)	
3	Perform	The 4th term and 9th term of an arithmetic	Known :	3
	mathematical	sequence are 110 and 150, respectively. Find	$U_4 = 110$	
	manipulations.	the 30th term of the sequence of numbers !!	$U_9 = 150$	
			Asked	
			The 30th term of the arithmetic sequence is	
			<u>^</u>	
			Answer :	
			SCORE 1	
			(1) $U_4 = a + 3b = 110$	

(2) $U_9 = a + 8b = 150$
From equations (1) and (2) are obtained :
$a + 3b = 110 \longrightarrow a = 3b - 110$
Substitute into equation (2) becomes :
a + 8b = 150
$3b - \frac{110}{8} 8b = 150$
-110 <del>+ 110</del> = 150
11 <i>b</i> <del>- 40</del> ►
<i>b</i> = 3 <del>,64</del> ►
Substitute the value of $b = 3.64$ into equation (1) or (2), then :
a = 3b - 110
a = 3(3,64) - 110
a = 10,92 - 110
a = -99,08
So, the values for $a = -99.08$ and $b = 3.64$
<u>SCORE 2</u>
(1) $U_4 = a + 3b = 110$
(2) $U_9 = a + 8b = 150$
From equations (1) and (2) are obtained :
$a + 3b - 110 \longrightarrow a - 110 - 3b$
u + 5b = 110 $r = u = 110 - 5bSubstitute into equation (2) becomes:$
a + 8b = 150
110 - 3b + 8b = 150
110 + 5b = 150

	5b = 40	
	$b = 8 \longrightarrow$	
	Substitute the value of $b = 8$ into equation (1) or (2), then :	
	a = 110 - 3b	
	a = 110 - 3(8)	
	a = 110 - 24	
	a = 86	
	The 30th term of the arithmetic sequence is:	
	$U_{ac} = a + 31h$	
	$U_{30} = \frac{1}{4} + \frac{310}{310}$	
	$\rightarrow 0_{30} = 86 + 248$	
	$\rightarrow U_{30} = 334$	
	So, the 30th term of the arithmetic sequence is 334.	
	SCORE 3	
	(1) $U_4 = a + 3b = 110$	
	(2) $U_9 = a + 8b = 150$	
	From equations (1) and (2) are obtained :	
	$a + 3b = 110 \longrightarrow a = 110 - 3b$	
	Substitute into equation (2) becomes :	
	a + 8b = 150	
	110 - 3b + 8b = 150	
	110 + 5b = 150	
	5 <i>b</i> = <del>40</del> ►	

$b = 8 \longrightarrow$ Substitute the value of $b = 8$ into equation (1) or (2). Suppose we substitute it for equation (1), then : a = 110 - 3b $a = 110 - 3(8)$ $a = 110 - 24$ $a = 86$ The 30th term of the arithmetic sequence is : $U_n = a + (n - 1) b$ $U_{30} = a + 29b$ $\longrightarrow U_{30} = 86 + 29(8)$ $\longrightarrow U_{30} = 318$ So, the 30th term of the arithmetic sequence is 318.			
Substitute the value of $b = 8$ into equation (1) or (2). Suppose we substitute it for equation (1), then : a = 110 - 3b $a = 110 - 3(8)$ $a = 110 - 24$ $a = 86$ The 30th term of the arithmetic sequence is : $U_n = a + (n - 1) b$ $U_{30} = a + 29b$ $\longrightarrow U_{30} = 86 + 29(8)$ $\longrightarrow U_{30} = 86 + 232$ $\longrightarrow U_{30} = 318$ So, the 30th term of the arithmetic sequence is 318.		$b = 8 \longrightarrow$	
a = 110 - 3b a = 110 - 3(8) a = 110 - 24 a = 86 The 30th term of the arithmetic sequence is : $U_n = a + (n - 1) b$ $U_{30} = a + 29b$ $\rightarrow U_{30} = 86 + 29(8)$ $\rightarrow U_{30} = 86 + 232$ $\rightarrow U_{30} = 318$ So, the 30th term of the arithmetic sequence is 318.		Substitute the value of $b = 8$ into equation (1) or (2). Suppose we substitute it for equation (1), then :	
The 30th term of the arithmetic sequence is : $U_n = a + (n - 1) b$ $U_{30} = a + 29b$ $\rightarrow U_{30} = 86 + 29(8)$ $\rightarrow U_{30} = 86 + 232$ $\rightarrow U_{30} = 318$ So, the 30th term of the arithmetic sequence is 318.		a = 110 - 3b a = 110 - 3(8) a = 110 - 24 a = 86	
So, the 30th term of the arithmetic sequence is 318.		The 30th term of the arithmetic sequence is : $U_n = a + (n-1) b$ $U_{30} = a + 29b$ $\longrightarrow U_{30} = 86 + 29(8)$ $\longrightarrow U_{30} = 86 + 232$ $\longrightarrow U_{30} = 318$	
		So, the 30th term of the arithmetic sequence is 318.	

4	Provide logical	A mother distributes candy to her 5 children	Known :	3
	and correct	with the rule that the younger the child is,	$U_2 = 11$	
	reasons or	the more candy she gets. If the second child	$U_4 = 19$	
	evidence for the	received 11 candies and the fourth child 19		
	colution	nices whether the total number of	Askadı	
	solution.	pieces, check whether the total humber of	Askeu:	
		candles that the mother distributed to her 5	Check whether the total number of candles that the mother	
		children was 75 pieces of candy. Explain	distributed to her 5 children was 75 pieces of candy. Explain	
		your answer	your answer !!	
			Answer :	
			SCORE 1	
			Yes, the number of marbles that the mother distributed to her 5	
			children was 75 nermen	
			entaren was 75 permen .	
			SCODE 1	
			SCORE 2	
			(1) $U_2 = a + (2 - 1)b = a + b = 11$	
			(2) $U_4 = a + (4 - 1)b = a + 3b = 19$	
			$a + b = 11 \longrightarrow a = 11 - b$	
			Substitute into equation (2) becomes :	
			Substitute into equation (2) becomes :	
			a + 3b - 19	
			u + 55 – 17	
			a + 3b = 19	
			<i>11 - b <del>+ 3b</del></i> 19	
			$2b = 8 \longrightarrow$	
			$\overrightarrow{h-4}$	

	Substitute the value of $b = 4$ into equation (1) or (2), then	:
	a = 11 - b	
	a = 11 - 4	
	a = 7	
	<u>SCORE 3</u>	
	II = a + (n-1)h	
	$o_n - a + (n - 1)o$	
	(1) $U_2 = a + (2-1)b = a + b = 11$	
	(2) $U_{-} = z + (4 - 1)b = z + 2b = 10$	
	$(2) 0_4 = a + (4 - 1)b = a + 3b = 19$	
	From and the values of a and h can be found as follo	ows ·
		, , , , , , , , , , , , , , , , , , ,
	$a + b = 11 \longrightarrow a = 11 - b$	
	Substitute into equation (2) becomes :	
	a + 3 = 19	
	a + 3b = 19	
	11- <i>b</i> + 3 <i>b</i> →19	
	$2b = 8 \longrightarrow$	
	$b = 4$ $\longrightarrow$	
	Substitute the value of $b = 4$ into equation (1) or (2). Suppose the set of $b = 4$ into equation (1) or (2).	ppose we
	substitute it for equation (1), then :	
	a = 11 - b	
	a = 11 - 4	
	a = 7	

	To calculate the amount of candy, the following formula can be used :	
	$S_n = \frac{n}{2}(2a + (n-1)b)$	
	Then the amount of candy that the mother distributed to her five children, namely :	
	$S_n = \frac{n}{2}(2a + (n-1)b)$	
	$=\frac{5}{2}(2(7)+(5-1)4)$	
	$=\frac{5}{2}(14+(4)4)$	
	So, it is true that the amount of candy that the mother distributed to her five children was 75 pieces of candy	
	to her five children was 75 pieces of canay .	

## DISTRIBUTION OF TEST RESULT VALUE TRIAL TEST

STUDENT'S	QUESTION NUMBER							
NAME	1a	1b	2a	<b>2b</b>	3	4	TOTAL	QUADRATE TOTAL
SCORE	3	3	3	3	3	3	SCORE	SCORE
UC11	3	3	3	3	3	3	18	324
UC15	3	2	3	3	2	3	16	256
UC4	3	1	3	3	2	3	15	225
UC12	1	3	3	2	3	3	15	225
UC24	3	2	3	2	3	2	15	225
UC6	3	2	2	2	3	3	15	225
UC7	2	3	2	1	2	3	13	169
UC21	3	2	0	2	3	3	13	169
UC9	3	2	0	2	3	2	12	144
UC16	3	2	0	2	3	2	12	144
UC17	3	3	2	2	1	1	12	144
UC18	2	3	2	1	2	2	12	144
UC10	3	2	2	2	2	0	11	121
UC19	2	1	2	2	2	2	11	121
UC25	3	1	2	2	3	0	11	121
UC26	3	2	2	2	2	0	11	121
UC8	3	2	2	2	1	0	10	100
UC14	2	1	2	2	2	1	10	100
UC22	3	1	2	0	2	1	9	81
UC23	2	1	0	2	2	2	9	81
UC2	1	3	2	2	0	0	8	64
UC3	2	1	2	0	1	2	8	64
UC5	2	1	2	2	1	0	8	64
UC13	2	1	2	0	2	1	8	64
UC20	0	0	2	0	1	2	5	25
UC1	1	0	0	0	3	0	4	16
TOTAL	61	45	47	43	54	41	291	3537

## PROBLEM ITEM DIFFERENT INDEX TABLE

Df	0,10	0,05	0,02	0,01
1	t = 6,34	t = 12,71	t = 31,82	t = 63,66
2	2,92	4,30	6,96	9,92
3	2,35	3,18	4,54	5,48
4	2,13	2,78	3,75	4,60
5	2,02	2,57	3,36	4,03
6	1.94	2.45	3.14	3.71
7	1.90	2.36	3.00	3.50
8	1.86	2.31	2.90	3.36
9	1.83	2.26	2.82	3.25
10	1 81	2,23	2,76	3,17
11	1.80	2,20	2.72	3 11
12	1 78	2.18	2,68	3,06
13	1 77	2.16	2,65	3,00
14	1 76	2,10	2,63	2.98
15	1,75	2,14	2,62	2,90
16	1 74	2 12	2 58	2,92
17	1 73	2,12	2,50	2,92
18	1,73	2,11	2,57	2,90
10	1,75	2,10	2,54	2,70
20	1,72	2,09	2,55	2,80
20	1,72	2,00	2,52	2,04
21	1,72	2,07	2,51	2,83
22	1,/1	2,07	2,30	2,02
25	1,/1	2,00	2,40	2,01
24	1,/1	2,00	2,40	2,78
25	1,/1	2,00	2,40	2,70
20	1,/1	2,05	2,47	2,11
27	1,70	2,03	2,47	2,70
28	1,70	2,04	2,40	2,75
29	1,70	2,04	2,40	2,72
3U 25	1,09	2,03	2,44	2,/1
33	1,08	2,02	2,42	2,09
40	1,08	2,02	2,41	2,68
45	1,08	2,01	2,40	2,00
50	1,6/	2,00	2,39	2,65
60	1,6/	2,00	2,38	2,64
/0	1,66	1,99	2,38	2,63
80	1,66	1,98	2,37	2,63
90	1,66	1,98	2,36	2,62
100	1,66	1,98	2,36	2,61
125	1,66	1,98	2,35	2,60
150	1,65	1,97	2,35	2,59
200	1,65	1,97	2,34	2,59
300	1,65	1,97	2,34	2,59
400	1,65	1,96	2,33	2,59
500	1,65	1,96	2,33	2,58
1000	1,65	1,96	2,33	2,58

## CALCULATION OF DIFFERENT PERIOD OF TRIAL PROBLEM MATHEMATIC COMMUNICATION SKILLS TEST

N = 26 students

 $n = 27 \% x 26 = 7,02 \approx 7$  students

 $n_t=n_r=n=7\\$ 

So, 7 students were taken for the high and low groups.

 $d_f = (n_t - 1) + (n_r - 1) = (7 - 1) + (7 - 1) = 12$ 

For an error rate of 5% on  $d_f = 12$  obtained  $I_{p \text{ table}} = 2,18$ 

	Score	X - Mt			Score	X - Mr	
High group	(X)	(Xt)	Xt <sup>2</sup>	Low Group	(X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,43	0,184	UC23	2	0,57	0,327
UC15	3	0,43	0,184	UC2	1	-0,43	0,184
UC4	3	0,43	0,184	UC3	2	0,57	0,327
UC12	1	-1,57	2,470	UC5	2	0,57	0,327
UC24	3	0,43	0,184	UC13	2	0,57	0,327
UC6	3	0,43	0,184	UC20	0	-1,43	2,041
UC7	2	-0,57	0,327	UC1	1	-0,43	0,184
Total	18		3,717	Total	10		3,717
Mean (Mt)	2,57			Mean (Mr)	1,43		

**Question Number 1a** 

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,57 - 1,43}{\sqrt{\frac{3,717 + 3,717}{42}}} = 2,71$$

Because  $I_p$  count  $\geq I_p$  table, then Question Number 1a Significant with  $\alpha = 5 \%$ ( $I_p$  table = 2,18)

Question Number 1b

High	Score	X - Mt			Score	X - Mr	
Group	( <b>X</b> )	(Xt)	Xt <sup>2</sup>	Low Group	(X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,71	0,510	UC23	1	0	0
UC15	2	-0,29	0,082	UC2	3	2	4
UC4	1	-1,29	1,653	UC3	1	0	0
UC12	3	0,71	0,510	UC5	1	0	0
UC24	2	-0,29	0,082	UC13	1	0	0
UC6	2	-0,29	0,082	UC20	0	-1	1
UC7	3	0,71	0,510	UC1	0	-1	1
Total	16		3,429	Total	7		6
Mean							
(Mt)	2,29			Mean (Mr)	1		

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,29 - 1}{\sqrt{\frac{3,429 + 6}{42}}} = 2,72$$

Because  $I_p$  count  $\ge I_p$  table, then Question Number 1b Significant with  $\alpha = 5 \%$ % ( $I_p$  tabel = 2,18)

High	Score	X - Mt			Score	X - Mr	
Group	( <b>X</b> )	(Xt)	Xt <sup>2</sup>	Low Group	(X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,29	0,082	UC23	0	-1,43	2,041
UC15	3	0,29	0,082	UC2	2	0,57	0,327
UC4	3	0,29	0,082	UC3	2	0,57	0,327
UC12	3	0,29	0,082	UC5	2	0,57	0,327
UC24	3	0,29	0,082	UC13	2	0,57	0,327
UC6	2	-0,71	0,510	UC20	2	0,57	0,327
UC7	2	0,71	0,510	UC1	0	-1,43	2,041
Total	19		1,43	Total	10		5,717
Mean							
(Mt)	2,71			Mean (Mr)	1,43		

**Question Number 2a** 

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,71 - 1,43}{\sqrt{\frac{1,43 + 5,717}{42}}} = 3,12$$

Because  $I_p$  count  $\geq I_p$  table, then Question Number 2a Significant with  $\alpha = 5 \%$ ( $I_p$  table = 2,18)

High	Score	X - Mt			Scor	X - Mr	
Group	(X)	(Xt)	Xt <sup>2</sup>	Low Group	e (X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,71	0,510	UC23	2	1,14	1,307
UC15	3	-0,29	0,082	UC2	2	1,14	1,307
UC4	3	-1,29	1,653	UC3	0	-0,86	0,735
UC12	2	0,71	0,510	UC5	2	1,14	1,307
UC24	2	-0,29	0,082	UC13	0	-0,86	0,745
UC6	2	-0,29	0,082	UC20	0	-0,86	0,735
UC7	1	0,71	0,510	UC1	0	-0,86	0,735
Total	16		3,429	Total	6		6,871
Mean							
(Mt)	2,29			Mean (Mr)	0,86		

## **Question Number 2b**

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,29 - 0,86}{\sqrt{\frac{3,429 + 6,871}{42}}} = 2,88$$

Because  $I_p$  count  $\geq I_p$  table, then Question Number 2b Significant with  $\alpha = 5 \%$ ( $I_p$  table = 2,18)

High	Score	X - Mt			Scor	X - Mr	
Group	( <b>X</b> )	(Xt)	Xt <sup>2</sup>	Low Group	e (X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,43	0,184	UC23	2	0,57	0,327
UC15	2	-0,57	0,327	UC2	0	-1,43	2,041
UC4	2	-0,57	0,327	UC3	1	-0,43	0,184
UC12	3	0,43	0,184	UC5	1	-0,43	0,184
UC24	3	0,43	0,184	UC13	2	0,57	0,327
UC6	3	0,43	0,184	UC20	1	-0,43	0,184
UC7	2	-0,57	0,327	UC1	3	1,57	2,470
Total	18		1,717	Total	10		5,717
Mean							
(Mt)	2,57			Mean (Mr)	1,43		

Question Number 3

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,57 - 1,43}{\sqrt{\frac{1,717 + 5,717}{42}}} = 2,71$$

Because  $I_p$  count  $\geq I_p$  table, then Question Number 3 Significant with  $\alpha = 5 \%$ ( $I_p$  table = 2,18)

High	Score	X - Mt		Low	Score	X - Mr	
Group	(X)	(Xt)	Xt <sup>2</sup>	Group	(X)	(Xr)	Xr <sup>2</sup>
UC11	3	0,14	0,02	UC23	2	1	1
UC15	3	0,14	0,02	UC2	0	-1	1
UC4	3	0,14	0,02	UC3	2	1	1
UC12	3	0,14	0,02	UC5	0	-1	1
UC24	2	-0,86	0,735	UC13	1	0	0
UC6	3	0,14	0,02	UC20	2	1	1
UC7	3	0,14	0,02	UC1	0	-1	1
Total	20		0,855	Total	7		6
Mean							
(Mt)	2,86			Mean (Mr)	1		

Question	Number	4

$$I_{p} = \frac{M_{t} - M_{r}}{\sqrt{\frac{\sum X_{t}^{2} + \sum X_{r}^{2}}{n(n-1)}}} = \frac{2,86 - 1}{\sqrt{\frac{0,855 + 6}{42}}} = 4,60$$

Because  $I_p$  count  $\geq I_p$  table, then Question Number 4 Significant with  $\alpha = 5 \%$ ( $I_p$  table = 2,18)

# CALCULATION OF ITEM SUCCESS INDEX PROBLEM TRIAL THE MATHEMATIC COMMUNICATION ABILITY TEST

N = 26

 $\begin{array}{l} n \ = 27\% \ x \ N = 27\% \ x \ 26 = 7,02 \approx 7 \\ & \mbox{The } I_k \ criteria \ used \ are \ as \ follows \\ & \mbox{Difficult Question, if } I_k < 27\% \\ & \mbox{Medium Question, if } 27\% \leq \ I_k \ \leq \ 73\% \\ & \mbox{Easy Question, if } I_k > 73\% \end{array}$ 

#### **Question Number 1a**

Student's Name	High Group Score	Student's Name	Low Group Score	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3	UC23	2	$=\frac{10+10}{2\cdot 3\cdot 7} \times 100\%$
UC15	3	UC2	1	28
UC4	3	UC3	2	$=\frac{20}{42} \times 100\%$
UC12	1	UC5	2	= 66 67%
UC24	3	UC13	2	
UC6	3	UC20	0	Difficulty index Ouestion Number 1a
UC7	2	UC1	1	Medium
Dt	18	Dr	10	

## **Question Number 1b**

Student's Name	High Group Score	Student's Name	Low Group Score	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3	UC23	1	$=\frac{10+7}{2\cdot3\cdot7}\times100\%$
UC15	2	UC2	3	23
UC4	1	UC3	1	$=\frac{23}{42} \times 100\%$
UC12	3	UC5	1	= 54 76%
UC24	2	UC13	1	51,7070
UC6	2	UC20	0	Difficulty index Ouestion Number 1b
UC7	3	UC1	0	Medium
Dt	16	Dr	7	1

## **Question Number 2a**

Student' s Name	High Group Score	Student' s Name	Low Group Score	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3	UC23	0	$=\frac{19+10}{2\cdot 3\cdot 7} \times 100\%$
UC15	3	UC2	2	29
UC4	3	UC3	2	$=\frac{23}{42} \times 100\%$
UC12	3	UC5	2	= 69.05%
UC24	3	UC13	2	- 07,0370
UC6	2	UC20	2	Difficulty index Ouestion Number 2a
UC7	2	UC1	0	Medium
Dt	19	Dr	10	

## **Question Number 2b**

Student' s Name	High Group Score	Student' s Name	Low Group Score	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3	UC23	2	$=\frac{10+0}{2\cdot3\cdot7}\times100\%$
UC15	3	UC2	2	22
UC4	3	UC3	0	$=\frac{32}{42} \times 100\%$
UC12	2	UC5	2	= 52 38%
UC24	2	UC13	0	52,50 %
UC6	2	UC20	0	Difficulty index Ouestion Number 2b
UC7	1	UC1	0	Medium
Dt	16	Dr	6	

Question	Number	3				
Student' s Name	High Score	Group	Student' s Name	Low Score	Group	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3		UC23	2		$=\frac{18+10}{2\cdot 3\cdot 7} \times 100\%$
UC15	2		UC2	0		28
UC4	2		UC3	1		$=\frac{20}{42} \times 100\%$
UC12	3		UC5	1		= 66 67%
UC24	3		UC13	2		00,0770
UC6	3		UC20	1		Difficulty index Ouestion Number 3
UC7	2		UC1	3		Medium
Dt	18		Dr	10		

Questio	n Number 4			
Stude nt's Name	High Group Score	Stude nt's Name	Low Group Score	$I_k = \frac{D_t + D_r}{2 \cdot m \cdot n} \times 100\%$
UC11	3	UC23	2	$=\frac{20+7}{2\cdot3\cdot7}\times100\%$
UC15	3	UC2	0	27
UC4	3	UC3	2	$=\frac{27}{42} \times 100\%$
UC12	3	UC5	0	= 64 29%
UC24	2	UC13	1	01,2770
UC6	3	UC20	2	Difficulty index Ouestion Number 4
UC7	3	UC1	0	Medium
Dt	20	Dr	7	

## CLASSIFICATION OF TRIAL PROBLEMS MATHEMATIC COMMUNICATION SKILLS TEST

#### $I_P table = 2,18$

The classification of questions used is as follows :

- Problem used if it is  $I_p$  Significant and 0% <  $I_k$ < 100%
- Problem is corrected if :
  - a.  $I_p$  Significant and  $I_k = 0\%$  or  $I_k = 100\%$
  - b.  $I_p$  Not Significant and  $0\% < I_k < 100\%$
- • Problem replaced if  $I_p$  not Significant and  $I_k = 0\%$  or  $I_k = 100\%$

No. Question	Ip	Description	<b>I</b> <sub>k</sub> (%)	Description	Classification
1a	2,71	Significant	66,67	Medium	Used
1b	2,72	Significant	54,76	Medium	Used
2a	3,12	Significant	69,05	Medium	Used
2b	2,88	Significant	52,38	Medium	Used
3	2,71	Significant	66,67	Medium	Used
4	4,60	Significant	64,29	Medium	Used

## CALCULATION OF RELIABILITY TRIAL PROBLEMS MATHEMATIC COMMUNICATION ABILITY TEST

**Reliability Formulas :** 

$$r_{11} = \left(\frac{n}{n-1}\right) \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right)$$

with

$$\sigma_t^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{N}}{N}$$

Description :

 $r_{11}$  = reliability sought  $\sum \sigma_i^2$  = Total variance Score of each item  $\sigma_i^2$  = total variance N = Total students n = lots of questions or items

Criteria:

If  $0,80 < r_{11} \le 1,00$  then reliability is very high If  $0,60 < r_{11} \le 0,80$  then reliability is high If  $0,40 < r_{11} \le 0,60$  then reliability is Medium If  $0,20 < r_{11} \le 0,40$  then reliability is low If  $0,00 < r_{11} \le 0,20$  then reliability is very low

STUDENT'S	QUEST	TION NU	MBER					TOTAL
NAME	<b>1</b> a	1b	2a	2b	3	4	SCORE	SCORE
SCORE	3	3	3	3	3	3	IUIAL	QUADRATE
UC11	3	3	3	3	3	3	18	324
UC15	3	2	3	3	2	3	16	256
UC4	3	1	3	3	2	3	15	225
UC12	1	3	3	2	3	3	15	225
UC24	3	2	3	2	3	2	15	225
UC6	3	2	2	2	3	3	15	225
UC7	2	3	2	1	2	3	13	169
UC21	3	2	0	2	3	3	13	169
UC9	3	2	0	2	3	2	12	144
UC16	3	2	0	2	3	2	12	144
UC17	3	3	2	2	1	1	12	144
UC18	2	3	2	1	2	2	12	144
UC10	3	2	2	2	2	0	11	121
UC19	2	1	2	2	2	2	11	121
UC25	3	1	2	2	3	0	11	121
UC26	3	2	2	2	2	0	11	121
UC8	3	2	2	2	1	0	10	100
UC14	2	1	2	2	2	1	10	100
UC22	3	1	2	0	2	1	9	81
UC23	2	1	0	2	2	2	9	81
UC2	1	3	2	2	0	0	8	64
UC3	2	1	2	0	1	2	8	64
UC5	2	1	2	2	1	0	8	64
UC13	2	1	2	0	2	1	8	64
UC20	0	0	2	0	1	2	5	25
UC1	1	0	0	0	3	0	4	16
ΣΧι	61	45	47	43	54	41	291	3537
$(\Sigma X_i)^2$	3721	2025	2209	1849	2916	1681	84681	
$\Sigma X_i^2$	161	99	109	93	130	99		

Variance Score of question no. 1

$$\sigma_1^2 = \frac{\sum x_1^2 - \frac{(\sum x_1)^2}{N}}{N}$$
$$= \frac{161 - \frac{3721}{26}}{26}$$
$$= 0,69$$

In the same way, the variance Score for each is obtained as follows :

$\sigma_1^2$	$\sigma_2^2$	$\sigma_3^2$	$\sigma_4^2$	$\sigma_5^2$	$\sigma_6^2$	$\sum {\sigma_i}^2$
0,69	0,81	0,93	0,84	0,68	1,32	5,27

**Total Score Variance** 

$$\sigma_t^2 = \frac{\sum x_t^2 - \frac{(\sum x_t)^2}{N}}{N} = \frac{3537 - \frac{(291)^2}{26}}{26}$$
$$= 10,78$$

Question Reliability of Trial Test

$$r_{11} = \left(\frac{n}{n-1}\right) \left(1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right)$$
$$= \left(\frac{6}{6-1}\right) \left(1 - \frac{5,27}{10,78}\right)$$
$$= \left(\frac{6}{5}\right) (0,511)$$

=0,6132

The test reliability obtained was 0.6132. Means that the test questions have high reliability.

## DISTRIBUTION OF EXPERIMENT CLASS END TEST VALUE

STUDENT'S	QUESTION NUMBER						SCOR	
NAME	<b>1</b> a	1b	2a	2b	3	4		VALUE
SCORE	3	3	3	3	3	3	L	VALUE
E1	1	1	2	2	1	1	8	44,45
E2	3	3	2	2	3	3	16	88,89
E3	3	3	2	2	1	1	12	66,67
E4	2	3	3	3	1	1	13	72,23
E5	3	3	2	1	2	1	12	66,67
E6	3	3	3	3	2	2	16	88,89
E7	1	3	2	2	2	3	13	72,23
E8	2	3	2	2	3	2	14	77,78
E9	2	2	3	2	1	1	11	61,12
E10	1	3	3	3	1	1	12	66,67
E11	2	1	3	3	3	2	14	77,78
E12	2	3	3	3	2	2	15	83,34
E13	3	3	3	3	2	2	16	88,89
E14	3	3	3	2	3	2	16	88,89
E15	3	3	3	3	3	3	18	100
E16	2	3	3	2	2	3	15	83,34
E17	1	3	3	3	1	2	13	72,23
E18	2	1	3	3	2	3	14	77,78
E19	1	3	2	2	1	1	10	55,56
E20	2	1	3	3	3	2	14	77,78
E21	2	3	2	1	2	2	12	66,67
E22	1	3	3	3	2	3	15	83,34
E23	1	3	3	3	1	1	12	66,67
E24	2	3	2	2	2	2	13	72,23
E25	0	3	2	1	0	0	6	33,34
E26	3	3	3	3	3	3	18	100
E27	1	3	3	3	1	0	11	61,12
E28	1	3	3	3	1	0	11	61,12
Mean	1,90	2,68	2,65	2,43	1,83	1,75	13,21	73,41
Standard Deviation	0,88	0,73	0,49	0,70	0,87	0,97	2,73	15,14

## DISTRIBUTION OF CONTROL CLASS END TEST VALUE

STUDENT'S	QUESTION NUMBER						SCOR	
NAME	1a	1b	2a	2b	3	4		
SCORE	3	3	3	3	3	3	L	VALUE
K1	1	1	1	2	3	0	8	44,45
K2	1	1	1	1	1	3	8	44,45
K3	3	1	2	2	3	2	13	72,22
K4	1	1	1	2	3	1	9	50
K5	1	2	2	2	1	2	10	55,56
K6	3	3	3	3	2	2	16	88,89
K7	3	3	2	3	3	2	16	88,89
K8	1	1	2	1	2	2	9	50
K9	3	2	2	2	3	3	15	83,33
K10	1	1	1	2	2	0	7	38,89
K11	1	1	2	2	3	2	11	61,11
K12	1	1	1	1	1	0	5	27,78
K13	3	2	2	2	2	3	14	77,78
K14	3	2	1	2	1	2	11	61,11
K15	3	1	1	1	3	0	9	50
K16	3	1	2	1	3	0	10	55,56
K17	3	3	2	1	3	0	12	66,67
K18	3	3	1	1	3	2	13	72,22
K19	2	2	3	2	2	2	13	72,22
K20	3	3	2	2	3	0	13	72,22
K21	1	1	2	1	1	3	9	50
K22	3	1	2	1	2	3	12	66,67
K23	3	1	1	1	2	0	8	44,45
K24	3	3	3	3	3	3	18	100
Mean	2,21	1,71	1,75	1,71	2,30	1,54	11,21	62,27
Standard								17,87
Deviation	0,98	0,86	0,68	0,69	0,81	1,22	3,22	

## SAMPLE CLASS NORMALITY TEST





### SAMPLE CLASS HOMOGENITY TEST

#### Test for Equal Variances: KELAS EKSPERIMEN; KELAS KONTROL

95% Bonferroni confidence intervals for standard deviations

N Lower StDev Upper KELAS EKSPERIMEN 28 11,5945 15,1456 21,6135 KELAS KONTROL 24 13,4168 17,8684 26,4092

F-Test (normal distribution)
Test statistic = 0,72; p-value = 0,408

Levene's Test (any continuous distribution) Test statistic = 1,27; p-value = 0,265



#### SAMPLE CLASS HYPOTHESIS TEST

Both classes have data that is normally distributed and homogeneous, so to test

the hypothesis the t-test is used.

#### **Two-Sample T-Test and CI: Eksperimen; Kontrol**

Two-sample T for Eksperimen vs Kontrol N Mean StDev SE Mean Eksperimen 28 73,4 15,1 2,9 Kontrol 24 62,3 17,9 3,6 Difference = mu (Eksperimen) - mu (Kontrol) Estimate for difference: 11,1445 95% CI for difference: (1,9502; 20,3389) T-Test of difference = 0(vs not =): T-Value = 2,43 P-Value = 0,019 DF = 50 Both use Pooled StDev = 16,4558

No. Indicator		Score						
INO	Indicator	0	1	2	3			
1	Convey real situations, pictures, diagrams or objects into the language of symbols, ideas or mathematical models.	Not Answer the Question	Real situations, pictures, diagrams or objects that are expressed in language, symbols, ideas, or mathematical models are misrepresented and many important descriptions are not written down.	Situations, pictures, diagrams or real objects that are expressed in language, symbols, ideas, or mathematical models that are made incomplete but the answers are mostly correct.	Situations, pictures, diagrams or real objects are expressed in complete, correct and clear language, symbols, ideas or mathematical models.			
2	Explain an idea, or situation, or mathematical relation through pictures.	Doesn't make picture	The picture is wrong and the answer is wrong too.	The picture is correct but the answer is wrong or the picture is wrong but the answer is correct.	Answer questions with pictures and the answer is correct.			
3	Perform Mathematic Manipulation	Does not create mathematica l symbols or models	The symbol or mathematical model created is incomplete and the answer is wrong.	The symbol or mathematical model created is incomplete, but the answer is correct.	Complete and correct symbols or mathematical models.			
4	Provide logical and correct reasons or evidence for the solution.	Not answer the question	Wrong reasons, proving that the flow is incomplete and the calculations are incorrect.	The reasons or evidence provided are little bit wrong but the calculations are wrong.	The reasons or evidence provided are complete, precise and logical and the calculations are correct.			

## Rubic of Mathematic Communication Ability Test Score

Source: Modifications of Performance Assessment Puji Iryanti (2004)



Jin. Prof. Dr. Hamka, Kampus Air Tawar Padang 25131 Telp. (0751) 7057420

Nomor :<u>2150</u>/UN35.1.1/PP/2017 Hal : Izin Penelitian 12 Juni 2017

Yth. Kepala Dinas Pendidikan Kota Padang Jl. Bagindo Aziz Chan No. 8A

di Padang

Dengan hormat

Bersama ini kami sampaikan bahwa dalam rangka menyelesaikan Tugas Akhir/Skripsi/Tesis, mahasiswa kami dari jenjang pendidikan S1 FMIPA UNP bermaksud akan melaksanakan Penelitian di SMP Adabiah Padang.

Sehubungan dengan hal di atas, kami mohon persetujuan Saudara dan memberikan surat izin melakukan Penelitian untuk mahasiswa tersebut di bawah ini :

No	Nama / NIM / Prodi	Tempat Penelitian	Waktu Penelitian	Judul Skripsi / Tugas Akhir
1	Chintya Tifani / 1101234 / Pendidikan Matematika / S1	SMP Adabiah Padang	10-07-2017 s/d 15-08-2017	Pengaruh Penerapan Model Pembelajaran Kooperatif Tipe Think Pair Share (TPS) Terhadap Kemampuan Komunikasi Matematis Siswa Kelas VIII SMP A dabidi Padena

Demikianlah kami sampaikan, atas bantuan dan kerjasama Saudara kami ucapkan terima kasih.



#### Tembusan:

A

- 1. Dekan FMIPA UNP, sebagai laporan.
- 2. Ketua Jurusan Matematika /Prodi Pendidikan Matematika FMIPA UNP Padang.
- 3. Kepala SMP Adabiah Padang



## PEMERINTAH KOTA PADANG DINAS PENDIDIKAN

JL. Bagindo Aziz Chan no. 8 Padang Telp. (0751) 21554-21825 fax (0751 21554 Website : http://www.diskdik.padang.go.id

#### **IZIN PENELITIAN**

Nomor: 070/1680/ DP.PPMP1/2017

Kepala Dinas Pendidikan berdasarkan Surat Wakil Dekan I FMIPA UNP nomor : 2150/UN.35.1/PP/2017 tanggal 12 Juni 2017 perihal izin penelitian dalam rangka pengambilan data untuk penyelesaian tugas akhir Skripsi pada prinsipnya dapat diberikan kepada :

Nama	: CHINTYA TIFANI
Nim	: 1101234
Jurusan	: Matematika
Prodi	: Pendidikan Matematika
Jenjang	: <b>S1</b>
Judul	: PENGARUH PENERAPAN MODEL PEMBELAJARAN KOOPERATIF TIPE THINK PAIR SHARE (TPS) TERHADAP KEMAMPUAN KOMUNIKASI MATEMATIS SISWA KELAS VIII SMP ADABIAH PADANG
Lokasi	: SMP Adabiah Padang
Waktu	: Juli s.d. Agustus 2017
Dengan ketentuan :	
	1. Selama kegiatan berlangsung tidak mengganggu proses belajar mengajar.
	2. Setelah melakukan penelitian agar dapat memberikan laporan satu rangkap ke
	Dinas Pendidikan Kota Padang Cq. Seksi Perencanaan PPMP
	3. Kegiatan tersebut dilaksanakan di dalam jam belajar siswa

Demikianlah untuk dapat dipergunakan sebagaimana mestinya.

Padang, 6 Juli 2017 an, Kepata Kast: Perencanaan Juli Juli Atriosa S.Si. ME NIP:19760921 200212 1 010

#### Tembusan :

- 1. Walikota Padang (sebagai laporan)
- 2. Kepala Dinas Pendidikan
- Wakil Dekan I FMIPA UNP
   Kepala SMP Adabiah Padang
- 5. Arsip



#### YAYASAN SYARIKAT OESAHA ADABIAH PADANG SEKOLAH MENENGAH PERTAMA (SMP) ADABIAH (Akreditasi A)

JI. Jati Adabiah No. 1 Padang Telp. (0751) 31958 Fax. (0751) 26727

#### SURAT IZIN PENELITIAN Nomor : 420/376 /SMP-ADB/2017

Kepala Sekolah Menengah Pertama (SMP) Adabiah Padang, berdasarkan surat dari Dinas Pendidikan Kota Padang Nomor : 070/1680/DP. PPMP1/2017, tanggal 06 Juli 2017 prihal izin melaksanakan penelitian Mahasiswa UNP Padang, dengan ini menerangkan:

Nama	: Chintya Tifani
NIM	: 1101234
Jurusan/Prog. Studi	: Matematika / Pendidikan Matematika
Tempat Penelitian	: SMP Adabiah Padang
Waktu	: Juli s.d. Agustus 2017
Judul Penelitian	: "Pengaruh Penerapan Model Pembelajaran Kooperatif Tipe <i>Think Pair</i> <i>Share</i> (TPS) terhadap Kemampuan Komunikasi Matematis Siswa
	Kelas VIII SMP Adabiah Padang"

Bahwa nama tersebut di atas telah melaksanakan penelitian di SMP Adabiah Padang dalam rangka penyusunan Tugas Akhir/skripsi.

Demikianlah surat keterangan ini kami berikan kepada yang bersangkutan untuk dapat dipergunakan sebagaimana mestinya. Terima kasih.

