CHAPTER I
INTRODUCTION

I.1 Background

Mathematics is known as an abstract science, whose main characteristics are logical, critical, systematic, and consistent thinking patterns. Mathematics is a very important basic science. Therefore, the number of hours of mathematics lessons is more than other subjects and mathematics is also taught at all levels of education, from elementary school to tertiary level. Mathematics is also the subject most often used in solving other subjects.

According to the National Council of Teachers of Mathematics (NCTM) in learning mathematics students are required to have several abilities, namely mathematical communication skills, mathematical reasoning abilities, mathematical problem solving abilities, mathematical connection skills, and mathematical representation abilities (Mikrayanti, 2016). In the Education Unit Level Curriculum (Depdiknas, 2006) it is stated that students must also have a set of competencies that are expected to be achieved in learning mathematics for secondary schools, namely: (1) Students must understand mathematical concepts, (2) Students do reasoning on patterns and characteristics, perform mathematical manipulation in making generalizations, compiling evidence, or explaining mathematical ideas and statements. (3) Students can solve problems which include the ability to understand problems, design mathematical models. (4) Students can communicate ideas with symbols, tables, diagrams, or other media to clarify a situation or problem in mathematics. (5) Students must have an attitude of appreciating the usefulness of mathematics in life.

According to the Ministry of National Education, reasoning ability is one of the goals in learning mathematics in schools, namely training how to think and

reason in drawing conclusions, develop problem-solving skills, and develop the ability to convey information or communicate ideas through oral, written, pictures, graphics, maps, diagrams, and so on (Sumartini, 2015). The thinking pattern developed by mathematics will train students to be able to draw conclusions about a fact and this requires a mathematical reasoning ability that should be embedded in every student. Mathematical reasoning forms the basis of an understanding of mathematics.

Based on the demands and competency standards contained in the curriculum, it is explained that reasoning ability is one of the abilities that must be possessed and developed by students. Mathematics learning is related to reasoning abilities. Without reasoning, one cannot study mathematics well.

According to Tukaryanto (2018) The importance of mathematical reasoning skills greatly affects the mathematics learning process they follow. Because students who have good reasoning skills will easily understand mathematics material and vice versa students with low mathematical reasoning abilities will find it difficult to understand mathematics material. Mathematical reasoning skills are very important abilities that students must have in solving mathematical problems. This is because every mathematical problem must be solved by a reasoning process, and reasoning can be understood and trained by solving math problems. Teachers can assess students' reasoning abilities by observing how students solve math problems. Through various student answers, the teacher can differentiate or classify students 'answers, in order to obtain an overview of the extent to which students' reasoning abilities solve math problems. To measure students' mathematical reasoning abilities, students are given questions that are guided by the aspects of reasoning, namely aspects of understanding understanding, logical thinking, understanding negative examples, systematic thinking, consistent thinking, making excuses, determining strategies, thinking deductively, determining methods and drawing conclusions. According to Setiadi (2012) states that reasoning can directly improve student learning outcomes, that is, if students are given the opportunity to use their reasoning skills in making predictions based on their own experiences, so that students will more easily

understand the concept. According to Agustin (2016) Mathematical reasoning is not only important for proving or examining programs, but also for inference in an artificial intelligence system. Basically every math problem solving requires reasoning skills. Through reasoning, students are expected to see that mathematics is a study that makes sense or is logical. Thus students feel confident that mathematics can be understood, thought about, proven, and can be evaluated. Based on the description previously described, it can be concluded that students' mathematical reasoning ability is the ability or ability of students to solve the given problems.

In reality in the field, students' mathematical reasoning abilities still lacking, this is in line with the research report of Priatna (2003) argued that the quality of students' mathematical reasoning abilities was still lacking, which is around 49% of the ideal score.

Based on TIMSS (Trends in International Mathematics and Science Study) data in 2011, the average ability of Indonesian students in each domain is still far below neighboring Malaysia, Thailand and Singapore. The lowest average percentage achieved by Indonesian students is in the cognitive domain at the reasoning level, namely 17%.

There are a lot of factors that cause reasoning skills to not develop, such as students 'lack of learning motivation, inadequate learning resources, to students' difficulties in working with reasoning ability questions. Ario (2016) argues that there are various mistakes made by students when solving questions of reasoning ability including understanding the meaning of the problem, errors in using formulas, errors in performing calculation operations, misunderstanding of concepts, and difficulty writing reasons in written form. Furthermore, Lestari (2015) stated that students' learning difficulties in solving generalization problems are not understanding the questions, it is difficult to determine the strategy to be used, the occurrence of misconceptions in other words the lack of prerequisite material. Then Sari (2014) also states that student errors in completing the proportional reasoning test sheet are in the form of conceptual and procedural errors. One of these things is caused by learning mathematics which does not

involve students (Sulistiawati, 2014). When viewed from the reality in the field, the teaching methods that are often used by teachers tend to be teachers who are more active while students passively receive the information conveyed by the teacher.

Broadly speaking, mathematical reasoning can be classified into two types, namely deductive reasoning and inductive reasoning. Deductive reasoning is a process of drawing conclusions starting from special cases to reach generally accepted conclusions. Meanwhile, inductive reasoning is a process of drawing conclusions starting from generally accepted rules to reach specific conclusions (Sumarmo, 2013).

Mathematics learning is directed to meet present and future needs, where future vision has a broader meaning, including developing the ability to reason, think systematically, critically and carefully (Sumarmo, 2013). Given the importance of mathematical reasoning skills in learning, every student must have reasoning skills to solve mathematical problems.

Mathematical reasoning ability is a cognitive aspect which is one of the goals of learning mathematics. In addition to cognitive aspects, the objectives of learning mathematics must also include affective aspects. Therefore, the affective aspect is an aspect that must be owned and developed by every student.

One of the important affective aspects for students to have is the habit of thinking. Costa & Kallick (2008) named intelligent behavior with the term habits of mind. Habit is a process of behaving and acting repeatedly until it is settled and automatically carried out (Soeyono & Sholikah, 2013).

To achieve mathematical reasoning abilities in learning, students need adequate behavior, one of which is habits of mind. With habits of mind, students can assess their own ability to understand, reason and work on a problem.

Habits of mind is defined as the tendency to behave intelligently or form certain intelligent behavior patterns that can encourage success in solving problems (Miliyawati, 2014). There are sixteen categories of Habits of Mind, namely surviving or never giving up; set conscience; listens to other people's opinions with empathy; flexible thinking; think about thinking; try to work

carefully and precisely; asking questions and posting problems; using past experiences to form new knowledge; think and communicate clearly and accurately; collect various data with various senses; creating, imagining, innovating; responds with admiration; take responsibility for the risks involved; humorous; dependency thinking; open to further learning (Costa, 2012). This shows that Habits of Mind can be seen and observed through the learning process experienced by students.

Costa and Kallick (2008) state that learning that includes Habits Of Mind can find out how students behave when students cannot answer questions correctly, in contrast to traditional learning outcomes which only focus on how many students can answer questions correctly. When doing learning evaluations or exams, there are not many children who are not ready to face the evaluation given by the teacher so what happens is they think negatively about cheating. It begins with the minds of those who have lost the power of goodness. They do not make it a habit to always think positively so that cheating occurs. This needs to be examined more deeply through habitual thoughts. According to Isfiani (2016) Habits of Mind in fact has very good benefits. The application of Habits of Mind will help students to always use their time productively and hone their intelligence. This kind of study habit is of course very much needed by students both in their daily life and at certain times such as final exams. According to Shah (2010) Habits of mind is a student's experience in the learning process, their habitual habits will appear to change, learning habits arise due to the process of shrinking the tendency of responses by using repeated stimulation. Therefore, students who study at school will have certain habits as a result of the learning process at school.

Thinking habits must be trained in students to become intellectual humans. An intellectual person not only has information but also has to know what to do with it. Thinking habits will train students to be more productive, critical, creative, diligent, and have broad insights.

In working on math problems, students are usually not careful, so they often make mistakes that can lead to fatal answers. As stated by Sugiman, students who

are unable to work on mathematical problems are caused by inability to understand concepts, do not have the right strategy, are less able to communicate what they are doing, and perform inaccurate calculations (Salwah, 2014). Students must be trained to always be careful in solving problems in mathematics. It will become a habit to always be right in doing anything. This habit will affect the way of thinking and how students perform in their environment.

Habits of thinking in mathematics are known as mathematical habits of mind. The term mathematical habits of mind is used by mathematicians, educators, and experts to describe the essence of the meaning of doing mathematics and think mathematically (Seeley, 2014). Mathematical Habits of mind contains aspects of thinking and reasoning. The mathematical descriptions of habits of mind are built from habits of mind in general, for example persistence, persistence, listening and communication skills, or metacognitive skills such as reflection and analysis (Seeley, 2014).

Based on previous studies, there are still many students who do not have good reasoning skills. Students' reasoning abilities are still not optimal and low thinking habits become obstacles. There are various levels of difficulty experienced by students in learning, from lack of understanding of the concept to independence and lack of motivation to learn. This affects the learning outcomes to be achieved and the character that is embedded far from targets and expectations. Given the importance of reasoning abilities and mathematical habits of mind for students, it is necessary to make efforts to develop these two abilities.

Efforts that can be made include improving the learning process through selecting the learning model used. Learning models that can be applied by teachers to create learning objectives and can have a good influence on mathematical reasoning, one of which is the Realistic Mathematics Education (RME) learning model.

Realistic Mathematics Education (RME) is a teaching and learning theory in mathematics education. Realistic Mathematics Education (RME) was first developed in the Netherlands in 1971 by the Freudenthal Institute. The use of the word realistic comes from the Dutch, *zich realiseren* which means to imagine

(Wijaya, 2012). This means that students are expected to be able to imagine learning mathematics in real situations.

One of the difficulties of students in solving math problems is the difficulty of understanding and reasoning the initial concepts of mathematics. In general, students in Indonesia work more on problems that are expressed in language and mathematical symbols or which are made in contexts that are far from the realities of everyday life. As a result, students perceive mathematics as an unpleasant subject. They are also unable to apply theory in school to solve everyday problems.

Subject matter needs to be linked to everyday life. By working on mathematical problems that can be imagined by students in everyday life (realistic mathematics), students build concepts and understandings with instincts, instincts, reasoning power, from known concepts. They form their own structure of mathematical knowledge with the help of the teacher by discussing possible alternative answers.

Learning models that can help students identify and understand the basic concepts of mathematics by students so that they are easy to imagine, one of which is by applying the Realistic Mathematics Education (RME) learning model. Learning mathematics will be more meaningful if in learning it can be linked and imagined with the real (realistic) environment or student experience.

Realistic mathematics learning is not only connecting with the real world but also imagining a situation so that it looks more real in the minds of students. This imagining process can help focus learning so that it is easier for students to remember, so that the mathematics they learn can be useful and used in the future. In addition, the Realistic Mathematics Education (RME) learning model can provide students with an understanding of the usefulness of learning mathematics in daily life.

By using examples of cases that occur in everyday life, it is hoped that students' awareness of the importance of mathematics in the realities of life will emerge. The use of the Realistic Mathematics Education (RME) approach is an alternative to improve students' mathematical reasoning skills. In general, students

feel happy, interested, and easy to understand learning mathematics with a realistic mathematics approach, especially students in the middle and low groups. Realistic Mathematics Education (RME) learning is a learning that places students' realities and experiences as a starting point for learning where students are given the opportunity to construct their own formal mathematical knowledge through existing reality problems.

Therefore, based on the descriptions that have been described, researchers are interested in conducting research on mathematics learning with the title "Analysis of Habits of Mind through Realistic Mathematics Education (RME) Approach in Improving Reasoning Ability".

I.2 Problem Identification

Based on the background of the problem above, several problems can be identified, namely:

1. Students have difficulty understanding and reasoning the initial concepts of mathematics.
2. Students perceive mathematics as an unpleasant subject
3. Students are not able to apply theories in school to solve everyday problems.
4. The low ability of students' mathematical reasoning
5. Students work more on problems which are expressed in language and mathematical symbols which are made in contexts that are far from the realities of everyday life.
6. In working on math problems students are usually not careful, so they often make mistakes that can lead to fatal answers.
7. Students' thinking habits are still low.
8. Teaching methods used by teachers tend to be more active teachers while students passively receive the information conveyed by the teacher.
9. Lack of students' awareness of the importance of mathematics in the realities of life.
10. Students cannot apply learning results into everyday life.

I.3 Problem Limitation

Based on the identification of the above problems by considering the ability of the research and the extent of the problem, this research is limited to:

1. Research was conducted on research articles that have been published nationally and have been accredited by the Ministry of Research, Technology and Higher Education of the Republic of Indonesia (RISTEKDIKTI) in Sinta Indonesia and indexed by reputable international journals: Scopus, Thomson Reuters Web of Science, Microsoft Academic Search and has Impact Factors from the ISI Web Science or Schimago Journal Rank.

2. The research only focuses on articles that have been published in the 2014-2021 period.

3. The research only focuses on articles that analyze Habits of Mind through RME (Realistic Mathematics Education) learning to improve reasoning ability.

I.4 Problem Formulation

Based on the description on the background of the problem, problem identification, and problem boundaries, the problem formulations in this study are:

1. How is the habits of mind tendency towards reasoning ability?

2. What is the trend of Realistics Mathematics Education (RME) learning in improving the reasoning abilities?

3. What are the advantages and disadvantages of Realistic Mathematics Education (RME) learning?

I.5 Research Objective

Based on the background and problem formulations above, the objectives of this study are:

1. To analysis the habits of mind tendency towards reasoning abilities.

2. To analysis the tendency of Realistics Mathematics Education (RME) approach in improving the reasoning abilities.

3. To know the advantages and disadvantages of Realistic Mathematics Education (RME) learning.

I.6 Research Benefit

By achieving the research objectives above, the following research benefits will be obtained:

1. For Mathematics Teachers: Learning with a Realistic Mathematical Approach can be used as an alternative learning to improve students' reasoning abilities through a realistic mathematics learning approach because this learning presents contextual mathematics that is adjusted to the level of ability and is expected to be able to construct their own knowledge in learning activities.

2. For students: it can be used as a way to improve reasoning skills through the steps in a realistic mathematics learning approach.

3. For researchers: new findings and suggestions as reference material for further research and as guidance for researchers in carrying out tasks and implementing realistic mathematics learning approaches in the future.

4. For school administrators, as a material for developing mathematics teaching, it is necessary to design a learning system with Realistic Mathematics Education (RME) as an effort to overcome student learning difficulties in learning mathematics, and can be a reference for improving students' reasoning abilities.

I.7 Operational Definition

The following operational definitions of variables need to be conveyed so that there is no misinterpretation in the study. The things that need to be defined include:

1. Analysis

Analysis is the activity of deciphering, differentiating, sorting out something to be regrouped according to certain criteria and looking for its relation and then interpreting its meaning.

2. Habits of Mind

   Habits of mind in Indonesian can be interpreted as habit of thinking. Habit is a process of behaving and acting repeatedly until it is settled and automatically carried out. Habits of mind in general include recognizing patterns, experimenting, formulating, trying, creating, visualizing, and guessing.

3. Realistic Mathematics Education (RME) Learning

   In this study, a mathematics learning approach is used with the reality and environment that students understand to improve students' reasoning abilities. The realistic mathematics approach is an approach that refers to the learning process which contains constructive, interactive and reflective elements. The realistic mathematics approach is a mathematics learning approach that refers to Realistic Mathematics Education (RME) which uses realistic problems as a starting point for learning (Astari, 2017).

4. Reasoning Ability

   Reasoning is also a high pattern of thinking that includes the ability to think logically and systematically. In line with that reasoning is a way of thinking to draw conclusions, both conclusions drawn from general to specific or general to specific.