CHAPTER I
INTRODUCTION

1.1. Background

Mathematics is a study that be the basic of science and technology that is very important in every aspect of human life. Threfore, mathematics is very important to teach in every level of educatioan such as SD, SMP, SMA and university. Beside of that mathematics is mother of all science, so mathematics is very important to teach. The statement is supported by the statement Cockroft (in Abdurrahman, 2012:204) said that :

> Matematika perlu di ajarkan kepada siswa karena (1) selalu digunakan dalam segi kehidupan; (2) semua bidang studi memerlukan keterampilan matematika yang sesuai; (3) merupakan sarana komunikasi yang kuat, singkat dan jelas; (4) dapat digunakan untuk menyajikan informasi dalam berbagai cara; (5) meningkatkan kemampuan berpikir logis, ketelitian, dan kesadaran keuangan; dan (6) memberikan kepuasan terhadap usaha memcahkan masalah yang menantang.

Many reasons why students need to learn math, math lesson one is making skilled students thought it caused mathematics have some way for resolution of a problem. So in fact the math makes the students as people are tough and not easily discouraged.

See the importance of mathematics, then the student must understand the mathematics. In the appendix to the regulation of the Minister of education national (Permendiknas) Number 20 in 2006 (Wijaya, 2012:16) on standard content said that “pembelajaran matematika bertujuan supaya siswa memiliki kemampuan diantaranya adalah mampu memecahkan masalah yang meliputi kemampuan memahami masalah, merancang model matematika, menyelesaikan model dan menafsirkan hasil yang diperoleh. Mengomunikasikan gagasan dengan simbol, tabel, diagram atau media lain untuk memperjelas keadaan atau masalah. Memiliki sikap menghargai kegunaan matematika dalam kehidupan, yaitu memiliki rasa ingin tahu, perhatian, dan minat dalam mempelajari matematika, serta ulet dan percaya diri dalam pemecahan masalah.”

From the above mathematics learning goals, to see that one of the goals of learning mathematics is to solve the problem.This is in accordance with the Dahar (2011:121) states that : “kemampuan untuk memecahkan masalah pada dasarnya merupakan tujuan utama proses pendidikan”.

To be able to produce students who can solve the problem, then needed a learning oriented to problem solving. It is very possible to do through mathematical subjects, because math has a purpose that made graduation standards in the form of problem-solving ability.

Mathematical problem solving ability in research this is students ' ability in solving math problems based on steps-steps Polya. As for the problem solving steps according to Polya (1973: xvi), namely: 1) understand the problem (understanding the problem), 2) designed the plan of settlement (devising a plan), 3) Execute the plan of settlement (carrying out the plan), and 4) look back at step completion (looking back).

Factors of students experiencing difficulty in solving math problems, can be sourced from the students as well as teachers. Factors sourced from students i.e. students accustomed to learning by rote and lack of interest and motivation of students to learn. While the cause factor who comes from teachers, i.e. a factor of learning strategies is lacking to build problem-solving skills in mathematics. Most teachers still practice the conventional learning, tasks and issues that are less challenging and not able to dig into the understanding of the students, and teachers just give little chance for students to convey the ideas of a settlement owned by students.

Based on the factors cause which has been described, then the cause of the most dominant i.e. learning strategies. An alternative strategy is to offer through strategy Realistic Mathematics Education. According to Safitri and Surya (2017:95) “Realistic mathematic education (RME) approach come from contextual issues, in this situastion student a should has the active role in learning activities, while teacher plays as facilitator. Teacher and student has a different role. Students can express and communicate the ideas to each other and teacher

will help and support to compare the idea and also to make a decision. Which idea are the best among other."

Problem-solving ability pupils can be measured through tests. Emilya (2010:8) stated a good test can measure the three aspects, namely the understanding of the concept of communication, reasoning, and problem solving. In fact, Indonesia is still not much growing tests or questions to measure problem-solving abilities of students. On the national exam, the questions given to students in the form of multiple choice, so without thinking of where students are able to answer the question by way of guessing. This leads to a lack of creativity and the power of reason students.

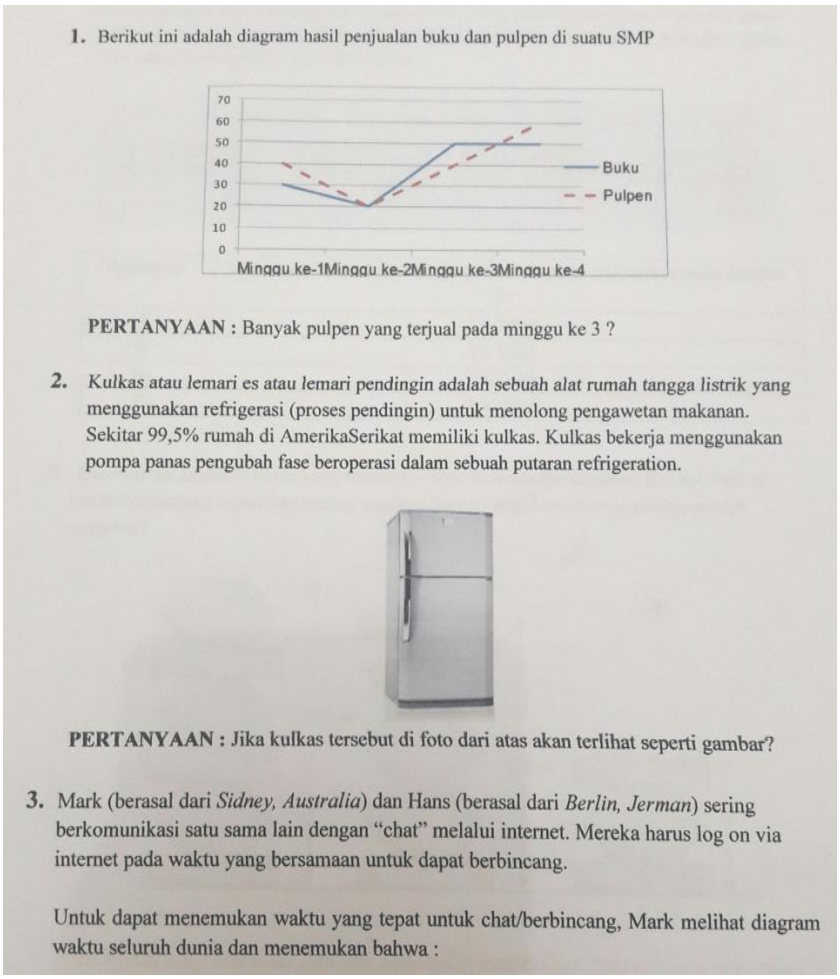
In order to be achieved the purpose of the assessment which includes the measurement of student problem solving, the need for the development of problem-solving ability to measure the student. Questions will be developed in this study is all about ability of solving math problems based on students of PISA. It caused problems such as PISA mathematics has a number of advantages than other questions, including the mathematical problems such as PISA arranged in a variety of formats. There is a question that asks students to answer questions using their own words, how many questions ask students to write down the process of calculation so that it can be known methods and process thought of students in answering the question, and there is a question that asks students to explain further what is their answer (Hayat, 2010:218).

In 2003 study conducted by the Programme for International Student Assessment (PISA) shows the achievements of Indonesia on the order of 36 from 41 countries. In 2006, the acquisition of junior high school students score on a mathematics perched on just the number 391 scales (0-800), whereas the average score of 500. The results of the PISA 2009 Indonesia ranked 61 of the 65 participating countries with an average value of only 371 and PISA last year 2012 the position of Indonesia ranks 64 out of 65 countries with a score of 375.

The achievement of value above proves that there are still many learners in indonesia still has not met the standard value defined by the world. Many of the factors that cause learners indonesia hasn't been able to reach the default value.

Among them the lack of students in the train itself against the reserved level of PISA, the lack of knowledge in implementing mathematical equations in the real issues, and less understanding students in understanding the problems given in the matter of PISA will be judged, so that when students will fail. The other factor is due to the problem given in schools is simply a matter of the low profile and the same problem occurs (novita, 2012).

The results of the preliminary observations made by researchers in the form of granting reserved pisa 5 reserved to 33 students of class VIII-J SMP Negeri 6 Medan. It can be seen from the following:



1. Berikut ini adalah diagram hasil penjualan buku dan pulpen di suatu SMP

PERTANYAAN : Banyak pulpen yang terjual pada minggu ke 3 ?

2. *Kulkas atau lemari es atau lemari pendingin adalah sebuah alat rumah tangga listrik yang* menggunakan refrigerasi (proses pendingin) untuk menolong pengawetan makanan. Sekitar 99,5% rumah di AmerikaSerikat memiliki kulkas. Kulkas bekerja menggunakan pompa panas pengubah fase beroperasi dalam sebuah putaran refrigeration.

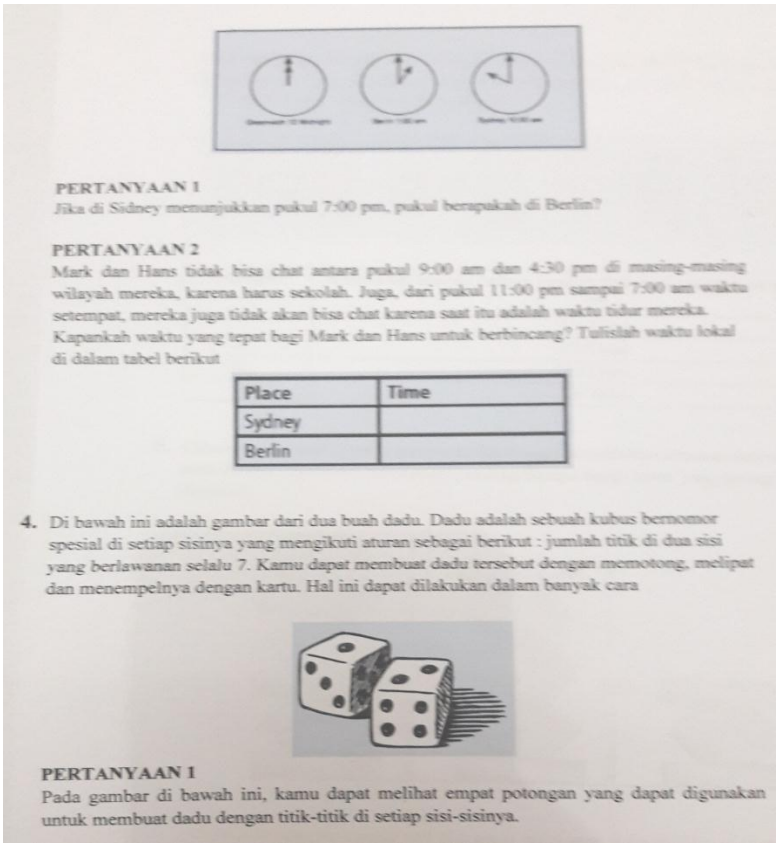
PERTANYAAN : Jika kulkas tersebut di foto dari atas akan terlihat seperti gambar?

3. Mark (berasal dari *Sidney, Australia*) dan Hans (berasal dari *Berlin, Jerman*) sering berkomunikasi satu sama lain dengan "chat" melalui internet. Mereka harus log on via internet pada waktu yang bersamaan untuk dapat berbincang.

Untuk dapat menemukan waktu yang tepat untuk chat/berbincang, Mark melihat diagram waktu seluruh dunia dan menemukan bahwa :

For problem number 1 there are as many as 15 people (45.4%) of students who answered correctly and as many as 18 people (54.6%) of students who answered incorrectly. For problem number 2 there are as many as 20 people

(60.6%) of students who answered correctly and as many as 13 people (39.4%) of students who answered incorrectly.



PERTANYAAN 1
Jika di Sidney menunjukkan pukul 7:00 pm, pukul berapakah di Berlin?

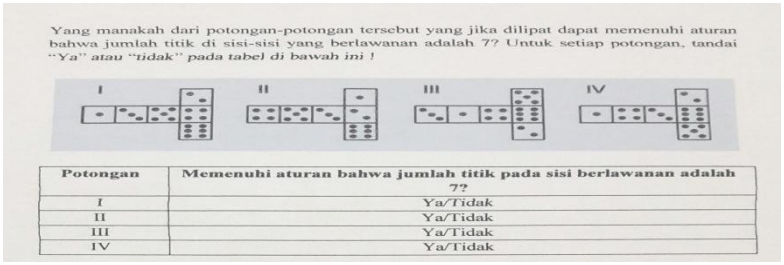
PERTANYAAN 2
Mark dan Hans tidak bisa chat antara pukul 9:00 am dan 4:30 pm di masing-masing wilayah mereka, karena harus sekolah. Juga, dari pukul 11:00 pm sampai 7:00 am waktu setempat, mereka juga tidak akan bisa chat karena saat itu adalah waktu tidur mereka. Kapankah waktu yang tepat bagi Mark dan Hans untuk berbincang? Tulislah waktu lokal di dalam tabel berikut

Place	Time
Sydney	
Berlin	

4. Di bawah ini adalah gambar dari dua buah dadu. Dadu adalah sebuah kubus bernomor spesial di setiap sisinya yang mengikuti aturan sebagai berikut : jumlah titik di dua sisi yang berlawanan selalu 7. Kamu dapat membuat dadu tersebut dengan memotong, melipat dan menempelnya dengan kartu. Hal ini dapat dilakukan dalam banyak cara

PERTANYAAN 1
Pada gambar di bawah ini, kamu dapat melihat empat potongan yang dapat digunakan untuk membuat dadu dengan titik-titik di setiap sisi-sisinya.

For problem number 3 part question 1 contained as many as 14 people (42.4%) of students who answered correctly and as many as 19 people (57.6%) of students who answered incorrectly. For question 2 there are as many as 7 people (21.2%) of students who answered correctly and as many as 26 people (78.8%) of students who answered incorrectly.

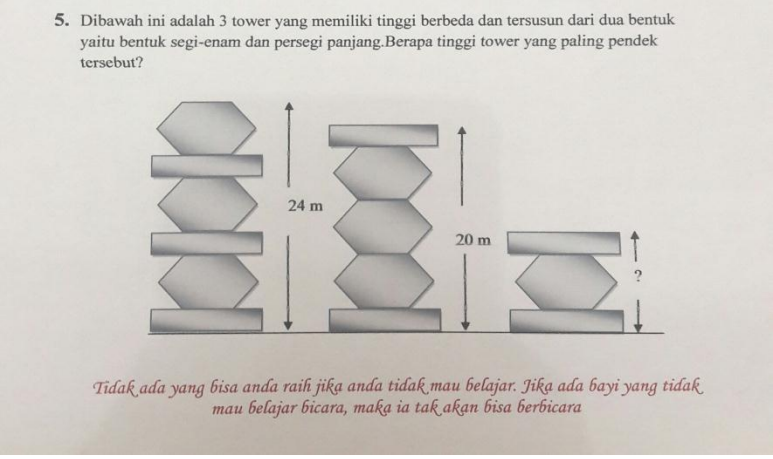


Yang manakah dari potongan-potongan tersebut yang jika dilipat dapat memenuhi aturan bahwa jumlah titik di sisi-sisi yang berlawanan adalah 7? Untuk setiap potongan, tandai "Ya" *atau "tidak" pada tabel di bawah ini !*

I II III IV

Potongan	Memenuhi aturan bahwa jumlah titik pada sisi berlawanan adalah 7?
I	Ya/Tidak
II	Ya/Tidak
III	Ya/Tidak
IV	Ya/Tidak

For problem number 4 there are as many as 9 people (27.3%) of students who answered correctly, as many as 16 people (48.5%) students who answer wrong and as many as 8 people (24.2%) not respond.



For problem number 5 there are a total of 11 people (33.3%) of students who answered correctly, a total of 9 people (27.3%) students who answer wrong and as many as 13 people (39.4%) not respond.

In addition to providing test question. in the interview conducted by researchers with Mrs.lili as a mathematics teacher in SMP Negeri 6 Medan, She says that:

> "Students are only able to solve problems similar to example question given. Most of the difficulty in resolving the question as a matter of the story. Especially when resolving the question presented in the form of images, tables or graphs of many students tend to be incapable or difficulty".

The above observations indicate that the low level of students ' ability in resolving the matter of PISA. Clearly visible from the results of the tests given can be said that a mathematical ability of students is low, so that the difficulties in solving the problem. This means students tend to only recite and memorize formulas.

Matter of PISA developed based on the content, context and competence (OECD, 2010), the four content include: Shape and Space, Change and Relationship, Quantity, and Uncertainty. One of the four content matter of PISA is the Quantity of content. Reserved Quantity on the content related to the relationship and the pattern number, among others, the ability to understand the size, pattern number and everything associated with numbers in everyday life,

such as counting and measuring. It contains the content of this number is the ability of reasoning quantitative, represent something with numbers, understand mathematical steps, counting on the outside of the head and do a valuation. Questions on the content of Quantity most implemented in everyday life, as in the exchange rate of the currency, determine bank interest, shopping, counting tax, measure, measure distances and others. So it is clear that the questions on the content of important Quantity to be developed because it directly related to human activity.

The characteristics of the mathematical PISA question consists of three components:

1. Mathematical content that is targeted for use in the assessment items, that is quantity; change and relationships; space and shape; uncertainty and data.
2. The context in which the assessment items are located, that is personal, occupational, societal, scientific.
3. The mathematical process that describe what individuals do to connect for the problem with the mathematics and thus solve the problem, and the capabilities that underlie those processes, that is reproduction, connection, reflection.

Problems such as PISA strongly demands the ability of reasoning and problem solving. A student said to be able to resolve the problem if he is able to apply knowledge that has been gained previously into new situations that are not yet known (Wardhani, 2005).

In problems such as PISA there are eight characteristics of mathematical cognitive ability that is thinking and reasoning, argumentation, communication, modelling, problem posing and solving, representation, using formal and symbolic, technical language and operations, and use of aids and tools. The eighth was highly mathematical cognitive ability according to the purpose of the learning of mathematics in our curriculum.

For these countries, PISA studies utilized for the following things: (1) compare the level of literacy students a country with other countries to know the

position of each country and improve the accomplishments of students, (2) set the limit comparison to increase improvement efforts in the field of education for example, by comparing the average value obtained by students of each of the participant countries and measure the power able to State in the achievement of a high level of literacy with the benefit from the opportunities that exist to improve the quality of education, (3) understand the strengths and shortcomings of the education system of each participating countries.

Based on the above description, then the need for development that can help to improve the ability of the mathematical problem solving of students base realistic approach, in this case is done through the development of the reserved model of PISA. Therefore, the authors are interested in elevating the issue be researches titled **"Developing Mathematics Problem of PISA Models Base Realistic Approach to Measure The Ability of Mathematical Problem Solving of Student Junior High School".**

1.2. Problem Identifications

Based on the background above, the problem becomes identifying a problem in this study are:

1. Lack of students in practice working on math problems Similar PISA.
2. Students are still difficulties in problems solving in the Shape of PISA.

1.3. Limitation of The Problems

Based on background and problems identification above, it needs problems limitation to be more focused. Researcher limits the problems only in:

1. Designing and developing similar problems PISA in content Quantity for eighth grade students.
2. The subject used in this research is a matter of numbers and number patterns

1.4. Problem Formulations

The problems formulation of this research is : generate math problems such as of PISA models base realistic approach on the content quantity is effectiveness in junior high school?

1.5. Research Objectives

This research aims to find a instrument based PISA with an effective realistic approach to improve the ability of problem solving in SMP.

1.6. Result Benefits

After doing this research study is expected to provide benefits for all people, including:

1. For Teacher :
   - **a.** Add teaching materials in the form of questions on the content of Quantity model Pisa
   - **b.** can be input and information that can be used in the process of teaching and learning.
2. For students:
   students can be trained in understanding and answering the problems such as PISA is usually considered difficult and confusing.
3. For other researchers :
   as an ingredient to learn more about the problems on the model PISA content quantity in mathematics learning in junior high school.

1.7. Defenition of Operational

To avoid the differencies in interpretation of the terms contained in the problem formulation in this research, it should be noted the operational definition as follows:

1. Mathematics is the science of numbers as well as to do a procedural. Mathematics is the science that systematically arranged and measured. Mathematics is also considered a structure and relationship of the symbols. symbols in mathematics is essential.
2. Mathematical literacy is an individual's capacity to formulate, employ, and interpret mathematics in variety of contexts. It includes reasoning mathematically and using mathematical concept,procedures,fact, and tolls to describe, explain and predict phenomena. It assists individuals to recognize the role that mathematical plays in the world and to make the

well-founded judgment and decision needed by constructive,enganged and relative citizens.

3. PISA (Programme for International Students Assessment) is a cooperative effort of the countries of the OECD to measure the ability of students aged 15 years in applying science in school to face the challenges of real life. PISA take the assessment in the aspect of knowledge and expertise in the areas of reading, mathematics and science curriculum implementation of learning in school to solve problems related to everyday life.
4. For these countries, PISA studies utilized for the following things: (1) compare the level of literacy students a country with other countries to know the position of each country and improve the accomplishments of students, (2) set the limit comparison or CF-quality (benchmark) to increase improvement efforts in the field of education for example, by comparing the average value obtained by students of each of the participant countries and measure the power able to State in the achievement of a high level of literacy with the benefit from the opportunities that exist to improve the quality of education, (3) understand the strengths and shortcomings of the education system of each participating countries
5. aquantity with regard to the relationship of numbers and number patterns, among others, the ability to understand the size, pattern numbers, and everything associated with numbers in everyday life, such as counting and measuring.
6. problem solving is athe planned process that need to be implemented in order to obtain certain settlement of an issue that may not be obtained immediately.
7. Realistic Mathematics Education is an approach that can help teachers implement the learning process that brings students enter into the real world context, so students have the impression that "qualified" because students are experiencing directly in finding the math concepts that are faced and they learn.