



## Mandiri Unbk Try Out Information System Web Based Using Linear Congruent Method At Madrasah Working Group (Kkm) Mts N 2 Demak

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**Abstract:** The try out process is an exam simulation exercise every year before the National Examination conducted by school institutions. The main objective of this exercise is as an effort of school institutions to prepare students to get maximum scores on the National Examination. Madrasah Working Group (KKM) of MTs 2 Demak is a body within the Ministry of Religion which fosters coordinative cooperative relations between Demak MTs 2 and private Madrasahs in the area of Demak 2 MTs. So far the Try Out system at the KKM level still uses manual procedures and is still off line using paper. As a result of this system, there are still delays in the distribution of questions and reports at the central level. In making Try Out questions, randomization of questions only uses the package method questions A, B and C, so there are still students who give each other answers. LCM (linear congruent method) is a method of generating random numbers on the Try Out. The principle of this method is where the form of the LCM number as the scrambler of the question, including increment ( $c$ ), modulus ( $m$ ), multiplier ( $a$ ), and initial value ( $Z_0$ ), which has provisions:  $c = 0 \leq c < m$ ,  $m = 0 < m$ ,  $a = 0 < a < m$ , and  $Z_0 = 0 \leq Z_0 < m$ . Making this application using the PHP programming language and database used is MySQL with the R & D system development method according to Borg and Gall, including: Research and information collecting, Planning, Develop preliminary form of product, Preliminary field testing, Main product revision, Main field testing, Operational product revision, Operational field testing, Final product revision, Dissemination and implementation. Madrasah Working Group (KKM) Demak MTs 2 in conducting a try out system still uses the manual offline method and the problem scrambler is only limited to packages A, B, and C, then with the Try Out Information System the web-based KKM level is expected to facilitate parties KKM and tighten students to avoid fraud.

**Keywords:** Information system try out, LCM Method, PHP, MYSQL, R & D Method.

### 1. Introduction

Nowadays, the development of science and technology is becoming more advanced day by day, one of which is in the field of information technology. Computers function as data processors and as a means of supporting the needs that cannot be separated from humans in today's modern era, both in organizations, government and private agencies, both large and small scale, apart from that, the development of information technology plays a very important role in supporting all related activities. with human work, one of which is in the field of education regarding the management of the Computer-Based National Examination (UNBK) system.

The existence of the Computer-Based National Examination (UNBK) is a form of government effort to overcome the weaknesses of the system which previously used paper, and minimize the level of cheating that might be committed. Given this, educational

institutions must also follow the government system, namely by preparing students for exams by carrying out computer-based Independent *Try Out exercises*.

*Try Out* is one of the efforts carried out by schools, agencies and institutions that organize it with the aim of preparing well mental and ability of each student to take the National Examination .

*LCM ( linear congruent method )* or *linear congruent method* is random number generator method which is widely used in computer program , in this case used as a random number generator for Try Out questions . *LCM* utilizes a linear model to generate random numbers which are defined by:

$$\mathbf{X_{n+1} = (a Z_0 + c) \bmod m}$$

Where :

$x_n$  = is the number. random to n

$Z_0$  = is the initial number for randomizing the problem

a and c are *LCM constants*

m is the maximum limit of random numbers

Conditions for each election parameters in the equation above are as follows:

- a. m = modulus,  $0 < m$
- b. a = *multiplier* ,  $0 < a < m$
- c. c = *Increment* (value addition),  $0 \leq c < m$
- d.  $Z_0$  = initial value,  $0 \leq Z_0 < m$
- e. c and m are relative prime numbers
- f. a – 1 is divisible by the prime factors of m
- g. a – 1 is a multiple of 4 if m is also a multiple of 4
- h. a must be very large

The Madrasah Working Group (KKM) MTs Negeri 2 Demak is a body within the Ministry of Religion that fosters relationships

Coordinative cooperation between MTs Negeri 2 Demak and private Tsanawiyah madrasahs in the MTs Negeri 2 Demak coaching area which is located on Jalan Raya Karangawen No. 28 Karangawen Demak, Supervising 26 private Tsanawiyah Madrasahs

and 1446 total students from all private Tsanawiyah Madrasahs in the 2017/2018 academic year. So far, the Mandiri *Try Out system* still uses manual procedures and is still *offline* using paper in each madrasah, with a model procedure for creating questions by the MGMP team of subject teachers and then submitting them to the KKM for distribution to KKM member madrasahs who then after completing *the Try Out* The results in the form of grades are deposited to the KKM committee. As a result of the paper system, there are still delays in the distribution of questions and reports at the KKM central level. In the *Try Out* question creation system , the randomization of questions only uses the question package method A, B and C, so that there are still students who give answers to each other. Apart from that, in terms of computer utilization, it is still not optimal because computers are only used for teaching and learning. As a result, it can be said that students are still not used to taking exams using computers.

Data on KKM members at MTs Negeri 2 Demak and the number of class IX students in each madrasah for the 2017/2018 academic year can be seen in the following table:

Table 1 Data on Class IX Students, Members of KKM MTs Negeri 2 Demak

<b>N O</b>	<b>MTs NAME</b>	<b>NUMBE R OF KLS IX STUDE NTS</b>
1	MTs Negeri 2 Demak	221
2	MTs Miftahul Ulum Jragung	67
3	MTs Manbaul Ulum Tlogorejo	91
4	MTs Miftahul Huda Brakas	70
5	MTs As Syarifiyah Sarirejo	109
6	MTs Fatahilah Rejosari	82
7	MTs Sabilul Huda Guntur	80
8	MTs Miftahul Ulum Megonten	55
9	MTs Yasimu Mangunrejo	39

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10	MTs Riyadlotul Ulum Kunir	23
11	MTs Miftahul Huda Kangkung	21
12	MTs Sholihiyah Kalitengah	130
13	MTs Bahrul Ulum Temuroso	64
14	MTs Matholiul Anwar Sarimulyo	66
15	MTs Nurul Hidayah Margohayu	49
16	MTs Al Khoiriyah Wonosekar	31
17	MTs Hidayatullah Pundenarum	32
18	MTs Hidayatullah Banjarrejo	27
19	MTs Al Hasaniyah Jragung	20
<hr/>		
20	MTs Al Hikmah Bakalrejo	51
21	MTs As Sa'adah Sukorejo	24
22	MTs Assakinah Boweh Rejosari	17
23	MTs Miftahul Ulum Bogosari	21
24	MTs Salafiyyah Brambang	19
25	MTs Miftakhul Jannah Rimbulo	18
26	MTs Rujchaniyyah Sumberejo	19
<hr/>		
<b>NUMBER OF CLASS IX STUDENTS</b>		<b>1446</b>

Source: *MTsN 2 Demak*

## **2. Theoretical Foundation**

### **a. Understanding Information Systems**

An information system is an organized combination of people, hardware, software, communications networks and data resources that collects, transforms and disseminates information within an organization [1]

### **b. Try Out**

Try Out is a mechanism used as practice for students before taking the real exam. Meanwhile, the Pre-National Examination Try Out is a trial (Try Out) which is held to determine students' abilities in answering the previous period's National Examination questions [5]

### **c. Linear Congruent Method (LCM)**

Linear Congruent Method (LCM) or linear congruent method is a random number generation method that is widely used in computer programs. LCM utilizes a linear model to generate random numbers which are defined by:

$$X_{n+1} = (aZ_n + c) \bmod m$$

Where:  $x_n$  is the number. random to  $n$

$Z_0$  is the initial number for randomizing the problem

$a$  and  $c$  are LCM constants

$m$  is the maximum limit of random numbers

The characteristic of LCM is that repetition occurs over a certain period of time or after a certain number of generations, this is one of the characteristics of this method, and pseudo random generators in general. Determining the LCM constants ( $a$ ,  $c$  and  $m$ ) really determines whether the random numbers obtained are good or not in the sense of getting random numbers as if there is no repetition. It can be seen from several examples as below:

Generate random numbers 3 times with the conditions  $a=3$ ,  $c=5$ ,  $m=10$ , and  $Z_0 = 4$ .

$$X_1 = (3(4) + 5) \bmod 10 = 17 \bmod 10 = 7$$

$$X_2 = (3(7) + 5) \bmod 10 = 26 \bmod 10 = 6$$

$$X_3 = (3(6) + 5) \bmod 10 = 23 \bmod 10 = 3$$

The random numbers generated are: 7, 6, and 3 and the recurrence is not seen periodically [3].

Linear congruent method or linear congruential generator has 2 types:

1. Mixed congruential generators where  $c > 0$

Example:

Generate random numbers 4 times with the conditions  $a=1$ ,  $c=8$ ,  $m=10$ , and  $Z_0 = 4$ .

$$X_1 = (1(4) + 8) \bmod 10 = 12 \bmod 10 = 2$$

$$X_2 = (1(2) + 8) \bmod 10 = 10 \bmod 10 = 0$$

$$X_3 = (1(0) + 8) \bmod 10 = 8 \bmod 10 = 8$$

$$X_4 = (1(8) + 8) \bmod 10 = 16 \bmod 10 = 6$$

The random numbers generated are: 2, 0, 8 and 6 and the recurrence is not seen periodically.

2. Multiplicative congruential generators where  $c=0$

Example:

Generate random numbers 3 times with the conditions  $a=3$ ,  $c=0$ ,  $m=10$ , and  $Z_0 = 2$ .

$$X_1 = (3(2) + 0) \bmod 10 = 6 \bmod 10 = 6$$

$$X_2 = (3(6) + 0) \bmod 10 = 18 \bmod 10 = 8$$

$$X_3 = (3(8) + 0) \bmod 10 = 24 \bmod 10 = 4$$

The random numbers generated are: 6, 8 and 4 and the recurrence is not seen periodically [4].

### **c. Madrasah Working Group (KKM)**

The Madrasah Working Group (KKM) is a forum for Madrasah Heads established by the Head of the Ministry of Religion Office for Roudlotul Athfal (RA), Madrasah Ibtidaiyah (MI), Madrasah Tsanawiyah (MTs), and Madrasah Aliyah (MA/MAK) which aims to develop the quality of madrasas in the district/city. [ 2 ]

### **d. Framework of Thinking**

The framework for building this *try out* information system is based on the formulation of problems that have been formulated and refers to the regulations of the National Education Standards Agency Number 0044/P/BSNP/XI/2017 concerning Standard Operational Procedures for Organizing National Examinations. This system was developed using the *Linear Congruent* method . It is hoped that the results of the development of this system can be achieved in accordance with its main objectives. The framework of thought can be seen in the image below:

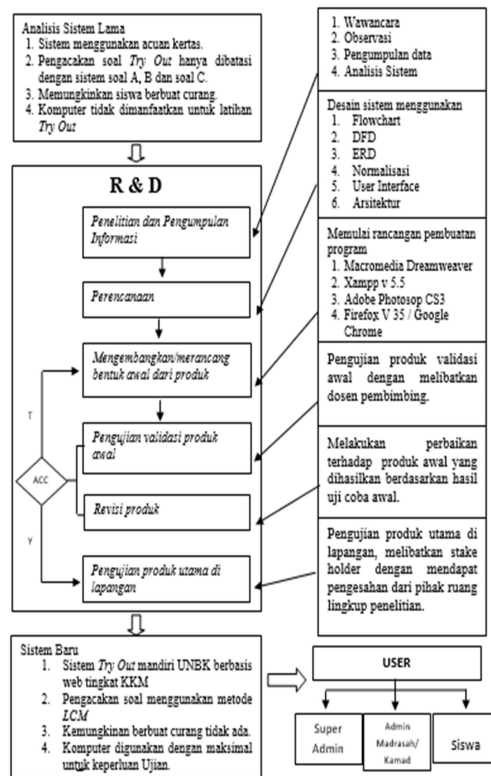


Figure 1 Framework of Thinking

### 3. Research Methods

The development model used in this research is the Research and Development (R&D) research and development model approach. Borg & Gall (1983), but only 6 (six) steps were carried out, namely as follows: research and information gathering, planning, preliminary product development (developing preliminary form of product), preliminary trials (preliminary field testing), main product revision, main field testing. This research refers to the steps taken by Borg & Gall which were then modified into a preliminary study which was

divided into field study and literature study , system analysis, system design, system development, system testing, system verification and validation, system revision and review, system testing, and results analysis .

The data obtained in this research is quantitative data. Quantitative data emphasizes the aspect of objective measurement of social phenomena. To be able to carry out measurements, each social phenomenon is broken down into several problem components, variables and indicators. Each variable that is determined is measured by providing different number symbols according to the category of information related to that variable. By using these number symbols, quantitative mathematical calculation techniques can be carried out so that they can produce a general conclusion regarding a parameter. The main goal of this methodology is to explain a problem but produce generalizations. Generalization is a fact of truth that occurs in a reality about a problem that is predicted to apply to a certain population. Generalizations can be produced through an estimation method or estimation method which is generally applicable in inductive statistics. The estimation method itself is carried out based on measurements of real conditions which are more limited in scope which are also often called "samples" in quantitative research. So, what is measured in research is actually a small part of the population or often called "data". Data is a concrete example of reality that can be predicted to the level of reality using certain quantitative methodologies. Quantitative research carries out further exploration and finds facts and tests emerging theories .

#### **4. Analysis and research results**

##### **4.1 Current Running System**

The flow of the results from the implementation of the *independent try out system research* above is presented in Figure 2 below:



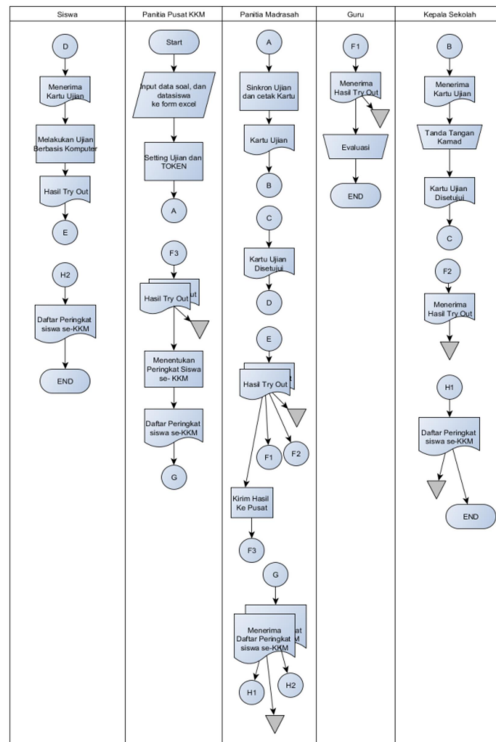


Figure 2 Flowchart of the try out implementation

*try out* management system that runs at the KKM level MTs N 2 Demak is that the MGMP teacher per UNBK subject creates *try out questions* in an excel format that has been determined by the system which is then submitted to the KKM committee to be imported *into* the central system after that. The KKM committee prepares exam data such as student data sent by each madrasah, question bank data, *try out schedule*, and TOKEN, after completing the exam settings at the center, then each madrasah synchronizes the data to their respective local madrasah accounts. respectively, then the madrasa committee prints the attendance list and cards which are then distributed to students who take part in *the try out* . After completing the exam, the committee prints and sends the exam results to the center which are then summarized by the system and determine the overall student ranking results.

#### 4.2 Proposed System

Based on research, the resulting system is described with a DFD as in the image below.

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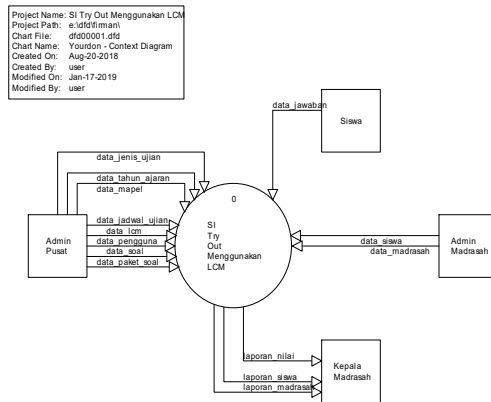


Figure 3 Context Diagram

Figure 3.14 above explains the operation of the system in general. The system consists of 3 entities, namely Central Admin, Madrasah Admin, Students and School Principal. In the Central Admin entity, enter user data, subject data, question data, question package data, exam data and LCM data. Madrasah Admin enters academic year data, exam type data, madrasah data and student data. Students take exams. Principals can access madrasa reports, student reports and grade reports.

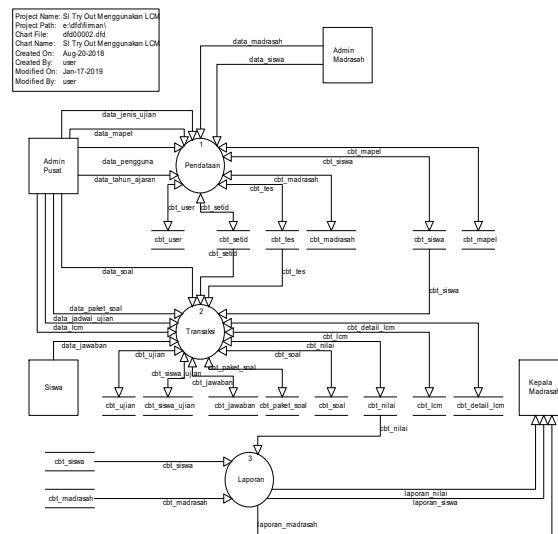


Figure 4 DFD Level 0

The system is divided into 3 parts, namely data collection, transactions and reports. Master data collection produces 6 databases, namely user data, subject data, school year data,

exam type data, madrasa data and student data. From the database, the data collection results are used for the transaction process to produce 8 databases, namely questions, question details, lcm , lcm details, exams, exam students, answers and grades. The resulting database is processed to produce reports.

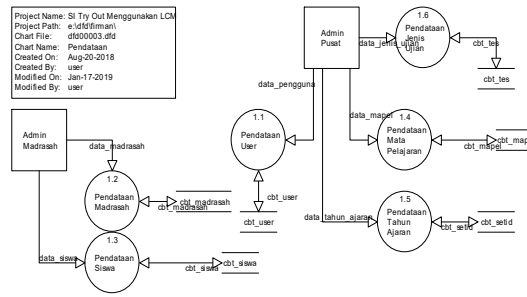


Figure 5 DFD Level 1 Data Collection

Figure 3.17 explains that master data collection is divided into 5 processes, namely user data collection, subject data collection, school year data collection, exam type data collection, madrasah data collection and student data collection.

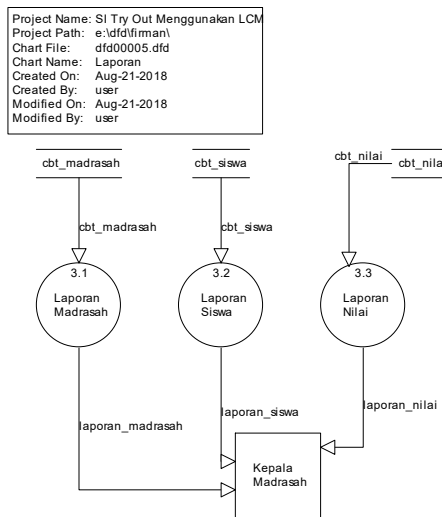


Figure 6 DFD Level 1 Report

Figure 3.19 explains that the report is divided into 4 reports, namely the madrasah report, student report and grades report.

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The Entity Relationship Diagram (ERD) resulting from a series of independent *try out* processes is as follows:

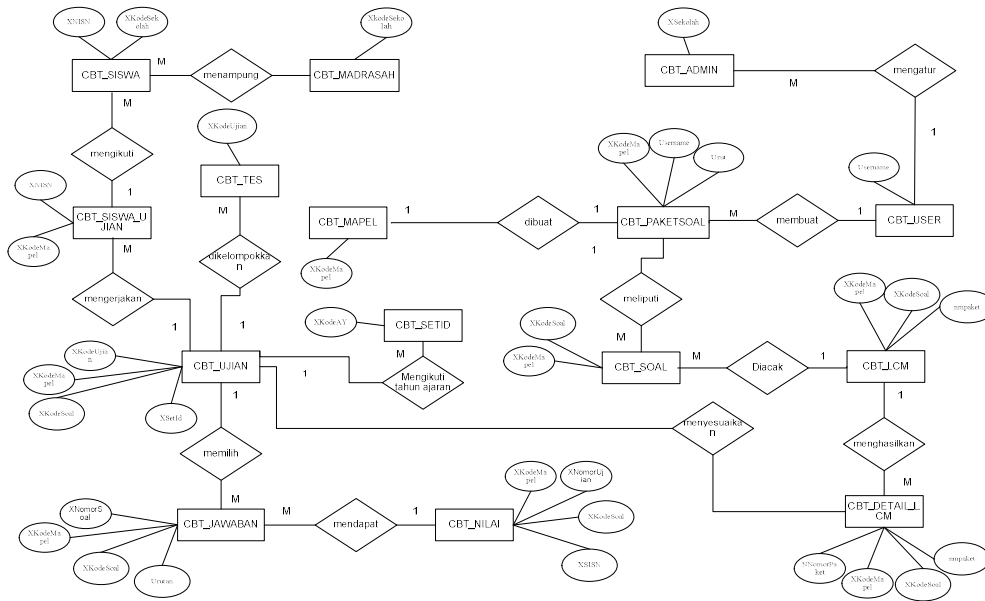


Figure 7 ERD

The ERD for the independent *try out* system from the picture above consists of Cbt\_Madrasah, Cbt\_Siswa, Cbt\_Siswa\_Ujian, Cbt\_ujian, Cbt\_Tes, Cbt\_Jawaban, Cbt\_Nilai, Cbt\_Setid, Cbt\_Mapel, Cbt\_PaketSoal, Cbt\_User, Cbt\_Admin, Cbt\_Soal, Cbt\_LCM, Cbt\_Detail\_Lcm.

Apart from that, the system architecture design of the independent *try out* information system design can be seen in the following figure .....

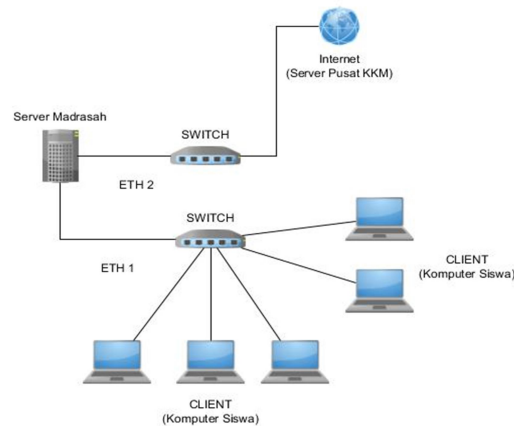


Figure 8 System Architecture

The system architecture is adjusted to the parts involved in the *Try Out system* , namely Students, Madrasah Admin, and Central Admin. The system is distributed via the internet network and local networks. Internet network for synchronizing questions from the KKM center to madrasahs and local networks for distributing questions to students.

## 5. Application of the *Linear Congruent Method* as randomization of questions.

Sample case :

It is known that the data for Madrasah members of KKM MTs N 2 Demak are as follows:

Miftahul Huda Kangkung MTs Student Data

Table 2 Data on Class 9 Students at MTs Miftahul Huda Kangkung

No	Name	Gender	Username
1	Ahmad Budi Rusdianto	L	P1001001
2	Ahmad Hadi Wijaya	L	P1001002
3	Ahmad Mufit	L	P1001003
4	Ahmad Ulinuha	L	P1001004
5	Aji Bagas Setiawan	L	P1001005
6	Ana Aristiyani	P	P1001006
7	Andi Dimas Julianto	L	P1001007
8	Dewi Sartika	P	P1001008
9	Diana Natalia	P	P1001009
10	Dinda Aulivia Rahayu	P	P1001010
11	Irdam Alamsyah	L	P1001011

No	Name	Gender	Username
12	Latiful Khandiroh	P	P1001012
13	Lutfiyatul Masythoh Muhammad	P	P1001013
14	Aris Rahmat Efendi	L	P1001014
15	Muhammad David Sauti	L	P1001015
16	Muhammad Nuru Alvin Nurul	L	P1001016
17	Lailatul Nisqiyah	P	P1001017
18	Rifqi Manaf	L	P1001018
19	Silviyana	P	P1001019
20	Surya Adil Witcasana	L	P1001020

*Table 3 Data for Try Out Subjects*

No	Code	Subjects	KKM
1	TO-01	Indonesian	75
2	TO-02	Mathematics	75
3	TO-03	English	75
4	TO-04	IPA	75

*Table 4 Data on Indonesian Question Packages and LCM*

No	Question	Package Name	(a)	(c)	(m)	(Z0)
1	B hs _Indo	Package 1	11	7	25	1
2	B hs _Indo	Package 2	11	7	25	3
3	B hs _Indo	Package 3	11	7	25	5

From the LCM data above it is known:

$$a = 11$$

$$c = 7$$

$$M = 25 \text{ and}$$

$$Z_0 = 1, 3, \text{ and } 5$$

$$X_{n+1} = \text{Question Number}$$

From this data, it is also known that in the question database there are 50 questions, of these 50 questions 20 questions will be displayed with a maximum randomization limit of 25, so the calculation is as follows:

Formula :

$$\mathbf{X_{n+1} = (aZ_0 + c) \text{ against } m}$$

Perhitungan :

1.  $X(1) = (11(1) + 7) \text{ against } 25 = 18$
2.  $X(2) = (11(18) + 7) \text{ mod } 25 = 5$
3.  $X(3) = (11(5) + 7) \text{ against } 25 = 12$
4.  $X(4) = (11(12) + 7) \text{ against } 25 = 14$
5.  $X(5) = (11(14) + 7) \text{ against } 25 = 11$
6.  $X(6) = (11(11) + 7) \text{ against } 25 = 3$
7.  $X(7) = (11(3) + 7) \text{ against } 25 = 15$
8.  $X(8) = (11(15) + 7) \text{ against } 25 = 22$
9.  $X(9) = (11(22) + 7) \text{ against } 25 = 24$
10.  $X(10) = (11(24) + 7) \text{ against } 25 = 21$
11.  $X(11) = (11(21) + 7) \text{ mod } 25 = 13$
12.  $X(12) = (11(13) + 7) \text{ mod } 25 = 25$
13.  $X(13) = (11(25) + 7) \text{ mod } 25 = 7$
14.  $X(14) = (11(7) + 7) \text{ mod } 25 = 9$
15.  $X(15) = (11(9) + 7) \text{ mod } 25 = 6$
16.  $X(16) = (11(6) + 7) \text{ mod } 25 = 23$
17.  $X(17) = (11(23) + 7) \text{ mod } 25 = 10$
18.  $X(18) = (11(10) + 7) \text{ mod } 25 = 17$
19.  $X(19) = (11(17) + 7) \text{ mod } 25 = 19$
20.  $X(20) = (11(1) + 7) \text{ mod } 25 = 16$

From the LCM above we can obtain the following randomization data :

Table 5 Results of randomization of LCM questions

Question Package	Question Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pct 1	1	5	1	1	1	3	1	2	2	2	1	2	7	9	6	2	1	1	1	1
	8		2	4	1		5	2	4	1	3	5			3	0	7	9	6	
Point 2	1	2	2	2	1	2	7	9	6	2	1	1	1	1	1	5	1	1	1	3
	5	2	4	1	3	5				3	0	7	9	6	8		2	4	1	
Point 3	1	1	1	3	1	2	2	2	1	2	7	9	6	2	1	1	1	1	1	5
	2	4	1		5	2	4	1	3	5				3	0	7	9	6	8	

## 5. Conclusion

From the analysis and discussion that has been carried out, the following conclusions can be drawn:

1. *Try Out* using the Linear Congruent method is very good for randomizing *Try Out* questions .
2. Determination of constant numbers in *Linear Congruent* will determine whether the randomization of questions is good.
3. With the *Linear Congruent method* , the central user can create question packages and can determine randomization in each package.
4. Distribution of questions by synchronizing data from the KKM center to KKM member madrasahs using the internet network so that it is more efficient and practical.
5. *Try Out* exam assessments are no longer corrected manually, but are corrected directly from the system so that students' parallel scores and rankings will immediately appear on the madrasa online server and central server.
6. *Try Out* information system using the LCM method, students can measure their respective levels of ability in facing the National Examination.



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