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Prototyping PISA-like Mathematics Problems for 8th-grade Students Using Javanese Context

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Abstract

Javanese context is rich of phenomena potentially used as a starting point to learn mathematics. On the other hand, the Indonesian students' performance in PISA is consistently low due to the small number of PISA-like problems which can be used to foster the students' mathematical literacy measured in PISA. Therefore, this research aims to develop a set of PISA-like problems using the Javanese context targeted for 8th-grade students of Junior High School. It is a development study using Plomp's framework in the stage of need analysis and prototyping. We have successfully developed a prototype of PISA-like mathematics problems using Javanese context. There are six items covering seven basic competences in the 8th-grade of junior high school. The items used various mathematics skills such as communication, representation, mathematization, devising strategies, and reasoning. We could explore some Javanese contexts such as traditional building, transportation, calendar system, community meeting, and historical place. Meanwhile the school mathematics materials include number sequence, Cartesian coordinate, relation, linear function, linear equation system in two variables, and Pythagorean theorem.

Keywords: Javanese context, PISA, school mathematics

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INTRODUCTION

Programme for International Students Assessment (PISA) is a project to measure how 15-year-old students acquire essential knowledge and skills to succeed in modern society (She et al., 2018). The assessment measures some aspects, such as mathematics literacy, reading literacy, science literacy, problem-solving literacy, and financial literacy. Indonesia has participated in the assessment program since 2000 (Hewi & Shaleh, 2020), and its government regards the PISA results as a competence benchmark and external challenge in developing its 2013 curriculum (MOEC, 2016). In fact, the Indonesian students' performance consistently ranked around bottom ten. It means that the Indonesian students' mathematics literacy is low (Hewi & Shaleh, 2020).

Mathematics literacy is defined as a person's capacity to formulate, apply, and interpret mathematics in various contexts (OECD, 2013). The contexts used in the problems consists of personal, occupation, community, and scientific contexts. Besides the three mathematical literacy processes, mathematics literacy skills can also be classified into seven abilities, namely: communicating, mathematizing, representation, reasoning, devising strategies, using symbolic formal and technical operations, and using mathematics tools. These abilities help students to understand the role of mathematics in their daily life as well as prepare them to succeed as constructive, caring, and reflective citizens.

In terms of measuring the students' mathematics literacy, PISA consist of content dimensions, process dimensions, and context dimensions (OECD, 2013). The content of

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PISA mathematics problems consists of space and shape, changes and relationships, numbers, and uncertainty and data. The PISA process includes three things, namely, formulating a situation mathematically, applying concepts, facts, procedures, mathematical reasoning, and interpreting mathematical results. Also, the PISA problems can be classified into several levels in terms of difficulty or complexity of the measured ability, namely Level 1 (solving problem when the data are already available in the problem), Level 2 (using direct inference, sorting out relevant information), Level 3 (performing procedures in the right order), Level 4 (working with concrete models with complex situations), Level 5 (working with models with complex situations and being able to make assumptions), and Level 6 (conceptualizing and generalizing using contexts).

Many believes that some factors cause the students' low performance of mathematics literacy in PISA. One of the factors is the instructional factor, namely learning that has not facilitated students to have adequate mathematics literacy (Hidayati et al., 2020). In fact, students are less familiar with mathematics literacy problems during learning. The teacher does not have an adequate mathematics literacy problems which are close to students' life. Thus, the problems presented to students all this time are less contextual. Meanwhile, there are many contexts around students that can be developed into mathematics literacy problems like PISA, one of which is the context of Javanese society.

Society is a good context and relevant to PISA framework (OECD, 2013). Javanese society is one of the contexts that is very rich and potential to be developed as a problem context in the entire content domain of PISA. Javanese people, especially in Yogyakarta, build houses in the form of Joglo or Limasan (Fajrina et al., 2017). This context is closely related to the content of space and shape. Another example, Javanese people know the Javanese calendar which can be used as a number context, and other contexts that can be explored further.

Although several studies have developed PISA-like mathematics problems using various contexts, such as batik (Oktiningrum et al., 2016), football and table tennis (Nizar & Putri, 2018), and Asian Games (Putri, 2020), the developed problems are generally still limited to one content domain or have not been linked to the school mathematics curriculum. For example, considering whether the material content of a problem has been taught at a certain level. Therefore, it is necessary to develop mathematical literacy questions for junior high school students whose contexts are more varied, the content domain is more complete, and adapted to the mapping of basic mathematical competencies at that level.

The present article aims to develop a set of PISA-like problems using the Javanese context targeted for 8th-grade students of Junior High School. Particulary, this article presents a stage of need analysis and prototyping the problems under the bigger development studies using Plomp's framework.

RESEARCH METHOD

This research is a development study using the Plomp's framework (van den Akker et al., 2013). The framework started with need analysis. In this research, we conducted a survey targeting 208 junior high school mathematics teachers and followed up with a focus group discussion involving 21 junior high school mathematics teachers under the administration of Primary and Secondary Education Council of Muhammadiyah Regional Administration of Yogyakarta. The discussion focused on the reflection of the need of PISA-like problems for mathematics learning and the availability of the problems they could access so far.

The next stage is prototyping the problems. We mapped the basic competences in the 8th-grade junior high school mathematics. We searched in the contexts of Javanese society for any phenomena which could be a relevant starting point for certain topics in the existing basic competences. We also considered the process and the level of the problems referring to the PISA framework. Finally, we managed to formulate the problems' grid, the problems' items, and their sample of solution. The evaluation results are presented in separate publication.

RESULTS AND DISCUSSION

We divided this section into two sub-sections, namely the results of need analysis stage and the results of prototyping stage.

Results of Need Analysis

We conducted a survey targeting 208 junior high school mathematics teachers and followed up with focus group discussion with 21 teachers in Yogyakarta. The survey and the discussion were regarding the need for PISA-like problems that foster students' mathematics literacy. The survey functioned as initial data on the availability of the problem instrument, while the limited discussion was intended to validate the survey results.

The survey consisted only one question about the availability of PISA-like mathematics problems the teacher at school. We designed the survey item in Likert scale 1 to 5. Score 1 represents the fact that the teachers did not have any access to PISA-like mathematics problems and never develop them for their mathematics learning. Score 5 represents the fact that teachers already have many stocks of PISA-like mathematics problems, they are familiar enough with them, or they actively develop them for their needs in mathematics learning. The result of the survey is presented in Figure 1.

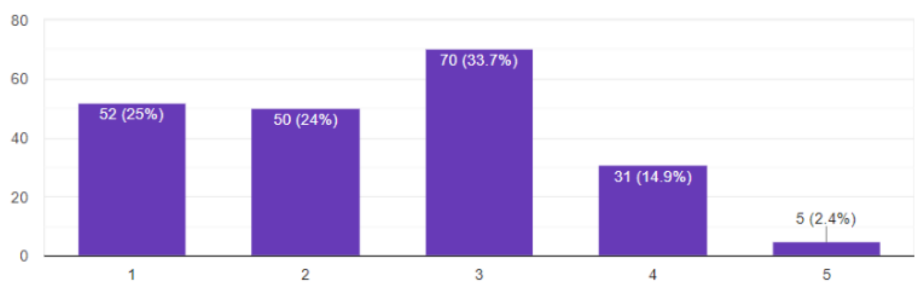


Figure 1. Survey on the availability of PISA-like problems a school

In Figure 1, we could see that 25% of the respondents said that they did not have any access to PISA-like mathematics problems and never develop them for their mathematics learning. Score 1 and Score 2 are not significantly different in terms of the criteria, as they only reflect the variation of intensity the teachers feel about the survey question. Therefore, we could also get that almost 50% of the junior high school did not have adequate access to PISA-like mathematics problems for their learning. It surely leads to the fact that their students are not used to engage with the PISA-like problems.

Based on Charmila et al. (2016), such habituation is needed to foster the students' mathematics literacy skills.

Moreover, it was only 17% (Score 4 and 5) of the teachers who were confident enough to say that they have been familiar with PISA-like mathematics problems, already have many stocks of them, or they actively develop them for their needs in mathematics learning. Based on the results, the need for the development of PISA-like problems was high enough.

We followed up the survey results with a focused group discussion with 21 junior high school mathematics teachers using an online meeting platform, as presented in Figure 2.

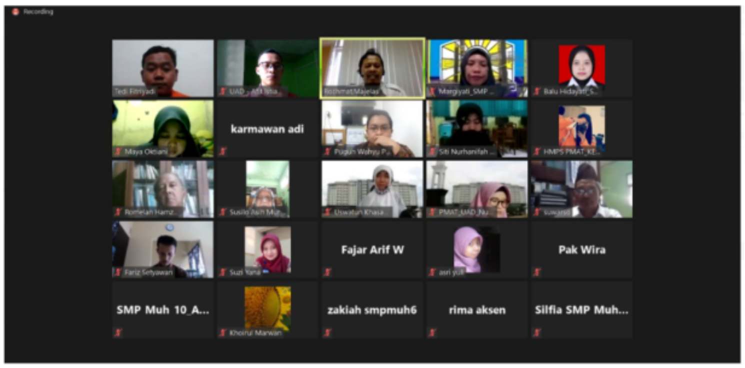


Figure 2. Focused-Group Discussion with the junior high school mathematics teachers

The Focused-Group Discussion validated the findings of the survey that the need of PISA-like mathematics problems was high. Furthermore, the teachers provided some feedback. First, the contexts used must be close to the students' daily life. Therefore, the context of Javanese society is appropriate. Second, the problems need to be in line with the basic competences of junior high school mathematics. It aims to make sure that the developed problems could be used for mid semester or final semester examination. The two statements are enough to be the basis of the development of PISA-like mathematics problems using the Javanese society context.

Results of Prototyping

We have mapped the basic competences in the 8th-grade junior high school mathematics. Among ten basic competences, we could develop problems in seven of them (See Appendix 1). We searched in the contexts of Javanese society for any phenomena which could be a relevant starting point for certain topics in the existing basic competences. We found that the following phenomena in Javanese society were potential to be developed as the PISA-like problems: traditional building, transportation, calendar system, community meeting, and historical place. Those contexts can be used to develop mathematics problem with the following topics: number sequence, Cartesian coordinate, relation, linear function, linear equation system in two variables, and Pythagorean theorem.

Furthermore, we also considered the process and the level of the problems referring to the PISA framework. The relevant skills were communication, representation, mathematization, devising strategies, and reasoning. Finally, we managed to formulate the problems' grid as the guidance to develop the problems (See Appendix 1).

In Appendix 2, we also present the problems' items and their sample of solution. It consists of six essay problems requiring the students to work in 60 minutes. The grid and the problems are developed in Bahasa Indonesia.

CONCLUSION

We have successfully developed a prototype of PISA-like mathematics problems using Javanese context. There are six items covering seven basic competences in the 8th-grade of junior high school. The items used various mathematics skills such as communication, representation, mathematization, devising strategies, and reasoning. We could explore some Javanese contexts such as traditional building, transportation, calendar system, community meeting, and historical place. Meanwhile the school mathematics materials include number sequence, Cartesian coordinate, relation, linear function, linear equation system in two variables, and Pythagorean theorem.

For future research, we continue the Plomp's stages by evaluating this prototype. Self-evaluation, validation, and small group implementation will be conducted to see the validity, practicality, and potential effect of the test instrument to foster the students' mathematics literacy skills.

REFERENCES

Charmila, N., Zulkardi, Z., & Darmawijoyo, D. (2016). Pengembangan soal matematika model PISA menggunakan Konteks Jambi. *Jurnal Penelitian dan Evaluasi Pendidikan*, *20*(2), 198-207.

Fajrina, M. N., Antariksa, A., & Ridjal, A. M. (2017). Pola Ruang Dalam pada Rumah Tinggal Tradisional Jawa di Desa Brayut, Yogyakarta. *Jurnal Mahasiswa Jurusan Arsitektur*, *5*(1).

Hewi, L., & Shaleh, M. (2020). Refleksi Hasil PISA (The Programme for International Student Assesment): Upaya Perbaikan Bertumpu Pada Pendidikan Anak Usia Dini. *Jurnal Golden Age*, *4*(01), 30-41.

Hidayati, V. R., Wulandari, N. P., Maulyda, M. A., Erfan, M., & Rosyidah, A. N. K. (2020). Literasi matematika calon guru sekolah dasar dalam menyelesaikan masalah PISA konten shape and space. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *3*(3), 185-194.

MOEC. (2016). *Peraturan Menteri Pendidikan dan Kebudayaan Nomor 20 Tahun 2016 tentang Standar Kompetensi Lulusan Jenjang Pendidikan Dasar dan Menengah*. Jakarta: Indonesian Ministry of Education and Culture.

Nizar, H., & Putri, R. I. I. (2018). Developing PISA-Like Mathematics Problem Using the 2018 Asian Games Football and Table Tennis Context. *Journal on Mathematics Education*, *9*(2), 183-194.

OECD. (2013). *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving, and Financial Literacy*. Paris: OECD Publishing.

Oktiningrum, W., Zulkardi, Z., & Hartono, Y. (2016). Developing PISA-like Mathematics Task with Indonesia Natural and Cultural Heritage as Context to Assess Students Mathematical Literacy. *Journal on Mathematics Education*, *7*(1), 1-8.

Putri, R. I. I. (2020). Designing PISA-Like Mathematics Task Using Asian Games Context. *Journal on Mathematics Education*, *11*(1), 135-144.

She, H. C., Stacey, K., & Schmidt, W. H. (2018). Science and mathematics literacy: PISA for better school education. *International Journal of Science and Mathematics Education*, *16*(1), 1-5.

van den Akker, J., Bannan, B., Kelly, E. A., Nieveen, N., & Plomp, T. (2013). *Educational Design Research*. Enschede: Netherlands Institute for Curriculum Development.

APPENDIX 1

GUIDE TO DEVELOP PISA-LIKE MATHEMATICS TASKS USING JAVANESE SOCIETY CONTEXT

Level : Junior High School
Grade : 8

Basic Competences	Content	Context	Process (Skills)	Level	Task Indikator	Item Number
3.1 Generalizing pattern in number sequence and object configuration sequence 4.1 Solving problems related to number sequence and object configuration sequence	Determining n and n-th term of arithmetic sequence (*quantity*)	*Society* (Days in Javanese calendar)	Devising a plan to solve problems about calculation of pasaran days, implementing the plan, and interpreting it (*devising problem-solving strategies*)	3	Given a date of the first day of working, daily salary, and the amount of salary which has been pre-paid, students could determine the number of days of the worker and when the employer must pay again.	3
3.2 Explaining position of points in Cartesian coordinate in connection with contextual problems 4.2 Solving problems related to position of points in Cartesian coordinate	Position of points in cartesian coordinate (*change and relationship*)	*Occupation* (Andong driver)	Making a representation of location using Cartesian coordinate based on a given information (*representation, formulating.*	3	Given a map appointing some locations, students could determine the coordinate of location they passing through after selecting a point of origin.	1c
3.3 Desribing the relation and function using various representations (words, table, graph, diagram, and equation) 4.3 Solving problems related to relation and function using various representations	Stating relation in a form of table (*change and relationship*)	*Society* (Community meeting of Selapanan)	Making representation and communicating it using table to find solution (*representation, communication*)	2	Given a screshot of Whatsapp chat about schedule of community meeting, students could help to determine the schedule such that the leader could come.	4
3.4 Analyzing linear function as a linear equation and interpreting its graph connected to contextual problems	Formula and values of linear function (*change and relationship*)	*Occupation* (Andong driver)	Formulating the linear function using appropriate variables and interpreting the results after certain value is substituted. Then, estimating the appropriate distance to	4	Given a map of andong route sand its distance, students could formulate the function representing the condition, determining the distance (function value) if given the time,	1a, 1b

Basic Competences	Content	Context	Process (Skills)	Level	Task Indikator	Item Number
4.4 Solving contextual problems related to linear function as a linear equation			determine the route of the andong (*mathematization, using formal language*)		and selecting an appropriate route based on the interpretation of distance.	
3.5 Explaining linear equation system in two variables and its solution connected to contextual problems 4.5 Solving problems related to linear equation system in two variables	Linear equation system in two variables (*change and relationship*)	*Occupation* (Shopping batik in Malioboro)	Formulationg mathematics model related to shopping batik, solving it, and choosing the appropriate combination of batik to get the biggest number of items (*mathematization, reasoning*)	3	Given two choices of buying batik shirts and T-shirts with different combinations of shirts and T-shirts, students are able to determine the price of 1 shirt and 1 T-shirt and make decisions about the most items that can be purchased for a certain amount of money.	2a, 2b
3.6 Explaining and proving the Pythagorean theorem and Pythagorean triple 4.6 Solving problems related to Pythagorean theorem and Pythagorean triple 3.9 Distinguishing and determining the surface area and volume of solid figures (cube, cuboid, prism, and pyramid) 4.9 Solving problems related to the surface area and volume of solid figures (cube, cuboid, prism, and pyramid) and its combination	Pythagorean theorem and surface area of pyramid (*space and shape*)	*Society* (Javanese building, roof of Masjid Pathok Negara)	Estimating the need of roof tiles for mosque renovation having pyramid shape (*devising strategies to solve problems, reasoning*)	4	Given the case of the renovation of the roof of the mosque in the shape of a pyramid and the number of tiles that are available, students assess whether or not the tiles are sufficient for the renovation.	5

APPENDIX 2

SOAL LITERASI MATEMATIKA SERUPA PISA
MENGGUNAKAN KONTEKS MASYARAKAT JAWA

Kelas VIII

60 menit

1. **Berwisata Naik Andong**

Malioboro adalah kawasan *pedestrian* terkenal di Yogyakarta. Perhatikan peta berikut.

Peta kawasan Malioboro

Sumber: Loekito, Y & Istiandaru, A. (2020). Modul literasi dan numerasi kelas 5 tema 5(3) (hlm. 16). Kemdikbud.

Seorang wisatawan diberi tahu bahwa butuh waktu 5 menit untuk sampai ke pasar Beringharjo dengan naik andong dari hotel Grand Inna saat jalanan ramai.

a. Bantulah wisatawan tersebut untuk memperkirakan jarak yang bisa ditempuh dengan naik andong jika ia mempunyai waktu tertentu.
b. Jika ia mempunyai waktu 10 menit untuk berkeliling berangkat dari hotel Grand Inna, tempat dan rute mana saja yang bisa ia lalui?
c. Sajikan rute yang dilalui dalam koordinat Kartesius.

Kunci Jawaban:

a. Jarak dapat diperkirakan dengan fungsi linear yang dinyatakan dengan $f(t)$ di mana t adalah waktu (menit). Karena jarak hotel Grand Inna ke pasar Beringharjo adalah $2 \times 500 = 1000$ m, ditempuh dalam waktu 5 menit, maka dalam 1 menit andong dapat menempuh jarak $\frac{1000}{5} = 200$ menit. Dengan demikian, dapat ditulis,

$$f(t) = 200t$$

b. Jika t = 10, maka $f(10) = 200(10) = 2000$ m. Berdasarkan peta, jarak tersebut dapat mengunjungi beberapa alternatif lokasi, seperti:
   - Grand Inna – Pasar Beringharjo – Grand Inna
   - Grand Inna – Stasiun Yogyakarta – Pasar Beringharjo
   - Grand Inna – Stadion Kridosono – Grand Inna
   - Stadion Kridosono – Grand Inna – Pasar Beringharjo, atau sebaliknya

c. Koordinat titik-titik yang dilalui, jika Pasar Beringharjo dijadikan titik (0,0), maka
   - Grand Inna (250, 1000) – Pasar Beringharjo (0,0) – Grand Inna (250, 1000)

- Grand Inna (250, 1000) – Stasiun Yogyakarta (0, 1000) – Pasar Beringharjo (0,0)
- Grand Inna (250, 1000) – Stadion Kridosono (1000, 1250) – Grand Inna (250, 1000)
- Stadion Kridosono (1000, 1250) – Grand Inna (250, 1000) – Pasar Beringharjo (0,0), dst.

2. Belanja Batik di Malioboro

Salah satu aktivitas yang dapat dilakukan di Malioboro adalah belanja batik.

Belanja batik di Malioboro
Sumber: https://unsplash.com/photos/eOPhf0z2Q9g

Sebuah kios menawarkan dua jenis produk batik, yaitu baju dan kaos, masing-masing harganya seragam. Abisatya membawa uang Rp500.000,- untuk dibelanjakan di kios tersebut. Jika ia membeli 2 baju dan 2 kaos, maka ia akan mendapat kembalian sebesar Rp50.000,-. Jika ia membeli 1 baju dan 4 kaos, makai uangnya justru kurang Rp25.000,-.

a. Berapakah harga 1 baju batik dan 1 kaos batik?
b. Dengan uang yang dimilikinya, apa saja yang bisa dibeli Abisatya di kios tersebut? Bantulah Abisatya untuk bisa membeli barang sebanyak mungkin.

Kunci Jawaban:

a. Misalkan x adalah harga 1 baju batik dan y adalah harga 1 kaos batik.
Maka,

$$\begin{cases} 2x + 2y + 50000 = 500000 \Leftrightarrow 2x + 2y = 450000 \\ x + 4y - 25000 = 500000 \Leftrightarrow x + 4y = 525000 \end{cases}$$

Selanjutnya, dengan menggunakan eliminasi variabel x, diperoleh:

$$\begin{cases} 2x + 2y = 450000 \\ 2x + 8y = 1050000 \end{cases}$$

Maka,

$$6y = 600000 \Leftrightarrow y = 100000$$
$$x + 4y = 525000 \Leftrightarrow x = 525000 - 4(100000) = 125000$$

b. Kombinasi barang yang bisa dibeli:

Banyaknya baju batik	Banyaknya kaos batik	Harga
4	0	500000
3	1	425000
2	2	450000
1	3	425000
0	5	500000

Berdasarkan tabel tersebut, barang paling banyak dibeli dengan uang Rp500.000,- adalah 5 kaos batik.

3. Hari-Hari pada Kelender Ja

Masyarakat Jawa mengenal 5 hari pasaran, yaitu Legi, Pahing, Pon, Wage, dan Kliwon. Pasar Pahing adalah pasar yang hanya dibuka di hari Pahing.

Kalender Jawa

Sumber: https://kratonjogja.id

Seorang petugas kebersihan rutin membantu bongkar muat dagangan. Ia biasanya diberi upah Rp50.000,- untuk sekali membantu bongkar muat. Pada hari Jumat Pahing, 3 September 2021, pedagang memberinya Rp500.000,- sebagai upah di awal.

a. Jika hari ini adalah Rabu Pahing, 13 Oktober 2021, apakah pedagang sudah waktunya memberi upah lagi kepada petugas kebersihan?
b. Kapan pedagang harus memberi upah lagi?

Kunci Jawaban:

a. Selang waktu antara 3 September dan 13 Oktober 2021 adalah 41 hari. Karena Pasar Pahing beroperasi setiap 5 hari dengan hari pertama tanggal 3 September, maka

$$\frac{41}{5} = 8,2$$

petugas kebersihan sudah 9 kali membantu. Upah yang dibayarkan sebesar Rp 500.000,- merupakan upah 10 kali bekerja. Jadi, belum saatnya pedagang memberi upah lagi.

Cara lain:

Jika pertemuan ke-1 adalah 3 September 2021 (hari ke-3 di bulan September), maka tanggal 13 Oktober 2021 dapat dipandang sebagai pertemuan ke-n (hari ke- (30 + 13 = 43) dari bulan September).

Maka

$$U_n = a + (n-1)b \Leftrightarrow 43 = 3 + (n-1)5$$
$$\Leftrightarrow 5n - 2 = 43$$
$$\Leftrightarrow 5n = 45$$
$$\Leftrightarrow n = 9$$

b. Pedagang harus memberi upah lagi pada pertemuan ke-11, yaitu

$$U_n = a + (n-1)b \Leftrightarrow U_{11} = 3 + (11-1)5 = 53$$

Pertemuan ke-11 jatuh pada hari ke-53 dari bulan September, atau hari ke- (53 – 30 = 23) bulan berikutnya, yaitu tanggal 23 Oktober 2021.

4. Selapanan Warga

Padukuhan Karanggayam terdiri dari 8 RT. Pak Dukuh meminta setiap RT mengusulkan jadwal pertemuan warga setiap *selapan* (35 hari). Agar pertemuan optimal, selapanan warga hendaknya dilaksanakan pada hari Sabtu bakda Asar atau bakda Isya. Berikut ini jadwal yang diusulkan oleh setiap RT.

Screenshoot Chat Usulan Jadwal selapanan Warga

a. Agar Pak Dukuh dapat menghadiri pertemuan di setiap RT, jadwal pertemuan RT mana yang harus disesuaikan?
b. Bantulah Pak Dukuh mengusulkan jadwal yang baru.

Kunci Jawaban:

a. Untuk memudahkan pencermatan usulan jadwal, data perlu direkap sebagai berikut.

RT	Hari	Waktu
1	Sabtu Legi	Bakda Isya
2	Sabtu Pon	Bakda Isya
3	Sabtu Pon	Bakda Asar
4	Sabtu Pahing	Bakda Isya
5	Sabtu Kliwon	Bakda Isya
6	Sabtu Pahing	Bakda Isya
7	Sabtu Pahing	Bakda Asar
8	Sabtu Wage	Bakda Asar

Dari tabel, diperoleh keterangan bahwa RT 4 dan RT 6 mengusulkan jadwal yang sama, sehingga salah satu harus diubah. Karena RT 6 tidak bisa mengubah jadwal, maka RT 4 dimungkinkan mengubah jadwal ke waktu yang lain.

b. Salah satu cara mengubah jadwal adalah dengan menggeser jadwal RT 4 ke hari Sabtu Legi bakda Asar. Selain itu, masih banyak pilihan hari dan waktu yang masih tersedia sepanjang tidak bertumbukan dengan jadwal pertemuan RT lain.

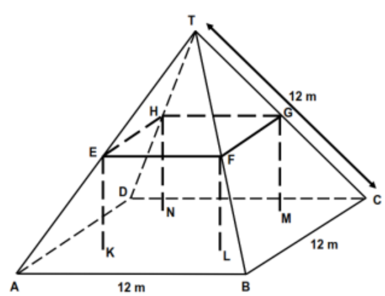
5. Atap Masjid Pathok Negara

Masjid Pathok Negara merupakan masjid-masjid yang menjadi batas-batas wilayah pemerintahan Keraton Ngayogyakarta Hadiningrat. Salah satu keunikannya terletak pada bentuk atap masjid sebagaimana digambarkan sebagai berikut.

Atap Masjid Pathok Negara Plosokuning

Sumber: https://www.kratonjogja.id/tata-rakiting-wewangunan/3/masjid-pathok-negara-sebagai-pilar-kasultanan-yogyakarta

Bentuk atap masjid tersebut dapat disederhanakan dengan model sebagai berikut.



Pengelola masjid hendak merenovasi atap dengan mengganti semua genting yang ada dengan genting yang baru berikut ini.

NAMA	Genteng Plentong
UKURAN	30 x 22 cm
ISI/M2	25 pcs
JARAK RENG	23 cm
BERAT	1 kg/pcs

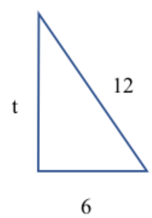
Jika ia membeli 2000 genting, cukupkah digunakan untuk mengganti genting atap tersebut?

Kunci Jawaban:

Pertama, dicari luas permukaan atap genting, yaitu:

$$4 \times \frac{1}{2} \times alas \times tinggi\ segitiga$$

Tinggi segitiga bisa diperoleh dengan menerapkan Teorema Pythagoras



sehingga

$$t^2 = 12^2 - 6^2 = 144 - 36 = 108$$
$$t = 6\sqrt{3}\, m$$

Jadi luas atap

$$4 \times \frac{1}{2} \times 12 \times 6\sqrt{3} = 144\sqrt{3} \approx 249{,}42\ m^2$$

Luas 1 genting, jika diasumsikan berbentuk persegi panjang adalah

$$30 \times 22 = 660\ cm^2 = 0{,}066\ m^2$$

Agar cukup menutupi atap, dibutuhkan

$$\frac{249{,}42}{0{,}066} = 3779{,}09\ genting$$

Jadi, 2000 genting belum cukup untuk merenovasi atap masjid tersebut.

HASIL CEK_Afit Istiandaru

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