

## Introduction to CEDT Final Project Group 30 Report

### Member

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### About the application

This web application is designed as a single page, offering mathematics problems retrieved from a database. Each problem is accompanied by information, including its difficulty level categorized using a 10-level Thai student behavior model [1], and the relevant content based on the IPST course topics [2]. Users have the option to choose their answers, and the application will promptly inform them whether their selection is correct. Additionally, the webpage provides statistics, displaying the total number of views and the overall number of correct answers by the user.

## Manual

The image displays two versions of a web application interface for a math problem. The desktop version (left) features a title 'OML ระดับความยาก 4' and a subtitle 'เลือกคำตอบเพื่อตรวจสอบ'. The problem text is in Thai, asking for the value of  $\frac{a}{b}$  given conditions on  $a$  and  $b$ . It lists four options: 1. 3 จำนวน, 2. 4 จำนวน, 3. 5 จำนวน, and 4. 6 จำนวน. Below the options are four buttons labeled 1, 2, 3, and 4, and a 'Next' button. The mobile version (right) shows the same problem but with a different layout, including a difficulty rating 'OML ระดับความยาก 2' and a subtitle 'เลือกคำตอบเพื่อตรวจสอบ'. It also lists the same four options and has buttons labeled 1, 2, 3, 4, and a 'Next' button. Both versions include a footer with text about the application's purpose and usage statistics.

**OML ระดับความยาก 4**  
เลือกคำตอบเพื่อตรวจสอบ

ถ้า  $a$  และ  $b$  เป็นจำนวนเต็มบวกที่มีค่าไม่เกิน 5 แล้ว จะมีเศษส่วน  $\frac{a}{b}$  ที่มีค่ามากกว่า  $\frac{3}{5}$  แต่น้อยกว่า  $\frac{5}{6}$  ที่เป็นไปได้ทั้งหมดกี่จำนวน

1. 3 จำนวน                      2. 4 จำนวน  
3. 5 จำนวน                      4. 6 จำนวน

เนื้อหาที่ใช้: ทศนิยมและเศษส่วน  
ดูโจทย์แล้ว: 9 ข้อ, ทำถูก: 3 ข้อ

1 2 3 4

Next

**OML ระดับความยาก 2**  
เลือกคำตอบเพื่อตรวจสอบ

ถ้า  $x - y = 3$  และ  $x + y = 2$  แล้ว  $x^2 - y^2$  มีค่าเท่าใด

ก. 7                      ข. 3  
ค. 6                      ง. 12

เนื้อหาที่ใช้: ความรู้เบื้องต้นเกี่ยวกับจำนวนจริง, สมบัติของเลขยกกำลัง  
ดูโจทย์แล้ว: 22 ข้อ, ทำถูก: 5 ข้อ

1 2 3 4

Next

Upon visiting the website, you will encounter a user interface resembling either the one on the left (for desktop) or the one on the right (for mobile). The web interface presents mathematical problems as images along with related information. To submit your answer, simply click one of the buttons labeled 1-4, each corresponding to a different choice. The outcome of your response is displayed below the difficulty rating at the top of the page. You can navigate to the subsequent problem by selecting "Next." The website also keeps track of the number of problems you've viewed and the total count of correctly answered problems.

## Basic Requirements

- The users have fun using the web application.
- The web application is a Single-page Web Application.
- The web application enhances the field of education.
- The front-end of the web application does NOT use any libraries/frameworks/plugins other than what was used in Activity 5-6. Standard Web (JavaScript) APIs

(<https://developer.mozilla.org/en-US/docs/Web/API>) that can be used in most modern web browsers without loading additional libraries/frameworks can be used.

- The back-end of the web application does NOT use any libraries/frameworks/plugins other than what was used in Activity 7-8. However, you can choose any databases you like apart from the activities.
- All members contribute to the development and the contribution of each member is according to a “plan” agreed among the members of the group.

## Challenging Requirements

- The web application displays and interacts with the user nicely on different screen sizes and orientations.
- The application has a nice look and feel GUI.
- The web application has a unique feature enhancing user experience (related to the main goal of the web application) via utilization of Web API (<https://developer.mozilla.org/en-US/docs/Web/API>)
- The web application should be deployed on EC2

## Development

We split the team into 3 groups: Frontend development, Backend development, and database and system design. The finished code is provided here:

<https://github.com/martnarabodee/oml-intro>

### 1. Database development

We sourced mathematical problems from the paper [1], each represented as an image with accompanying JSON data to describe each item. For this application, we specifically chose 4-choice type problems, resulting in a total of 3,181 items. These problem images are stored on the frontend, while the JSON data, which outlines the details of each problem, is stored in MongoDB as follows.

Filter ⓘ Type a query: { field: 'value' }

Explain Reset Find &lt;/&gt; Options ▶

ADD DATA EXPORT DATA

1 - 20 of 3181

```

_id: ObjectId('652685aaa15d8a0288b600d0')
problem_id: "ML000472"
difficulty: 1
dir: 10600472
content: Array (1)
comment: null
answer: 3
count: 1

```

```

_id: ObjectId('652685aaa15d8a0288b600d1')
problem_id: "ML000473"
difficulty: 1
dir: 10600473
content: Array (1)
comment: null
answer: 2
count: 2

```

```

_id: ObjectId('652685aaa15d8a0288b600d2')
problem_id: "ML000474"
difficulty: 1
dir: 10600474

```

The field store are: problem\_id: not use in this work, difficulty: level of difficulty, dir: problem image file name, content: store as array of number 1-3 items, comment: note for the problem (mostly not have), answer: choice that is correct, count: use like problem\_id to identify problem from randoming to in this work.

## 2. Backend development

We use ExpressJS as a backend framework as we studied in the activities. The backend is used to connect to the database and provide API for the frontend to request the data of each problem as shown in the picture.

```

← → ↺ ⌂ Not secure | 34.230.58.211:3222/api/problem/5
{"_id":"6526b838a15d8a0288b600d49","problem_id":"ML000476","difficulty":1,"dir":10600476,"content":[1,11],"comment":null,"answer":2,"count":5}

```

## 3. Frontend development

Our frontend is built with HTML, CSS, and JavaScript as we studied in the activities. The app randomly selects math problems from 1 to 3181 and uses the Fetch API to retrieve problem details, displaying the image based on the "dir" field. Users can choose answers (1 to 4) and check correctness using click event listeners. We also track and display the total problems viewed and answered correctly for each user using Local Storage.

Our CSS plays a pivotal role in ensuring an aesthetically pleasing and responsive user interface. It guarantees that the images and buttons are elegantly displayed across various platforms, including mobile devices.

#### 4. Deployment

We use AWS EC2 to deploy the system as we studied in activities.

#### The planning and executing of work contributed by group members

We are communicating using discord to dispute the work. The distribution of the work is as follows. The problem we found in the development process is that connecting to the database is complicated and ChatGPT did not help fixing this problem.

1. Narabodee Rodjananant: Develop database and design the system
2. Punnarun Yonvilas: Develop backend
3. Atipat Siwhatrakool: Develop backend
4. Sirichet Anankitphaiboon: Develop frontend
5. Poompat Sritanaanant: Develop frontend

#### Reference

- [1] Rodjananant N., Polasa P., Kritsutikul N., & Buaurai N., (2022). An Optimal Mathematics Learning – an Online Mathematics Learning Platform using 10-levels of Thai Student Behavior Model. *17th International Joint Symposium on Artificial Intelligence and Natural Language Processing*. (2022).
- [2] IPST. (2019, May 24). *Mathematics course manual (revised edition B.E. 2560) according to the core curriculum of basic education, B.E. 2551 at the lower secondary level*. <https://www.scimath.org/ebook-mathematics/download/1528/8380/88>.