**MATHEMATICAL FUNCTIONS WEBSITE PROJECT**

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# 1 Introduction

The overview of the project goal was to design and implement a website that performed several mathematical functions. This was to involve creating a plan, a website mock-up, creating the website in html, adding styling using css, incorporating JavaScript for functionality, testing and finally reporting and presenting our results.

The project was undertaken as part of our Developer Basic Skills course at Oulu University of Applied Sciences.

The timeframe of the project was from 27th November 2017 until 18th December 2017.

The driving goal behind our project was to create an easy to use website that combined performance and usability. We hoped our site would be easy to navigate, simple to use and provide the user with a good all-round experience. Furthermore, we wanted to focus on the requirements to ensure that we met them or surpassed them.

# 2 THE WORK ENVIRONMENT

The project requirements tasked us with completing several work items. This lead us to discuss the environment in which we would complete the work. In our first planning session we set out some parameters for our work. We chose tools that we both understood and allowed us to collaborate effectively. In this planning session we also set a guide for splitting the workload.

We selected ‘Google Docs’ as the solution for our course documentation. This meant that we could both write information about our project plan, track our time and write our project report. We had both used ‘Google Docs’ previously; this was one factor behind its’ selection, it also backs up all files and allows real-time collaboration.

The use of ‘Balsamiq’ for creating our mock-up was down to two main factors. It was a tool we had used before and, in comparison to other tools, it was very effective. The second main reason was it allowed for multiple users to edit the same file. This meant it was easy for us to edit files and create an accurate mock-up to focus our work around.

The main tool we used for constructing html, css and coding JavaScript was ‘Atom’. We chose this because it was simple and effective it also included ‘GitHub’ support. ‘Atom’ also adapts its presentation depending on which file type you are editing and offers multi-tab and multi-plane views. This all added to its’ appeal and made it the right choice for us to the bulk of our work.

The final tool we used was a combination of ‘Git’ and the online repository ‘GitHub’. We decided to use these as firstly having a ‘GitHub’ repository was in the requirements. Additionally, this tool and repository combination meant it was very easy for us to manage version control. We could work on separate branches and not disrupt our main/origin branch with bug filed or incomplete code.

The workload we established was focused around tasks we could do as a pair and individual tasks. When defining individual tasks, we made sure to still implement collaboration and teamwork. The project was divided into four main categories; planning and design, website creation with functionality, testing and, reporting and presenting. The first, third and fourth of these categories were to be done as a pair and the website creation with functionality, was to be further divided and worked on individually.

The categories we decided to work on together were selected as they needed closer collaboration. The planning and design phase was important to work on together as it set the guide lines of how we were going to implement the project. This meant that we had to agree on design elements, time scales and workloads. It was good to do this together as it allowed us to really focus on what would be best for design and insure that we delivered the project successfully.  Testing was also done together to allow us to cover lots of areas of testing and use different variables (web browsers, screen sizes, etc.). In doing the testing together we were able to identify and remedy bugfixes promptly. The report and presentation were also done together for similar reasons.

The work we opted to divide individually was the website creation and functionality implementation. The project requirements specified seven key things we chose to divide. These were creating the website and having six mathematical tools available. We organised the tools into two manageable workloads. This allowed us to write JavaScript and html elements separately which was more effective for us, as this allowed us both to develop our skillset in these areas. The main html source was worked on collaboratively to provide a template to insert each individual tool.

# 3 Definition

The requirements of the project led us to design six individual mathematical tools which were incorporated into a website. This site should be able to perform some basic functions using these tools.

**The First Tool**

The first tool we wanted to create was a number system conversion tool. This would allow a user to enter a number select a number system to convert from and another to have the function convert to. The focus was to have an easy data entry point for the user to enter a number, two selectable options for “from” and “to”, a button to start the conversion process and a result output.

**The Second Tool**

This tool was to display a number system conversion table with the four main number systems, Decimal, Binary, Octal and Hexadecimal. The tool should be able to print out Decimal numbers up to 50 with the other number system equivalents and have the option to be cleared. This was to be presented in a table format.

**The Third Tool**

The third tool had to allow the user to input options for a combinatorics calculation, with options for both combinations and permutations. It was to allow the user input two selections and return the calculated result. The permutations section also had to allow the user to choose a calculation with or without repetition.

**The Fourth Tool**

This tool was to provide a display of the basic truth tables, ‘or’, ‘and’ and ‘not’. These were not to be hard coded and we chose to include user input with a check function to change the truth table display.

**The Fifth Tool**

The fifth tool was to provide a random number generation function that also quantified results. We decided to have a dice rolling simulation to count random dice roll outputs to a user specified amount of times and display the number of each output.

**The Sixth Tool**

The final tool was to allow users to define different shade of displayed colour using three sliding selections. This was to allow users to customise red, green and blue values to show the corresponding colour and its hexadecimal number. This was to help website design colour schemes whilst using mathematical calculations.

# 4 Implementation

We had to design the tools so that they fit on the website, have a proper layout and are fully functional. The implementation of the tools often started with designing the html as a skeleton for the tool. Later, the JavaScript was added to give functionality to the html code, and finally, the css gave personality to the tools and made them look nice and customized.   
  
The html that has been created is very simple and basic. Much of it has been done with basic elements and we have used the website of ‘W3Schools.com’ and their instructions to get much of it on the rails.

The JavaScript adds functionality to the tools that we have created. Some of the tools were harder to write than others, but eventually we managed to get all the tools working accordingly. A website called ‘Stackoverflow.com’ has been a great help in finding solutions whenever we were stuck writing code. The JavaScript used is not very advanced, most of it consists of basic functions such as base conversion, loops and if-else statements.

Finally, we added the css styling. It was very important that the css is consistent and looks appealing. We saved some time by adding css onto the main page of the tool, which would be used by all other pages/tools as reference for the styling. This also meant that there was less risk of inconsistencies and it was much easier to style everything at once, rather than page by page.

# 5 Testing

Much is the testing has been done through trial and error, rather than writing code and expecting everything to be working perfectly fine on the first try. We constantly tested our code and its functionality with the html that we wrote, by refreshing our webpage in a browser and testing the functions. If it did not work, we would work on the code and try again.

As mentioned in the previous chapter, we have also used ‘Stackoverflow.com’ as a very useful reference. We were able to find people with similar issues regarding similar tools, and from there on we were able to fix our code and get the tools working. There have been challenges here and there, but we have managed to get very positive results.

Once we were satisfied with our tools we would continue to tweak them to make them look even better, even if it was just minor changes. ‘GitHub’ has been a great help in terms of version control, as we were able to keep up with even the smallest of changes. Especially towards the end, after all of the tools were finished, we pushed through a lot of minor changes regarding layout.

Ultimately, we have tested our final product multiple times to make sure everything is in order, all of the tools are functional, and the css complements the tools. We are very satisfied with the obtained results.

# 6 POSSIBILITIES OF FURTHER DEVELOPMENT

If developed further, this website could become a handy tool for users. Right now, it contains quite a few tools that could be useful in various situations. The tools could be expanded individually, and more tools could be added as well. The webpage itself is simple, easy to use and easy to navigate through, so there is pretty much no learning curve.

Some of the tools that are available right now require some background knowledge – anyone can write the inputs, but you will need to understand the outputs and how these were produced to understand the full use of the functions. These tools could use some additions in terms of instructions or explanations to make them easier to understand.

It could also expand in such a way that there are multiple categories to choose from, each containing different types of tools in relation to different subjects. Many of these are already

available on the internet, but it is always an option.

Further development would be a good way to improve our skills on an already existing product, and ultimately improve the quality of the product. However, considering tools like these are available on a wide scale on the internet, it would probably be best to use it as a personal training ground.

# 7 conclusion

In conclusion, we have learned a lot during this project. We have individually improved our skillsets in this field and we have also learned how to collaborate and complement each other’s skills.

We have completed the tasks in a timely manner and we have managed to overcome the challenges that we have had during this project. Most of the challenges consisted of getting all of the tools to function as desired, and we have reached that goal.

Our teamwork was smooth and there hasn’t been any obstacle that would harm our collaboration. We have always managed to find proper solutions and we were very active with bringing suggestions with regards as to what our tools should look like.

We are satisfied with our results and we are happy to present six unique tools that are fully functional as well as a nicely designed website. It was nice to get some practical experience and learn what things should look like, and learn how JavaScript works together with html.