**DEVELOPER BASIC SKILLS**

**PROJECT WORK**

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# 1 Introduction

This report is to summarize the project that I have done in the period from 28.11.2017 – 18.12.2017. To my best effort, I have finished the project on time and fulfilled requirements by myself. There is no other team member involving in this outcome.

The report covers main content of the website and its operations. They are 5 tasks I handled and explanation what I learnt and how I figured out the problem in each task.

A combination of computing mathematics, javascript, html and css skills in order to create a website which I called ***“Math Machine***” to automatically execute some mathematic problems. In each task, I create a separated page to be well organized within all tasks. However, navigation is much important to link all pages to one site only, so that viewer have a better look on what is in this website and how they can ultimate their needs by using this site only.

The project work started with a general plan when I defined different stages as well as divided proper time for each small task. Thus, the project could meet the deadline. During my work, I also kept track by using working-tracking to record the time I used to undertake the project and later on I have a quick comparison between estimated time and real working time. This tool is good for any person to have good organization in any job and take care personal responsibility as well as measure the quality and effect of the work.

**2 THE WORK ENVIRONMENT**

The website is built based on the idea of using a calculation to give quick result about some computing arithmetic such as conversion between different numeral systems, combinatorics, truth table and random value testing. This website runs in almost all browsers and is constructed in Windows operation system, implemented by javascript language embedded in html and page design by css. This combination is a powerful tool to develop a website. However, this index file is still running in local host, has not been published in any server.

The application of this website is quite large and useful for life, especially for whom study about computing and basic operation of computing based numbers. The page contains 5 main titles for different basic math: number conversion which converts number among decimal, binary, hexadecimal and octal systems; printing a table of numbers in those numeral systems; combinatorics calculation which gives result based combination and permutation; a tool for truth table and the last one is testing randomness which shows which number is randomly taken and its frequency.

During the whole project, loops such as “if… else if” is used almost in all cases to pick absolute functions based on input from users. Moreover, function is applied to connect between buttons and the arithmetic so that result executes when command is called from user by clicking buttons. Moreover, Math object is important in fulfilling mathematics problems as Math.pow(), Math.floor(). In the other hand, I have learnt about parseInt() function as a good tool to parse string from input in a desired numeral system then number conversion is implemented properly. And creating table dynamically.

It is very essential to have this kind of tool for getting quick result for some math problems since the world has change significantly by developing more artificial intelligent. Thus, a useful tool like this to understand more sophisticated about higher operations is needed.

**3 Definition**

**3.1 Number conversion**

A list of different type of conversion displays for user to choose certain conversion, for example converting from octal to hexadecimal or binary to decimal systems. Then, an input number is required to execute absolute converted number.

**3.2 Number output**

This section showing a table of number in decimals system in range 0-50 by clicking Print table. And it will disable table when Clear button is called.

**3.3 Combinatorics**

When user type a number in “n” and “k” fields, then choose type of mathematics available, the result of the math is shown. There are two types of math in this page: combination and permutation. In permutation, two options need to be chosen that are “sampling with replacement” and “sampling without replacement”.

**3.4 Truth table**

When user type letter “T” which represents for True and “F”- represent for False, and choose operation AND, OR, XOR, a logical value is executed and also a logical table of its operation also displays.

**3.5 Random number**

A range of 1 to 10 is given and random number is generated and shown. Moreover, frequency of each random number will be recorded as well as expected occurrences of distribution. Then, Chi-squared value is calculated to see if the distribution is fair or not by testing hypothesis given.

**4 Implementation**

Website consists of one main page and 5 other pages. All of the pages contain same page style so that they look harmonized. Each site links with its own css style file, except main page and combinatorics are styling in same css file Math.css because of simply of combinatorics page that doesn’t really need a separate css file. Design of all pages keep unchanged since main styling is copy to all css files.

All the objects in any page is positioned by using <div></div> tag and proper styling to define real practice compare to wireframe design. Moreover, <table></table> tage is also a good choice to reposition object which I used in random value site to get result with simple organization.

Any of task requires an input value, then <input> tag, type text is mainly used and then change to proper value later on based on specific function.

**4.1 Number conversion**

Firstly, from Decimals to other numeral systems, input value is converted into number and then toString() method is implemented to convert the number to string in certain numeral systems.

Secondly, from Binary to other system, parseInt() function is called to return binary string from input value. In here, regular expression is used to search whether in the string, there are other letter than “0” and “1”, then alert for user about wrong input is executed. After that, to change to other numeral system, toString() method is once again applied to return hexadecimals or octal value.

Thirdly, from Hexadecimal to other system, parseInt() function is also used at first to parse input string to hexadecimal string. Then a Do-While loops inside If loops is applied to calculate and convert each letter of the string to decimal value and sum up by at first reversing order of string and then multiply with decrement exponential of 16. To get value in binary or octal system, toString(2) and toString(8) are called.

Finally, from Octal to other system, parseInt() function is applied to return octal string from input value and then using toString() to convert to proper system as wanted.

In the whole page, if loops is used to call absolute type of execution when radio value list is checked and then convert button to execute the function in certain radio value.

**4.2 Number output**

Two functions are created in this page. Main content to be shown and other function is to disable the table. By clicking “Clear table”, the table is cleared and when clicking Print table, it comes again. In here, the table is created automatically by adding cell with row.insertCell() and row with table.insertRow(). Then, a for loops is used to print the number of rows we want. From decimal value 1 to 50, toString() is used to convert value in other numeral systems.

**4.3 Combinatorics**

Firstly, there is one function to calculate factorial of the input number. In here, if number is 0 then return 1 as result, otherwise, return Num \* factorial(num - 1). Other 3 functions are to calculate permutation with replacement, without replacement and combination. One styling function is to show radio list sampling with replacement and sampling without replacement when permutation is chosen. The last and main function to execute the whole program is calculate() with if loops to pick correct calculation.

Secondly, input value is converted to Number so that calculation is on the right way.

In addition, result is set to show on a disabled input number value. To have this style, document.getElementById( “result”).value = result is used to return the value in that box.

**4.4 Truth table**

A set of truth table including AND, OR, XOR operations will be shown. Two input type text for 2 value either True “T” or False “F” is set for the logical operation.

<select></select> tag to give a dropdown list of 3 operations to be chosen when calculating the logic of the character. There are two functions to be executed. The first one is to print proper logical table when operation is selected. And other function is to display logical value for specific operation. All of them will be run by clicking button “CHECK”.

Three different tables are created dynamically by using table.insertRow() and row.insertCell() under if loops. Then when any option is selected, a correct table will be shown.

**4.5 Random number**

A range number from 1 to 10 is only defined to test the random distribution. Function randomrange(min,max) is used to pick a random number by having Math.random() and round the number by Math.floor(). Then function randontest() is main program to execute, whether user click Test button, total time clicking is accumulated to calculate expect occurrences in order to check the fair of distribution and real distribution is also counted for each number in the range.

If loops is one more time applied to the site in order to get value in right place from 1 to 10.

I also used Math.pow() to calculate Chi-squared value. This value is important for testing hypothesis *H0: distribution is fair, H1: distribution is unfair*. With 10 numbers in the range, we get *Critical value for p\_value <0.01 is 21.67*. It means, if Chi-squared value is larger than this figure, we conclude that distribution is unfair. Thus, Chi-squared value is calculated by summing exponential of ) to 2 and dividing by expected occurrences.

**5 Testing**

Main page has nice navigation and link properly with other pages, the header also has link back to main page or among title bar in all pages, direction is set absolutely.

Firstly, number conversion page basically contains all requirement to have proper value for each numeral system so that it can convert to other system well. However, this design seems to need a longer coding when if loops is using almost in all radio button. It makes coding more difficult if there are more numeral systems to convert rather than those 4 systems. In future, I will take more time to understand different method to execute the arithmetic in an effective and simple way.

Secondly, number output page also targets well to requirement. Further development can have deep analysis to convert other numeral systems not decimal others as an automatically way. From here, we can see the importance to use script so that object can be created dynamically.

Thirdly, combinatorics page fulfills task to calculate combination and permutation and also some styling required.

Additionally, truth table adapts basic requirement to create a set of truth table. Different truth tables are displayed actively and respectively with specific operation, and also logical value of specific logic is shown. Nevertheless, table is still creating line by line and by adding particular string to the cell. They are not executed automatically if the task requires higher development when user type whole formula, for example, T and F. Thus, further understanding need to focus on simplifying the code line to create the truth table more dynamically.

Last but not least, random value site can handle range number from 1 to 10. However, if larger range such as 1 to 1000 is difficult to execute by this coding. Further development need to focus on simply of the code line but still maintain quality of generating a random number, calculating empirical occurrences, expected occurrences and chi-squared value.

In general, the website has very simple design and styling since it is a mathematics oriented site, however, better feedback from users can improve the outlook of the page to attract attention if users.

**6 conclusion**

The project work is almost fulfilled all requirements. If the plan initially scheduled 20 days to finish the project, real working is significantly less. I concentrated as best as I could to quickly understand and research for each task. A total time of 68 hours in 17 days was taken into account when handling the work. I had to do project by myself, but it didn’t mean I could not cover all problems. Since there were some instruction from friends and personal study, I figured out what I needed to do quickly. During project time, I took high responsibility to finish the task as planned.

Thanks to this kind of work, I took more study and got a lot of useful knowledge for my future study. I am now understanding how a basic web is developed and what a developer will do. Moreover, self- practicing is very important for me to get used to the code line, and also application of different methods, properties, functions so that I an able to apply those in other work, and it will be a strong base to develop higher skills.

Although tasks are covered, coding seems poor and ineffective somehow. It needs more practice and study from other teams’ work to get more ideas about one problem to handle by many ways.

In conclusion, web page is successfully built in html framework with css designing and javascript language to make page more dynamic. Different methods, functions, properties, etc were used to develops each task. Among those, if loops play a crucial role in executing a range of commands absolutely.