**FINAL PROJECT REPORT – TEAM 8**

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# 1 Introduction TO THE PROJECT

This project deals with the creation of a webpage that can handle mathematical calculations for Combinatorics, Random Values, and Number Systems Conversion, as well as being able to explain Truth Tables and Number Bases to users. Our team consists of three members, working as one hand by equally distributing the tasks day by day until the project has been successfully complete. The main idea of the project is to implement everything we have learned from the beginning of our studies in this degree programme into real-world projects. This means that we used all our knowledge and experience in fields such as programming with JavaScript, coding with HTML and CSS, User Interface Designing, using tools such as Visual Studio Code and GitHub, and topics in Mathematics to create an efficient and user-friendly webpage. Other purposes of the project are: gaining experience in working in teams, handling projects in limited amount of time, and working on giving the best results.

**2 THE WORK ENVIRONMENT**

Our work was mostly done inside the University campus, in where the three of us in the team can sit on the same table, distribute the tasks in the early morning before starting, and openly discuss any new ideas or problems that we may face. In addition to our working hours inside the University’s class, we continue to work on our individual tasks from our homes, communicating through social media for any necessary discussions relating to the project. A single task may take one to two days to be completed by the team’s individuals, with the help of the rest of the team in case a task takes too long. The work would be distributed in a way that all three of us interact interchangeably in the different tools which are needed to complete the task. The tools used throughout this project were: JavaScript, HTML for the pages’ skeleton, CSS for styling, Visual Studio Code for editing our codes

**3 Definition**

In general, the webpage’s main function is to enable the user to learn and also calculate basic mathematical operations, these include: calculating Combinations by using its formula, learn truth tables for the five basic primary operations, a table which prints out numbers 0 through 50 in decimal, binary, octal, and hexadecimal number systems, a converter between the four mentioned number systems bases, and a program that can print out random values between two specified numbers.

**3.1 Combinatorics**

The webpage has a section for calculating Combinatorics, specifically Combinations. The operation functions in sense that once the user is on the Combinations section of the webpage, an information box explaining what Combinations are with the formula of the operation is provided for the user to understand Combinations more. The section explains to the user what to enter for the two inputs. The program takes the two inputs from the user and gives them the number of possible combinations by using the equation. The program can detect errors, therefore notifying the user that the numbers must be positive if the user entered a negative number, as well as notifying the user that the number of selected items cannot be greater than the total number of items.

**3.2 Truth Tables**

The webpage has a section for truth tables, in which the user is provided with an information box explaining truth tables and the five basic operations. The page contains ready given truth tables for the five basic operations, OR, EXCLUSIVE OR, AND, IF-THEN, IF AND OLNLY IF.

**3.3 Number Systems**

This section of the webpage deals with the four primary number systems: Octal (8), Binary (2), Hexadecimals (16), and Decimals (10). The Number Systems has a table and a converter, which can be chosen by moving the mouse over “Number Systems” on the menu bar and then with a click choosing between the table and converter. Both sections, the table and the converter, contain an information box explaining the four different number systems and their bases.

**3.3.1 Table**

In this section, the user can open and close the table with a tab which they can click to reveal or hide the table. The table shows the numbers 0 through 50 in octal, decimal, binary, and hexadecimal form.

**3.3.2 Converter**

The converter has an input for the user to enter a number and a dropdown menu to choose the number system being converted from and the number system being converted to.

**3.4 Random Values**

This section of the webpage contains an information box explaining to the user how the program functions, in addition to the main program which consists of four inputs. The first input is for the user to enter a minimum number, the second being the maximum number, the third is for the user to specify the number of class intervals, and the fourth input is for the specification of the number of outcomes or result values.

**4 Implementation**

**4.1 Main Page**

The main page displays the titles as an animation by having the words appear letter by letter, and this is done by simply delaying the numbers by specifying how many milliseconds it will be delayed for the letters to appear in order, using JavaScript. Also, using the font-family type “Indie Flower, cursive” makes it appear as an animation to the user’s eyes. The letters were carried out using SVG (Scalable Vector Graphics), which allows the editing of 2D graphics by turning text into animation, in addition to inserting every individual character of the displayed titles (including spaces) into <tspan> to be affected with the animation.

**4.2 The Menu**

The menu is fixed and stable on all sections of the webpage and it has been done by generating buttons that are linked to the sections of the desired topics by using the <onclick> feature in which with a click the user is taken to linked webpage section. For the number systems, once the user moves the mouse over the word “Number Systems” on the menu, subtitles or options appear for the user “Table” and “Converter” by using the command <ul> to derive subtitles from the “Number Systems” button. This is the same for truth tables button and random values button, which are made to function as a button using HTML command <button>.

**4.3 Combinatorics**

The Combinations page both has been done by simply using a function that takes the two input numbers from the user (n and k, n being the total number of items, and k being the numbers of items chosen) and enters them into an equation on JavaScript which is the formula for Combinations. Therefore, the program gives the output by using the original formula for Combinations and simply inserting them into the JavaScript-written formula.

**4.4 Information Box**

The information was simply made using HTML to insert the text into it using a title with <h1> and a paragraph under it with <p> and the styling of the border and the organizing of the text along with the picture were all done using CSS, by specifying the width and padding from all sides. The equation in the info box is an image which was put into the HTMLby using <img src=image address>

**4.5 Number Systems**

**4.5.1 Table**

The table has been done using JavaScript by entering a long string and entering the binary, hexadecimal and the octal systems, respectively, for numbers 1 to 50 in decimal system. The string is later referred to on the html page by calling the string by its ID with document.getElementById(“Id”).innerHTML.

**4.5.2 Converter**

With HTML, the converter takes the numbers inserted by the user into the input box as two saved values and after the user specifies the number system for the inserted number and the number system for the result, by using a dropdown menu with options of the four number systems, the number system is recognized by its chosen value (for example, binary has the number base of 2, decimal system has the base of 10, etc.) and is then converted to the desired number system using a built-in library. The result is finally printed by calling or referring to it using the command document.getElementById("Result").innerHTML = parseInt(a,begin).toString(end).

**4.6 Truth Tables**

The truth table has being simply made by using HTML, in addition to CSS for the border and centering of the text. The command <table> is used to create the table, <tr> is used to create rows, ad <th> is used to create columns.

**4.7 Random Values**

Random Values program works by taking the user’s inputs for the minimum value, maximum value, number of class intervals, and number of desired results to be printed and saving them as values inside the JavaScript algorithm by using Number(document.getElementById("Id").value) for each input, which then uses the a for loop containing the function Math.floor to print the number of desired results.

Another for loop is generated operating an equation to get the class intervals between the numbers as given by the user. The random numbers are given using the function getRandomInt.

**5 Testing**

One user was used to the testing, the test plan consisted of questions relating to the ease of navigation and understanding of the webpage. The user was asked to: navigate to combinations, navigate to number systems table and converter, navigate to truth tables, and at last navigate to random values. The user was tested on understanding, by inspecting the level or ability of the user to know how to use the programs and comply with the topics in the various pages. The user was able to understand, through the help of the information box as well as the subtext how to use the programs and understand what they can give as outcome. The test was successful, and the page was estimated to be user-friendly.

**6 POSSIBILITIES OF FURTHER DEVELOPMENT**

The project can be developed by adding additional features, such as probability calculators, videos for each page as an additional feature to the information box, as well as changing of colors for the pages in a manner that it could look more fun for the users and learners. The page can also be developed by including an input for the truth tables page, in which the user, may enter any equation using the five different operators and it will print out a truth table for the equation given by the user. Methods for calculating and converting between number systems can be given in the number systems pages for users who desire to learn the mathematical way of converting a number between the four different number systems.

**7 CONCLUSION**

The page has been successfully accomplished by the help and teamwork of all three members of team 8. The page has generally met with all the goals and desires which we have planned out in the start of the project, based on the features given to us as instructions by the project’s description. The page may not be perfect, but it is simple and easy to use for the users. The page’s layout and colors have not been implemented as desired or planned out, therefore, if more time was given, the page’s graphical design could have been more attractive.

**8 REFERENCES**

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