Web Programming Fundamentals Using JavaScript

Practical Guide

School of Information Technology

Contents

WELCOME to Web Programming Fundamentals using JavaScript

Welcome to Web Programming Fundamentals using JavaScript. This subject will introduce you to the process of creating and testing computer code to build solutions to problems.

Each week you must complete ALL of the week-by-week exercises given in this Practical Guide.

Your mentor (lecturer) will share and discuss the solutions to these problems with you, to give you the opportunity to review your solutions, and to see how your solutions compare to those of the mentor and other students.

Module Overview

The following topics will be covered:

- Introduction to general software development
- Writing programs with decision and repetition statements
- Introduction to object-oriented code
- Introduction to software testing

Objectives

- You will learn the fundamental concepts of programming using JavaScript,
- the use of selection, repetition, and decision structures, and
- be introduced to writing object-oriented code

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WEEK 1

Use the Visual Studio IDE to write a JavaScript program to solve each of the problems provided. (You will create a new web project in Visual Studio for each problem).

In each case, you can test your program for correctness by checking that the sample input gives the sample output as a result. If your sample output is not correct, you must go back to your program code to understand where the code is not correct. Fix the problem, and test again until your program gives the expected output.

Your mentor (lecturer) will discuss solutions to the problems during class time, and post sample solutions online. Make sure that you compare your solutions to the mentor's sample solutions.

Week 1: Problem 1

Write a JavaScript program that asks the user to enter their name and their age. If the user is older than 18, output a message that they are old enough to apply for a car driver license. If the user is 17 years old, the output message must show that they can only apply for a car learner license. If the user is younger than 17 years of age, the output message must show that the user can't apply for a learner or driver license yet.

Sample Input:

```
Enter your name: Joe
Enter your age: 17
```

Sample Output:

```
Hi Joe. You qualify to apply for a car learner license.
```

Week 1: Problem 2

Write a JavaScript program that asks the user to enter 3 integer numbers and then shows the maximum and the minimum of those 3 values.

Sample Input:

```
Enter integer value 1: 5
Enter integer value 2: 10
Enter integer value 3: 2
```

Sample Output:

```
The minimum value is 2
The maximum value is 10
```

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Week 1: Problem 3

Write a JavaScript program to calculate a dog's age in "dog years". Use the following method to perform the calculation:

- For the first two years, each dog year is equal to 10.5 human years.
- After that, each dog year equals 4 human years.

Sample Input:

Enter the dog's age (in human years): 3

Sample Output:

The dog's age in dog years is 25

Week 1: Problem 4

Write a JavaScript program to check whether an alphabet letter is a vowel or a consonant.

Sample Input:
Enter an alphabet letter: E

Sample Output:
E is a vowel

Week 1: Problem 5

Write a JavaScript program to check whether a triangle is equilateral, isosceles or scalene.
Remember that an equilateral triangle is a triangle that has 3 sides equal in size. A scalene triangle is a triangle that has three unequal sides. An isosceles triangle is a triangle with (at least) two equal sides.

Sample Input:
Input length of triangle side 1: 6
Input length of triangle side 2: 12
Input length of triangle side 3: 8

Sample Output:
The triangle is scalene

Week 1: Problem 6

Write a JavaScript program that reads two values from the user - the first representing a month, and the second representing a day. The program must then print the season for that month and day.
You can assume that Summer is from 21 December and ends on 20 March. Autumn is from 21 March-20 June, Winter is from 21 June-20 September, and Spring from 21 September-20 December.

Sample Input:
Input the month (e.g. January, February, etc.): February
Input the day of the month: 28

Sample Output:
The season is summer

WEEK 2

Use the Visual Studio IDE to write a JavaScript program to solve each of the problems provided. (You will create a new web project in Visual Studio for each problem).

Test your program for correctness by checking that the sample input gives the sample output as a result. If your sample output is not correct, you must go back to your program code to understand where the code is not correct. Fix the problem, and test it again until your program gives the expected output.

Your mentor (lecturer) will discuss solutions to the problems during class time, and post sample solutions online. Make sure that you compare your solutions to the mentor's sample solutions.

Week 2: Problem 1

Write a JavaScript program that prints all the numbers from 0 to 6, except 3 and 6.

Sample input:

```
None
```

Sample output:

```
0 1 2 4 5
```

Week 2: Problem 2

Write a JavaScript program to count the number of even and odd numbers from a series of numbers.

Sample input:

```
How many numbers must be entered: 7
Enter value 1: 1
Enter value 2: 2
Enter value 3: 5
Enter value 4: 6
Enter value 5: 10
Enter value 6: 11
Enter value 7: 15
```

Sample output:

```
The number of odd numbers in the series = 4
The number of even numbers in the series = 3
```

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Week 2: Problem 3

Write a JavaScript program to print out the first *n* numbers in the Fibonacci series. The program will ask the user how many numbers they want (*n*).
The Fibonacci series is the series of numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, ….
(Note that the series starts with 0, 1, and thereafter every next number is found by adding up the two numbers before it.)

Sample input:

```
How many numbers from the Fibonacci series must be shown? 10
```

Sample output:

```
The first 10 numbers in the series: 0 1 1 2 3 5 8 13 21 34
```

Week 2: Problem 4

Write a JavaScript program that accepts a string as input, and then calculates the number of digits and letters in the string.
(Note: do not count spaces or punctuation marks as letters)

Sample input:

```
Enter a string: Today is the 1st day of my 2nd subject.
```

Sample output:

```
The string contains 2 digits
The string contains 28 letters
```

Week 2: Problem 5

Write a JavaScript program to construct the following pattern, using a nested loop.

Sample input:

None

Sample output:

```
1
22
333
4444
55555
666666
7777777
88888888
999999999
```

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WEEK 3

Use the Visual Studio IDE to write a JavaScript program to solve each of the problems provided. (You will create a new web project in Visual Studio for each problem).

Test your program for correctness by checking that the sample input gives the sample output as a result. If your sample output is not correct, you must go back to your program code to understand where the code is not correct. Fix the problem, and test again until your program gives the expected output.

Your mentor (lecturer) will discuss solutions to the problems during class time, and post sample solutions online. Make sure that you compare your solutions to the mentor's sample solutions.

Week 3: Problem 1

Write a JavaScript program to display information telling the user whether each of the books in the list below have already been read or not. (i.e. display a message with the book name, author name and reading status).

```
var library = [
  {
     author: 'Bill Gates',
     title: 'The Road Ahead',
     readingStatus: true
  },
  {
     author: 'Steve Jobs',
     title: 'Walter Isaacson',
     readingStatus: true
  },
  {
     author: 'Suzanne Collins',
     title:  'Mockingjay: The Final Book of The Hunger Games',
     readingStatus: false
  }];
```

Test input:
Include the objects listed above in your code.

Sample Output:

```
Already read ' The Road Ahead' by Bill Gates.
Already read ' Walter Isaacson' by Steve Jobs.
You still need to read 'Mockingjay: The Final Book
of The Hunger Games' by Suzanne Collins.
```

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Week 3: Problem 2

Write a JavaScript class named 'Rectangle' constructed by length and width values. Include two methods, one to compute the area and one to compute the circumference of a rectangle.

Test input:
To test your class, create an instance of the class using the following values:
length: 5
width: 10

Sample Output:

```
The area = 50
The circumference = 30
```

Week 3: Problem 3

Write a JavaScript class named 'Student' with the following attributes: student_id, student_name, and student_course. Create a function to display a message describing a student using the attributes and their values in the 'Student' class.

Test input:
To test your class, create 2 instances of the 'Student' class using the following values:

- Instance 1 values:
  - student_id: 1234
  - student_name: Joe Soap
  - student_course: Certificate in Networking
- Instance 2 values:
  - student_id: 999
  - student_name: Jane Doe
  - student_course: Engineering N3

Then use the function you created to print a message describing each of the 2 instances of class Student.

Sample Output:

```
Student Joe Soap (student ID 1234) is enrolled for Certificate in Networking.
Student Jane Doe (student ID 999) is enrolled for Engineering N3
```

WEEK 4

Use the Visual Studio IDE to write a JavaScript program to solve each of the problems provided. (You will create a new web project in Visual Studio for each problem).

Test your program for correctness by checking that the sample input gives the sample output as a result. If your sample output is not correct, you must go back to your program code to understand where the code is not correct. Fix the problem, and test again until your program gives the expected output.

Your mentor (lecturer) will discuss solutions to the problems during class time, and post sample solutions online. Make sure that you compare your solutions to the mentor's sample solutions.

Week 4: Problem 1

Write a JavaScript program that allows the user to enter 10 integer values, and stores those values in an array. Calculate the average value of all the array elements, and then show an output message counting the number of elements that are above, and the number of elements that are below the average.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results.

Week 4: Problem 2

Write a JavaScript program that allows the user to enter 10 integer values, and stores those values in an array. Then determine whether the array contains any duplicate values.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results.

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Week 4: Problem 3

A prime number is an integer greater than 1, that is only divisible by one and itself.

Devise a function that determines whether or not its parameter is prime, returning True if it is, and False otherwise. Your program must read an integer from the user and displays a message indicating whether or not it is prime.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results

Week 4: Problem 4

An online retailer provides express shipping for many of its items at a rate of R10.95 for the first item, and R2.95 for each subsequent item. Write a function that takes the number of items in the customer's order as its only parameter. Return the shipping charge for the order as the function's result. Your program must read the number of items purchased from the user and display the shipping charge.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results.

Week 4: Problem 5

Write a JavaScript function that takes the lengths of the two shorter sides of a right triangle as its parameters. Return the hypotenuse of the triangle, computed using Pythagorean theorem, as the function's result. Your program must read the lengths of the shorter sides of a right triangle from the user, use your function to compute the length of the hypotenuse, and display the result.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results.

Week 4: Problem 6

Write a JavaScript function that takes three numbers as parameters, and returns the median value of those parameters as its result. Your program must read the three values from the user and display their median.

Note: The median value is not the average – it is the *middle* of the three values when they are sorted into ascending order.

Testing:
Devise multiple test cases for your program, and carry out testing to ensure that your program delivers the expected results

APPENDIX

Subject Name	Data Science Programming Fundamentals, using JavaScript
Intake	2, 2021
Compiled by	Daniel van Deventer
Approved by	Johan Vorster
Last Updated	19 July 2021

1. Introduction

Welcome to the Software Programming Fundamentals Subject. This subject will introduce you to the process of creating and testing computer code to build solutions in order to rectify problems. You will learn the fundamental concepts of programming, using JavaScript, including the use of selection, repetition, and decision structures. You will also be introduced to writing object-oriented code.

This subject is offered to all IT Systems Development students in the Data Science Developer stream from 2 August 2021.

Use the Subject Pacer (provided in the Student Portal and as an Appendix to this document) to help you plan your studies. This will help you to stay on track to complete the subject within the planned timeframe. This schedule will also be used by the mentors when they plan workshops and/or online sessions to review content.

2. Resources

Several useful resources can be downloaded from the Student Portal:

- The Software Development Fundamentals textbook – this is the Microsoft manual
- A second textbook that introduces software testing
- Additional books as supplementary resources
- The Practical Guide (for weekly practical exercises)
- Practical Projects
- Additional resources (e.g. videos) could also be made available in the Student Portal

3. Assessments

a) Weekly practical exercises:

- This subject is presented using a problem-based approach. This ensures that students work on practical exercises and projects throughout the subject. The practical exercises to be completed each week are set out in the Practical Guide, and are compulsory. The subject mentor will discuss solutions and examples of student work during contact sessions to ensure that everyone knows how to solve the problems and can learn from their progress.

b) Practical projects:

- All students completing this subject must submit 2 integrated practical projects after completing the subject.

Appendix: Subject Pacer

Week	Weekly Class Topics	Supplementary Reading	Practical Activities
Week 1 6 – 10 Aug. 2021	Textbook: Software Development Fundamentals (Microsoft) Chapter 1. Introduction to Programming	Additional Reading: Eloquent JavaScript (Haverbeke) Chapter 2. Program Structure	Complete Week 1 Practical Exercises
Week 2 13 - 17 Aug. 2021	Chapter 1 (continued)	Chapter 3. Functions	Complete Week 2 Practical Exercises
Week 3 20 – 24 Aug. 2021	Chapter 2. Introduction to Object-Oriented Programming	Chapter 4. Data Structures: Objects and Arrays Chapter 6. The Secret Life of Objects	Complete Week 3 Practical Exercises Start working on the Practical Projects
Week 4 27 - 31 Aug. 2021	Chapter 3. Understanding General Software Development Additional Textbook: Beginners Guide to Software Testing (Padmini) Chapters 1-8 provide an introduction to software testing		Complete Week 4 Practical Exercises
After completing the classes and content for this subject, all students must complete the: • 2 Practical Projects for the subject			