Department of Career and Technology Teacher Education

UNIT PLAN

Teacher: Stephen Sabaugh Course: 12th Grade Computer Science w/ Java Date: 11/23/20

COURSE UNITS:

1. Introduction to Java and Primitive Data Types
2. Using Objects
3. Decision (If...Then...Else) Statements and Boolean Expressions
4. Iteration (Loops)
5. User Defined Classes
6. Arrays
7. Two-Dimensional Arrays
8. Inheritance
9. Search Algorithms
10. Recursion
11. File Handling (Time permitting)

UNIT TITLE: Introduction to Java and Primitive Data Types

UNIT SUMMARY AND RATIONALE:

This unit introduces students to the Java programming language and the use of classes, providing students with a firm foundation of concepts that will be leveraged and built upon in all future units. Students will focus on writing the main method and will start to call preexisting methods to produce output. Input is also a necessary part of any computer science course and will also be introduced. Students will start to learn about three built-in data types and learn how to create variables, store values, and interact with those variables using basic operations. The ability to write expressions is essential to representing the variability of the real world in a program and will be used in all future units. Primitive data is one of two categories of variables covered in this course.

NYS LEARNING STANDARD(S):

- New York State Career and Technical Education (CTE) Technology Standard 1-Analysis, Inquiry and Design Commencement: Computer Technology (1), (2), (3)
- New York State MTS Standard 5-Technology Commencement: Computer Technology (3)
- New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Basic Skills (1)

- New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Thinking Skills (2)
- New York State Career Development and Occupational Studies (CDOS) Standard 3b-Career Majors Core: Engineering/Technology (2)
- Requisite knowledge for students taking the AP Computer Science A exam.

DURATION OF UNIT: 10 periods (2 weeks)

UNIT OBJECTIVES (Aligned to prepare students for taking the College Board AP Computer Science A Exam):

1. Call System class methods to generate output to the console.
2. Identify the most appropriate data type category for a particular specification.
3. Evaluate what is stored in a variable as a result of an expression with an assignment statement.
4. Evaluate arithmetic expressions that use casting, compound operators, and decrement & increment operators

OUTLINE OF UNIT:

Lesson 1: Using Java for Object Oriented Programming

1.1. Structured programming vs. Object Oriented Programming.

1.2. How does a computer interact with a program?

1.3. What is a Java Virtual Machine and how does that make the Java language so versatile?

Lesson 2: Primitive Data Types

2.1 Variables and Constants

2.2 Primitive Data Types

3.3 Literals

Lesson 3: Using Java Statements

3.1 Expressions and Assignment Statements

3.2 Arithmetic Operators and Assignment operators.

3.3 Integer and Floating-Point Arithmetic

Lesson 4: Statement Operator Shortcuts

4.1 Compound Operators

4.2 Increment and Decrement Operators

4.3 Casting Operators

CONTENT:

Skills

- Determine the result or output based on statement execution order in a code segment without the aid of the computer
- Identify errors in a program
- Determine an appropriate program design to solve a problem or accomplish a task
- Determine the code that would be used to complete code segments
- Program, compile, debug and run programs
- Use an Integrated Development Environment (IDE) or GUI and a terminal "DOS-like" text and command line interface environment
- Apply the meaning of specific operators
- Describe the behavior of a given segment of program code
- Explain why a code segment will not compile or work as intended

Reading & Writing

- Students will read units from their textbooks and complete written assignments based on the lesson
- Students will maintain a journal with exercises given in class that employ the above skills

INSTRUCTIONAL MATERIALS/EQUIPMENT:

- Computer Lab with one workstation per student and teacher
- UNIX or Linux based operating system preferred
- Workstation with the latest version of Java SDK installed and the Eclipse IDE
- White or Blackboard
- Projector and Screen
- Network switch to prevent cheating preferred

ASSESSMENTS:

A written quiz at the end of the unit. This test will have questions that will be on the AP Computer Science A exam as well as the midterm and final. Students will have to think through problems without the aid of the computer and solve them based on what they did in class and their homework.

Graded Labs. Each lesson involves labs that the students complete in class, print out their results and turn in for grades and then save in their class folder and on their thumb drives.

Homework. Homework from the textbook involves reading a section of material from the textbook, then doing a written exercise, similar to the quizzes. These are turned in for grades and returned for the student's folder.

Journal Assignments. Students are to keep a journal of their class notes and journal assignments to be completed during class or at home. These exercises are graded throughout the unit. By the end of the course, the student will have a valuable resource of information between the student's folder and his journal that will prepare the student for taking the final, the AP Computer Science A exam as well as a good review for future college courses.

References

CollegeBoard. (2020, October 1). *AP Computer Science A Course*. AP Central. https://apcentral.collegeboard.org/courses/ap-computer-science-a/course.

McGrath, M. (2019). *Java in Easy Steps, 7th Edition* (Seventh). In Easy Steps.

NYS ED. (2011, March 17). *CTE*. NYSED. http://www.p12.nysed.gov/cte/technology/learn.html.

NYS ED. (2019). *CDOS Standards*. New York State Education Department. http://www.nysed.gov/curriculum-instruction/career-development-and-occupational-studies-cdos-standards.

Smith, J. A. (2013). *Java programs to accompany Programming logic and design* (Seventh). Course Technology, Cengage Learning.

Department of Career and Technology Teacher Education

EDU2362 SESSION7 ASSIGNMENT LESSON PLAN

Teacher: Stephen Sabaugh Class: 12th Grade Computer Science w/ Java Date: 10/19/20

UNIT: Introduction to Java and Primitive Data Types LP# 1 of 4

LESSON TOPIC: Using Java for Object Oriented Programming

NYS LEARNING STANDARD(S) ADDRESSED BY LESSON:
New York State Career and Technical Education (CTE) Technology Standard 5-Technology Commencement: Computer Technology (3),
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Thinking Skills (2)
New York State Career Development and Occupational Studies (CDOS) Standard 3b-Career Majors Core: Engineering/Technology (2)
Requisite knowledge for students taking the AP Computer Science A exam.

MOTIVATION:
Suppose you and your friends made a video game using a Windows platform, it is wildly successful, and a software company is willing to buy it, but needs you to make the game work on Mac and Linux platforms. It took you and your friends 2 years to build the game, the company rep gives you a month to make the changes. What can you do?

AIM: What makes Java and Object-Oriented Programming so popular?

INSTRUCTIONAL OBJECTIVES
Students Will Be Able To:

1) List 3 advantages of OOP over procedural programming
2) Describe Class, Object & Method
3) Write an Empty Class with a main method on paper
4) Explain what the Java Virtual Machine is and Platform Independence
5) Draw a Flow chart of the Java Development Cycle with descriptions

SPECIAL EQUIPMENT - MATERIALS – PREPARATION:
Students: Student Journal, Handout Folder
Instructor: Whiteboard, Projector, Laptop, lesson 1 notes

PRESENTATION:
Slide presentation on Object Oriented Programming

a) C family of languages
b) Procedural Programming
c) Object Oriented Programming
d) Class Method Object-Cake Recipe
e) Advantages of OOP

Computer Demonstration of Java, Environment, Basic Program Structure, etc.
White Board Overview of Key Terms and Concepts

a) Reserved or Keywords
b) Main
c) Class
d) Method
e) Parameters
f) Curley Braces
g) Java Virtual Machine
h) Java Compiler javac
i) Integrated Development Environment (IDE)

SUMMARY/EVALUATION:

1) List 3 advantages of OOP over procedural programming.
2) Describe Class, Object & Method
3) Explain Java's platform independence

IMMEDIATE APPLICATION:

- In your journal, write an empty Java class with an empty main method including all curly braces '{}'
- In your journal, draw a flow chart of the Java development cycle. Make sure you label all the steps of the process.

HOMEWORK ASSIGNMENT:
Read chapter 1.1 in textbook and do review exercises on pg. XX

Department of Career and Technology Teacher Education

EDU2362 SESSION7 ASSIGNMENT LESSON PLAN

Teacher: Stephen Sabaugh Class: 12th Grade Computer Science w/ Java Date: 10/25/20

UNIT: Introduction to Java and Primitive Data Types LP# 2 of 4

LESSON TOPIC: Primitive Data Types

NYS LEARNING STANDARD(S) ADDRESSED BY LESSON:
New York State Career and Technical Education (CTE) Technology Standard 5-Technology Commencement: Computer Technology (3),
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Thinking Skills (2)
New York State Career Development and Occupational Studies (CDOS) Standard 3b-Career Majors Core: Engineering/Technology (2)
Requisite knowledge for students taking the AP Computer Science A exam.

MOTIVATION: How do you suppose your money is stored in your bank account? What you see on your ATM screen or your bank statement is not what is inside the Bank's computers.

AIM: Why are variables what computer programming is all about?

INSTRUCTIONAL OBJECTIVES
Students Will Be Able To:

1) List 3 primitive data types
2) Name, declare & initiate variables in a program
3) Use constants and literals in their program as well as define their meaning
4) Use System.out.print and System.out.println in their program and define their function

SPECIAL EQUIPMENT - MATERIALS – PREPARATION:
Students: Student Journal, Handout Folder, computers with JDK installed, students project flash memory drive
Instructor: Whiteboard, Projector, Laptop, lesson 2 notes

PRESENTATION:
White Board Overview of Key Terms and Concepts

a) Computer memory
b) Integer
c) Float
d) Double
e) Bool
f) Declaring Variables
g) Defining Constants
h) Literals
i) Explanation of System.out.print()
j) arguments

Computer Demonstration

a) Declare variables
b) Initiate variables
c) Demonstrate naming conventions and casing
d) Illustrate literals
e) Demonstrate constants
f) Simple expression statement
g) Introduce and demonstrate overloaded operator '+' as addition and concatenation operator
h) Outputting results
i) Compiling
j) debugging

SUMMARY/EVALUATION:

1) What is data?
2) Why are variables so important to programming and why do we initiate variables only sometimes?
3) Define the function of System.out.print and System.out.println
4) Why is it useful to use a constant in your program?

IMMEDIATE APPLICATION:

- After the students have successfully compiled the demonstration program, ran it, printed the code and output for their folders, keep changing the values of variables and constants.
- Change string literals.
- Experiment.
- I will go around the room helping students and giving students who are progressing new challenges

HOMEWORK ASSIGNMENT:

Read chapter 1.2 in textbook and do review exercises on pg. XX

Department of Career and Technology Teacher Education

EDU2362 SESSION8 ASSIGNMENT LESSON PLAN

Teacher: Stephen Sabaugh Class: 12th Grade Computer Science w/ Java Date: 10/19/20

UNIT: Introduction to Java and Primitive Data Types LP# 3 of 4

LESSON TOPIC: Using Java Statements

NYS LEARNING STANDARD(S) ADDRESSED BY LESSON:
New York State Career and Technical Education (CTE) Technology Standard 1-Analysis, Inquiry and Design Commencement: Computer Technology (1), (2), (3)
New York State Career and Technical Education (CTE) Technology Standard 5-Technology Commencement: Computer Technology (3)
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Basic Skills (1)
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Thinking Skills (2)
New York State Career Development and Occupational Studies (CDOS) Standard 3b-Career Majors Core: Engineering/Technology (2)
Requisite knowledge for students taking the AP Computer Science A exam.

MOTIVATION:
I'm sure one of your relatives cooks a dish that you absolutely love, no? It might seem like they have a special power, but it is not magic. They follow a set of instructions one step or instruction at a time very well. This sequence is the same thing a computer does and like your relative, it too has no special power other than following a set of instructions perfectly or in our case today, these instructions are called statements and followed by the computer one line at a time. The best way to learn this concept is to see it in action. I'll demonstrate by writing some statements in Java while you follow along on your computers and you'll see just how easy it can be for a program to follow the same instruction with different variables perfectly, every time it is run if written correctly.

AIM: How can I make a statement in my programming?

INSTRUCTIONAL OBJECTIVES
Students Will Be Able To:

1) Navigate an Integrated Developing Environment (IDE)
2) Use primary arithmetic operators +, -, *, /, % (modulus)
3) Describe integer division vs floating point
4) Describe what an "in-line" means in regard to statements

SPECIAL EQUIPMENT - MATERIALS – PREPARATION:
Students: Student Journal, Handout Folder, computers with JDK and Eclipse IDE installed, students project flash memory drive

Instructor: Whiteboard, Projector, Laptop, lesson 3 notes, Handout of source code to be handed out after lesson for student's folders

PRESENTATION:
Computer Demonstration of Java statements and the Eclipse IDE

a) Open the Eclipse IDE
   i) File>New>Java Project
   ii) Name Project "Statements" and click radio button to make project file the root folder>Finish
b) Demonstrate the most important features of IDE for the lesson
c) Import JOptionPane library and do a quick GUI i/o demo
   i) Compile and run ask questions
   ii) Explain commenting then comment it out the code
d) 2 hard coded operand variables and answer variable
   i) Demonstrate = means assignment operator
   ii) Try a few operators and operand and run code
   iii) Demonstrate floor or integer division with integer variables. Run code.
   iv) Change operand variables to float. Run code.
   v) Change operand variables to double. Run code.
   vi) Show in line formula use without answer variable
   vii) Ask questions.
f) Demonstrate F°>C° formula
   i) Make a weather report for the week with fake data for Monday through Sunday, instead of writing the formula 7 times, there is an easier "method"
e) Demonstrate writing a method
   i) Explain what a parameter is and how it relates to arguments
   ii) Construct weather report with GUI and console output
   iii) Use in line method calls and statement method calls
   iv) Make intentional mistakes to demonstrate the Java debugging process and explain how to read errors

SUMMARY/EVALUATION:

1) Before writing a single line of code, what are the steps to set up a new program in the Eclipse IDE for our class? Which GUI button runs and your program?
2) What does the modulus '%' operator do and why is it so useful in programming?
3) What is the difference between inter and floating-point arithmetic?
4) What does "in line" mean in regard to statements?

IMMEDIATE APPLICATION:

- Make sure the demonstration program works for you and the project file is saved in your flash drive.
- Add an extra method to this program to convert F° to K°. Research the formula. Add a 3rd column to your weather report.
- In your journal, write the source code to make a chart converting KPH to MPH. Create a KPH to MPH method. Start from 0 KPH to 200 KPH and skip by 20 (0, 20, 40, etc.) If you have time, try running the code.

HOMEWORK ASSIGNMENT:
Read chapter 1.3 in textbook and do review exercises on pg. XX

Department of Career and Technology Teacher Education

EDU2362 SESSION8 ASSIGNMENT LESSON PLAN

Teacher: Stephen Sabaugh Class: 12th Grade Computer Science w/ Java Date: 10/23/20

UNIT: Introduction to Java and Primitive Data Types LP# 4 of 4

LESSON TOPIC: Statement Operator Shortcuts

NYS LEARNING STANDARD(S) ADDRESSED BY LESSON:
New York State Career and Technical Education (CTE) Technology Standard 1-Analysis, Inquiry and Design Commencement: Computer Technology (1), (2), (3)
New York State Career and Technical Education (CTE) Technology Standard 5-Technology Commencement: Computer Technology (3)
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Basic Skills (1)
New York State Career Development and Occupational Studies (CDOS) Standard 3a-Universal Foundation Skills Commencement: Thinking Skills (2)
New York State Career Development and Occupational Studies (CDOS) Standard 3b-Career Majors Core: Engineering/Technology (2)
Requisite knowledge for students taking the AP Computer Science A exam.

MOTIVATION:
Do you like to use keyboard shortcuts on your computer? How many of you use copy and paste as much as you can get away with? Be honest. What would you think if I encouraged you to use shortcuts in your code because it looks neater, more professional and best of all it is faster to type.

AIM: How can we make our code look neater and type our code faster? LESS CODE!!

INSTRUCTIONAL OBJECTIVES:
Students Will Be Able To:

1. Use and define compound Assignment operators in their code (+=, -=, *=, /=).
2. Use and define increment and decrement operators in their code (++, --).
3. Define the term post-fix notation, in-fix notation and pre-fix notation (AB+, A+B, +AB).
4. Be able to cast an integer variable to a type double ((double)intNum).

SPECIAL EQUIPMENT - MATERIALS – PREPARATION:
Students: Student Journal, Handout Folder, computers with JDK and Eclipse IDE installed, students project flash memory drive

Instructor: Whiteboard, Projector, Laptop, lesson 4 notes

PRESENTATION:
White Board Overview of Key Terms and Concepts

a) Compound Operators
b) +=, -=, *=, /=

c) [new value of variable] = [old value of variable] + [a value] can be written as [new value of variable] += [a value] e.g., intNum = intNum + 5 can be written as intNum += 5
d) You will see later in this course that there is several times where you will need to add or subtract 1 from a variable. Instead of intNum = intNum + 1 or even intNum += 1 we can simply write intNum++ and intNum—to subtract one
e) Post-fix notation intNum++ Pre-fix ++intNum both will add 1 but, in some applications, will yield different results.
f) Post-fix notation, in-fix notation and pre-fix notation (+AB, A+B, AB+)
g) The casting operators (int) and (double) can be used to create a temporary value converted to a different data type. This can useful if you need to perform floating point division on an integer, or integer division on a float.

SUMMARY/EVALUATION:

1. Define compound Assignment operators?
2. Define increment and decrement operators?
3. Define the term post-fix notation, in-fix notation and pre-fix notation?
4. What is a casting operator and how is it a useful shortcut?

IMMEDIATE APPLICATION:

- Open the project file from the previous lesson and change all of the math statements using the compound operators we learned out today.
- Change all the Double variables to int variables then use the casting operator (double) to do floating point division.
- Declare a variable as type char and initialize as ‘a’ then use the increment operator (++) and watch what happens.

HOMEWORK ASSIGNMENT:

Read chapter 1.4 in textbook and do review exercises on pg. XX