

Methods and Final Review Lab

[No Submission]



CSE110: Programming Language I

You must not hard code any of the tasks, which means your code should work for any valid user input.

Methods

1. [A,B,C,D should be written in a single java file]

- A. Write a method called **evenChecker** that takes an **integer** number as its argument and prints whether the number is even or odd **inside the method**.

Sample Method Call	Sample Output
<code>evenChecker(10);</code>	Even!!
<code>evenChecker(17);</code>	Odd!!

- B. Write a method called **isEven** that takes an **integer** number as an argument and **returns** boolean true if the number is even otherwise **returns** boolean false.

Sample Method Call	Sample Output
<code>boolean result = isEven(10); System.out.println(result);</code>	true
<code>boolean result = isEven(17); System.out.println(result);</code>	false

- C. Write a method called **isPos** that takes an **integer** number as an argument and **returns** boolean true if the number is positive otherwise **returns** boolean false.

Sample Method Call	Sample Output
<code>boolean result = isPos(-5); System.out.println(result);</code>	false
<code>boolean result = isPos(12); System.out.println(result);</code>	true

- D.** Write a method called **sequence()** that takes an **integer** in its parameter called **n**. Now, if **n** is **positive** then it prints all the **even** numbers from **0** to **n**, otherwise if **n** is **negative** it prints all the **odd** numbers from **n** to **-1**.

Note: **You must call** the methods from **CW-1B** and **CW-1C**, otherwise this task would be **considered invalid**.

Sample Method Call	Sample Output	Explanation
<code>sequence(10);</code>	0 2 4 6 8 10	Here, 10 is positive so 0,2,4,6,8,10 were printed.
<code>sequence(-7);</code>	-7 -5 -3 -1	Here, -7 is negative so -7,-5,-3,-1 were printed.
<code>sequence(7);</code>	0 2 4 6	Here, 7 is positive so 0,2,4,6 were printed
<code>sequence(-8);</code>	-7 -5 -3 -1	Here, -8 is negative so -7,-5,-3,-1 were printed.

2. [A,B,C should be written in a single java file]

- A.** Write a method called **circleArea** that takes an **integer** radius in its parameter and **returns** the **area** of the circle.

Note: area of a circle is πr^2

Sample Method Call	Sample Output
<code>double area = circleArea(5); System.out.println(area);</code>	78.5398

- B. Write a method called **sphereVolume** that takes an **integer** radius in its parameter and **returns** the **volume** of the sphere.

Note: volume of a sphere is $\frac{4}{3}\pi r^3$

Sample Method Call	Sample Output
<pre>double volume = sphereVolume(5); System.out.println(volume);</pre>	523.5987

- C. Write a method called **findSpace** that takes two values in its parameters one is an **integer** diameter and another one is a String. Using the given diameter, this method should calculate the Area of a circle or the Volume of a sphere depending on the value of the second parameter. Finally, it should print the result **inside the method**.

Note: **You must call** the method written in task **CW-2A & CW-2B**, otherwise this task would be **considered invalid**.

Sample Method Call	Sample Output
<pre>findSpace(10,"circle");</pre>	78.5398
<pre>findSpace(5,"sphere");</pre>	33.5103
<pre>findSpace(10,"square");</pre>	"Wrong Parameter"

3. Write a method called **isPrime** which takes an integer in its parameter to check whether a number is prime or not. If the number is prime then the method returns boolean **true** otherwise it returns boolean **false**.

Sample Input	Sample Output
<pre>boolean check = isPrime(7); System.out.println(check);</pre>	true

<code>boolean check = isPrime(15); System.out.println(check);</code>	false
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4. Write a method called **isPerfect** which takes an integer in its parameter to check whether a number is perfect or not. If the number is perfect then the method returns boolean **true** otherwise it returns boolean **false**.

Sample Input	Sample Output
<code>boolean check = isPerfect(6); System.out.println(check);</code>	true
<code>boolean check = isPerfect(33); System.out.println(check);</code>	false

5. Write a method called **calcTax** that takes 2 arguments which are **your age** then **your salary**. The method must calculate and **return** the tax as per the following conditions:

- No tax if you are less than 18 years old.
- No tax if you get paid less than 10,000
- 7% tax if you get paid between 10K and 20K
- 14% tax if you get paid more than 20K

Sample Method Call	Output	Explanation
<code>double t = calcTax(16,20000); System.out.println(t);</code>	0.0	Here, the age is less than 18 so 0 tax.
<code>double t = calcTax(20,18000); System.out.println(t);</code>	1260.0	Here, the age is greater than 18 and income is between 10K-20K so tax is 7% of 18000 = 1260.

Practice Problems

Strings

Task 1

Trace the following code and write the outputs.

public class Trace01{
public static void main(String[] args) {
String course = "";
int i = 2, j = 0, k = 18;
course = "-->cse";
while (i< 5) {
k--;
j = k;
while (j > 12) {
if (j % 2 != 0) {
course += "<--";
course = course + i + (j / 2);
} else {
course += "-->";
course = course + (i % 2) + j;
}
System.out.println(course);
if (j == 14) {
course = "-->cse";
}
--j;
}
i++;
}
}
}

Task 2

Write a method **modifyStrings()** that takes in three given strings **S**, **S1**, and **S2** consisting of different numbers of characters respectively, the task is to modify the string **S** by **replacing** all the **substrings S1** with the **string S2** in the string **S** and printing the modified string **S**.

Sample Input	Sample Output	Explanation
S = "abababa" S1 = "aba" S2 = "a" modifyStrings(S, S1, S2);	aba	Changing the substrings S[0, 2] (Referring to characters from the 0th index of S till the 2nd index of S and S[4, 6] (= S1) to the string S2 (= "a") modifies the string S to "aba". Therefore, print "aba".
S = "baddadda" S1 = "dd" S2 = "n" modifyStrings(S, S1, S2);	banana	Changing the substrings S[2,3] (Referring to characters from the 2nd and 3rd index of S) and S[5, 6] (= S1) to the string S2 (= "n") modifies the string S to "banana". Therefore, print "banana".

Strings + Arrays

Task 3

Given an array of email addresses, print the number of valid email addresses satisfying the following conditions.

- Each email contains an '@' character
- There is at least one character before and after '@' character and it has to start with letter
- There is a '.' character after the character(s) after '@' character
- There is at least one character after '.' character

Sample Input	Sample Output
email_list = {"abc@gmail.com", "!@cv.bd", "123cse@bracu.ac.bd"}	1
email_list = {"cse110@gmail.com", "government@cv.", "eee@bracu.ac.bd"}	2

Strings + Methods

Task 4

Write a method called `isHappyNumber` which takes an integer in its parameter to check whether a number is a happy number or not. If the number is a happy number then the method returns boolean `true` otherwise it returns boolean `false`. In number theory, a happy number is a number which eventually reaches 1 when replaced by the sum of the square of each digit. For instance, 13 is a happy number because $1^2 + 3^2 = 10$ and $1^2 + 0^2 = 1$. On the other hand, 4 is not a happy number because the process continues in an infinite cycle without ever reaching 1. Unhappy number ends in a cycle of repeating numbers which contains 4 .

Sample Input	Sample Output
<code>boolean check = isHappyNumber(82)</code> <code>System.out.println(check)</code>	<code>true</code>
<code>boolean check = isHappyNumber(4)</code> <code>System.out.println(check)</code>	<code>false</code>

Task 5

Write a method called `toDecimal` which takes a binary number as a string in its parameter to convert the binary number to its decimal number and return the decimal value. After returning the decimal value, write another method called `toHex` which takes the converted decimal value in its parameter and calculates the hexadecimal value and then return the hex value.

Sample Input	Sample Output
<code>int decimal = toDecimal("1010")</code> <code>String hex = toHex(decimal)</code> <code>System.out.println(hex)</code>	<code>"A"</code>

Arrays

Task 6

Trace the following code and write the outputs.

class Trace02 {
public static void main(String args[]) {
int[] arr1 = {3, 1, 4, 1, 5, 9, 2};
int[] arr2 = {10, 20, 30, 40, 50, 60, 70};
int x = 0, y = 0;
while (x < arr1.length - 1) {
arr2[x] = arr1[y] * (x + 1) - arr2[y];
y = 1;
while (y <= x) {
arr2[x] = arr2[x] + arr1[y] - y;
y = y + 1;
}
System.out.println(arr2[x]);
x = x + 1;
}
System.out.println(arr2[arr1.length - 1]);
}
}

Task 7

You are given an integer array. You need to identify all the **prime numbers** and **perfect numbers** within the array and print the **indices** along with these **numbers** from the original array.

Sample Input	Sample Output
Sample Input: int arr[] = {6, 13, 28, 17, 3, 9, 11, 23, 10, 29, 12, 7}	Prime Numbers: 1: 13 3: 17 4: 3 6: 11

	7: 23 9: 29 11: 7 Perfect Numbers: 0: 6 2: 28
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Task 8

Trace the following code and write the outputs.

public class tracing1 {
public static void main(String[] args){
int i = 1;
int [] a = {5,6,7,8,9};
while (i <= 5){
int j = a[i%a.length];
while (j > 1){
System.out.print(j--);
if (j == 2)
break;
}
System.out.println("****");
++i;
}
double x = 7;
double y = 8;
double z = 9;
System.out.println(x < y y > z);
System.out.println(x < y && y > z);
System.out.println(x < y);
System.out.println(x + y < z);
System.out.println((x + y)-6 < z);
}
}

Task 9

Your professor expects only As, Bs, and Cs. In the following program, write a method called **getScores** that takes as input corresponding arrays **studentGrades** and **studentScores**. Write a method called **getScores** that assigns **index i** in **studentGrades** based on **index i** in **studentScores**. If a grade is **A**, assign **100**. If a grade is **B**, assign **90**. If a grade is **C**, assign **70**. If a grade is anything else, assign **0**.

Sample Input	Sample Output
<pre>char[] studentGrades = new char[]{'A', 'A', 'A', 'B', 'C', 'U', 'Z'}; int[] studentScores = new int[7];</pre>	<pre>Output expectation: 100 100 100 90 70 0 0</pre>

Arrays + Methods

Task 10

A. Write a method called **convertToCm()**, that takes as input a **type double** and **returns** the value converted from inches to centimeters.

Hint: There are 2.54 centimeters in an inch

Sample Method Call	Output
<pre>double t = convertToCm(16); System.out.println(t + " cm");</pre>	40.64 cm

B. Create an **array** of **type double** of length **5** called **cheetos_inches**, that stores the length of each of the Cheetos **from the user**. Send the array of length in inches into a method called **findAvgCm()** that **returns** the average length of the Cheetos **in cm to 2 decimal places**. The method **findAvgCm()** uses **convertToCm()** to convert the length of each Cheetos **from inches to cm**.

Note: You must call the method written in [Method Task A], otherwise this task would be considered invalid.

Sample Method Call	Output
<pre>Sample array: double [] cheetos_inches = new double[]{10.0, 12.0, 14.0, 16.0, 18.0}; averageLength = findAvgCm(cheetos_inches); System.out.println("The average Cheeto length is "+ averageLength + " cm");</pre>	The average Cheeto length is 35.56 cm

Arrays + Strings + Methods

Task 11

A. Write a method called **isVowel** which takes a string in its parameter and counts all the vowels in the String. If any vowel exists in the string then the method returns the **count**.

Sample Input	Sample Output
The quick brown fox jumps over the lazy dog	Number of vowels in the string: 11

B. Write a method called **isConsonant** which takes a string in its parameter and counts all the consonants in the String. If any consonant exists in the string then the method returns the **count**.

Sample Input	Sample Output
The quick brown fox jumps over the lazy dog	Number of consonants in the string: 24

C. Write a method called **vowel/consonantSum** which takes an array of strings in its parameter and returns the summation of the number of vowels/consonants.

Note: **You must call** the methods written in tasks A/B, otherwise this task will be **considered invalid**.

Given Array	Sample Output
<pre>String [] names = {"Bob", "Alice", "Max", "Marry", "Rosy"}; System.out.println("The total number of vowels in the array is:" + vowelSum(names)); System.out.println("The total number of consonants in the array is:" + consonantSum(names));</pre>	<p>The total number of vowels in the array is: 7</p> <p>The total number of consonants in the array is: 13</p>