Christopher Bussen

CPS 150 02 – Algorithms and Programming 1

Assignment 3

10/26/20

**Problem 1.1**

if(b1 && b2){

**Problem 1.2**

if(b1 || b2){

**Problem 1.3**

if(b1 && !b2){

**Problem 1.4**

if(!b1 && b2){

**Problem 1.5**

if(b1 || !b2){

**Problem 1.6**

if(b1 || !b2){ ------- same question as 1.5

**Problem 1.7**

if(!b1 || b2){

**Problem 1.8**

if(!(b1 || b2)){

**Problem 1.9**

if((b1 && !b2) || (!b1 && b2)){

**Problem 2.1 – R3.1**

1. n=1, k=2, r=1
2. n=1, k=2, r=2
3. n=1, k=1, r=2
4. n=1, k=8, r=3

**Problem 2.2 – R3.3**

1. The word then is not a valid part of an if statement in Java – the then should be replaced with a bracket and another bracket should be added after the print statement. Additionally, the parentheses are missing around the condition for the if statement.
2. Calculations should not be done on the left side of the condition in if statements – x should be assigned the value 1+x outside of the if statement.
3. The operator == should be used to test for equality, not =.
4. The x=in.nextInt should be inside the true branch of the if statement because the entire point of the if statement is to make sure the user enters an int and to prevent an error if they don’t. However, if it is outside of the if statement and the user does not enter an int, it will cause a run-time error rather than running through the false branch of the if statement.
5. Because all of the if statements are independent of each other, letterGrade will be assigned the value of the most recent if loop it goes through. For example, if grade = 92, letterGrade will initially be assigned the value A, but then it will run through the rest of the if statements as 92 is greater than 80, 70, and 60, and letterGrade will end up assigned the value D. To fix this, the first statement should be an if statement and the rest should be else if statements.

**Problem 2.3 – R3.12**

10-12 and 11-13:

s=11, e=12, The appointments overlap

10-11 and 12-13:

s=12, e=11, The appointments don’t overlap

**Problem 2.4 – R3.27**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | r | (p && q) || !r | !(p && (q || !r)) |
| FALSE | FALSE | FALSE | TRUE | TRUE |
| FALSE | FALSE | TRUE | FALSE | TRUE |
| FALSE | TRUE | FALSE | TRUE | TRUE |
| TRUE | FALSE | FALSE | TRUE | FALSE |
| FALSE | TRUE | TRUE | FALSE | TRUE |
| TRUE | FALSE | TRUE | FALSE | TRUE |
| TRUE | TRUE | FALSE | TRUE | FALSE |
| TRUE | TRUE | TRUE | TRUE | FALSE |

**Problem 2.5 – E3.7**

Running Screenshot:

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Code:

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IntegersInOrder: number number number; string

program takes in 3 integers from the user and determines if the integers

are in either ascending or descending order as they were entered

ex1: user inputs 1, 2, 5 - programs outputs in order

ex2: user inputs 1, 5, 2 - program outputs not in order

ex3: user inputs 5, 2, -1 - program outputs in order

ex4: user inputs 1, 2, 2 - program outputs in order

ex5: user inputs 1, 2, x - program outputs error

ex6: user inputs 2.1, 3.1, 4.1 - program outputs error

\*/

import java.util.Scanner;

public class IntegersInOrder {

public static void main(String[] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt the user to enter 3 integers and declare int variables for them

System.out.print("Please enter 3 integers (separate with a space): ");

int int1 = input.nextInt();

int int2 = input.nextInt();

int int3 = input.nextInt();

//use if statements to check if numbers are in ascending or descending order

if(int1 >= int2 && int2 >= int3){

System.out.println("in order");

}

else if(int1 <= int2 && int2 <= int3){

System.out.println("in order");

}

else{

System.out.println("not in order");

}

}

}

**Problem 2.6 – E3.18**

Running Screenshot:

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Code:

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DaysInMonth: number; string

program takes in an integer corresponding to a month and determines/prints

how many days are in that given month

ex1: user inputs 1 - programs outputs There are 31 days in the given month

ex2: user inputs 2 - program outputs There are either 28 or 29 days in the given month

ex3: user inputs 9 - program outputs There are 30 days in the given month

ex4: user inputs 13 - program outputs Please enter an integer between 1 and 12

ex5: user inputs 1.6 - program outputs error

ex6: user inputs x - program outputs error

\*/

import java.util.Scanner;

public class DaysInMonth {

public static void main(String [] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter a number for a given number and declare an int variable for the value

System.out.print("Please enter month number (1 for January, 2 for February, etc.): ");

int month = input.nextInt();

//use if statements to see how many days will be in given month

if(month == 1 || month == 3 || month == 5 || month == 7 || month == 8 || month == 10 || month == 12){

System.out.println("There are 31 days in the given month");

}

else if(month == 4 || month == 6 || month == 9 || month == 11){

System.out.println("There are 30 days in the given month");

}

else if(month == 2){

System.out.println("There are either 28 or 29 days in the given month");

}

else{

System.out.println("Please enter an integer between 1 and 12");

}

}

}

**Problem 2.7 – P3.7**

Running Screenshot:

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Code:

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Assignment 3

OriginalUSIncomeTax: number; number

program takes in a value for the user's yearly income and calculates/prints

their total amount of taxes based on the original US income tax system

ex1: user inputs 30000 - programs outputs 300.0

ex2: user inputs 72000 - program outputs 940.0

ex3: user inputs 99000 - program outputs 1720.0

ex4: user inputs 131567 - program outputs 3012.68

ex5: user inputs 269000 - program outputs 8700.0

ex6: user inputs 512120.9 - program outputs 20977.254

ex7: user inputs cookie - program outputs error

\*/

import java.util.Scanner;

public class OriginalUSIncomeTax {

public static void main(String[] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter their yearly income and declare a double variable for this value

System.out.print("Please enter your yearly income: $");

double yearlyIncome = input.nextDouble();

//declare final double variables for tax rates and tax limits

final double RATE1 = 0.01;

final double RATE2 = 0.02;

final double RATE3 = 0.03;

final double RATE4 = 0.04;

final double RATE5 = 0.05;

final double RATE6 = 0.06;

final double RATE1\_LIMIT = 50000;

final double RATE2\_LIMIT = 75000;

final double RATE3\_LIMIT = 100000;

final double RATE4\_LIMIT = 250000;

final double RATE5\_LIMIT = 500000;

//declare double variable for total tax in each bracket

double tax1 = 0;

double tax2 = 0;

double tax3 = 0;

double tax4 = 0;

double tax5 = 0;

double tax6 = 0;

//use if statements to calculate taxes for different incomes

if(yearlyIncome <= RATE1\_LIMIT){

tax1 = yearlyIncome \* RATE1;

}

else if(yearlyIncome <= RATE2\_LIMIT){

tax1 = RATE1\_LIMIT \* RATE1;

tax2 = (yearlyIncome - RATE1\_LIMIT) \* RATE2;

}

else if(yearlyIncome <= RATE3\_LIMIT){

tax1 = RATE1\_LIMIT \* RATE1;

tax2 = (RATE2\_LIMIT - RATE1\_LIMIT) \* RATE2;

tax3 = (yearlyIncome - RATE2\_LIMIT) \* RATE3;

}

else if(yearlyIncome <= RATE4\_LIMIT){

tax1 = RATE1\_LIMIT \* RATE1;

tax2 = (RATE2\_LIMIT - RATE1\_LIMIT) \* RATE2;

tax3 = (RATE3\_LIMIT - RATE2\_LIMIT) \* RATE3;

tax4 = (yearlyIncome - RATE3\_LIMIT) \* RATE4;

}

else if(yearlyIncome <= RATE5\_LIMIT){

tax1 = RATE1\_LIMIT \* RATE1;

tax2 = (RATE2\_LIMIT - RATE1\_LIMIT) \* RATE2;

tax3 = (RATE3\_LIMIT - RATE2\_LIMIT) \* RATE3;

tax4 = (RATE4\_LIMIT - RATE3\_LIMIT) \* RATE4;

tax5 = (yearlyIncome - RATE4\_LIMIT) \* RATE5;

}

else{

tax1 = RATE1\_LIMIT \* RATE1;

tax2 = (RATE2\_LIMIT - RATE1\_LIMIT) \* RATE2;

tax3 = (RATE3\_LIMIT - RATE2\_LIMIT) \* RATE3;

tax4 = (RATE4\_LIMIT - RATE3\_LIMIT) \* RATE4;

tax5 = (RATE5\_LIMIT - RATE4\_LIMIT) \* RATE5;

tax6 = (yearlyIncome - RATE5\_LIMIT) \* RATE6;

}

//calculate total tax - sum of all taxes

double totalTax = tax1 + tax2 + tax3 + tax4 + tax5 + tax6;

//print total tax

System.out.println("Your total tax will be $" + totalTax);

}

}

**Problem 2.8 – P3.26**

Running Screenshot:

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Code:

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Assignment 3

ResistorTemperature: number; number

program takes in a value for the voltmeter voltage in a resistor and

calculates/prints out the gas temperature in degrees C when the voltage

is between 12 and 18 - prints an error when it isn't

T = (Rs/k) \* (Vm/(Vs-Vm)) - (Ro/k)

ex1: user inputs 12 - programs outputs 25.0

ex2: user inputs 13.2 - program outputs 91.176

ex3: user inputs 18 - program outputs 1150.0

ex4: user inputs 11 - program outputs Voltmeter voltage must be between 12 and 18

ex5: user inputs x - program outputs error

\*/

import java.util.Scanner;

public class ResistorTemperature {

public static void main(String[] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter a value for voltmeter voltage and declare a double variable for the value

System.out.print("Please enter the voltmeter voltage value: ");

double voltmeterVoltage = input.nextDouble();

//declare variables for Rs, k, Vs, and R0

int Rs = 75;

double k = 0.5;

int Vs = 20;

int R0 = 100;

//declare variable for temperature

double temperature;

//use if statement to check if voltmeter voltage is within the correct range of values

if(voltmeterVoltage >= 12 && voltmeterVoltage <= 18){

temperature = (Rs \* voltmeterVoltage) / (k \* (Vs - voltmeterVoltage)) - (R0 / k);

System.out.println("The temperature is " + temperature + " degrees Celsius");

}

else{

System.out.println("Voltmeter voltage must be between 12 and 18");

}

}

}

**Problem 3.a. Algorithm**

1. Start the program
2. Import the scanner
3. Prompt the user to enter 3 numbers
4. Declare double variables for each of the 3 input numbers
5. Create a separate method to check if all 3 numbers are the same – method should take in 3 doubles
6. Declare a boolean variable that will be set to true if the numbers are equal and false if the numbers aren’t equal
7. Use if statement to check if the 3 numbers are all equal – if so, set boolean variable to true, otherwise set it to false
8. Print the value of the boolean variable
9. End the method that checks if all numbers are equal
10. Call the method that checks if all numbers are equal in the main method using the user’s 3 numbers as inputs for the method
11. End the main method
12. End the program

**Problem 3.a. Running Screenshot**

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**Problem 3.a. Code**

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Assignment 3

AllTheSameDoubles: number number number; boolean

program takes in 3 doubles from the user and checks to see if

they are all equal - returns true if they are, false if they

aren't

ex1: user inputs 12, 12, 12 - programs outputs true

ex2: user inputs 100.2, 100.2 100.2 - program outputs true

ex3: user inputs 9, 3, 7 - program outputs false

ex4: user inputs 11, -4, 11 - program outputs false

ex5: user inputs x, y, z - program outputs error

\*/

import java.util.Scanner;

public class AllTheSameDoubles {

public static void main(String [] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter 3 numbers and declare double variables for each

System.out.print("Please enter 3 numbers: ");

double num1 = input.nextDouble();

double num2 = input.nextDouble();

double num3 = input.nextDouble();

//call AllTheSame method to check if all numbers are the same

AllTheSame(num1, num2, num3);

}

//create method to check if all 3 numbers are the same

public static void AllTheSame(double x, double y, double z){

//declare boolean variable for when all numbers are the same

boolean same;

//use if statement to check if all numbers are the same

if(x == y && y ==z){

same = true;

}

else{

same = false;

}

//print the value of the boolean variable same

System.out.println(same);

}

}

**Problem 3.b. Algorithm**

1. Start the program
2. Import the scanner
3. Prompt the user to enter 3 numbers
4. Declare double variables for each of the 3 input numbers
5. Create a separate method to check if all 3 numbers are different – method should take in 3 doubles
6. Declare a boolean variable that will be set to true if the numbers are different and false if the numbers aren’t all different
7. Use if statement to check if the 3 numbers are all different – if so, set boolean variable to true, otherwise set it to false
8. Print the value of the boolean variable
9. End the method that checks if all numbers are different
10. Call the method that checks if all numbers are different in the main method using the user’s 3 numbers as inputs for the method
11. End the main method
12. End the program

**Problem 3.b. Running Screenshot**

**Text

Description automatically generated**

**Problem 3.b. Code**

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Assignment 3

AllDifferentDoubles: number number number; boolean

program takes in 3 doubles from the user and checks to see if

they are all different - returns true if they are, false if they

aren't

ex1: user inputs 12, 12, 12 - programs outputs false

ex2: user inputs 100.2, 100.2 100.2 - program outputs false

ex3: user inputs 9, 3, 7 - program outputs true

ex4: user inputs 11, -4, 11 - program outputs false

ex5: user inputs x, y, z - program outputs error

ex6: user inputs 32.4, 14, 8 - program outputs true

\*/

import java.util.Scanner;

public class AllDifferentDoubles {

public static void main(String [] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter 3 numbers and declare double variables for each

System.out.print("Please enter 3 numbers: ");

double num1 = input.nextDouble();

double num2 = input.nextDouble();

double num3 = input.nextDouble();

//call AllDifferent method to check if all numbers are the same

AllDifferent(num1, num2, num3);

}

//create method to check if all 3 numbers are different

public static void AllDifferent(double x, double y, double z){

//declare boolean variable for when all numbers are different

boolean different;

//use if statement to check if all numbers are different

if(x != y && y !=z && x != z){

different = true;

}

else{

different = false;

}

//print the value of the boolean variable different

System.out.println(different);

}

}

**Problem 3.c. Algorithm**

1. Start the program
2. Import the scanner
3. Prompt the user to enter 3 numbers
4. Declare double variables for each of the 3 input numbers
5. Create a separate method to check if the 3 numbers are sorted from smallest to largest – method should take in 3 doubles
6. Declare a boolean variable that will be set to true if the numbers are sorted from smallest to largest and false if the numbers aren’t
7. Use if statement to check if the 3 numbers are sorted from smallest to largest – if so, set boolean variable to true, otherwise set it to false
8. Print the value of the boolean variable
9. End the method that checks if all numbers are sorted from smallest to largest
10. Call the method that checks if all numbers are sorted from smallest to largest in the main method using the user’s 3 numbers as inputs for the method
11. End the main method
12. End the program

**Problem 3.c. Running Screenshot Text

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**Problem 3.c. Code**

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Assignment 3

SortedDoubles: number number number; boolean

program takes in 3 doubles from the user and checks to see if

they are sorted from smallest to largest - returns true if they

are, false if they aren't

ex1: user inputs 12, 12, 12 - programs outputs true

ex2: user inputs 100.2, 100.3 100.4 - program outputs true

ex3: user inputs 9, 3, 7 - program outputs false

ex4: user inputs 11, -4, -7 - program outputs false

ex5: user inputs x, y, z - program outputs error

ex6: user inputs 32.4, 39, 39 - program outputs true

\*/

import java.util.Scanner;

public class SortedDoubles {

public static void main(String [] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter 3 numbers and declare double variables for each

System.out.print("Please enter 3 numbers: ");

double num1 = input.nextDouble();

double num2 = input.nextDouble();

double num3 = input.nextDouble();

//call Sorted method to check if all numbers are the same

Sorted(num1, num2, num3);

}

//create method to check if 3 numbers are sorted from smallest to largest

public static void Sorted(double x, double y, double z){

//declare boolean variable for when all numbers are sorted from smallest to largest

boolean smallestToLargest;

//use if statement to check if all numbers are sorted from smallest to largest

if(x <= y && y <= z){

smallestToLargest = true;

}

else{

smallestToLargest = false;

}

//print the value of the boolean variable smallestToLargest

System.out.println(smallestToLargest);

}

}

**Problem 3.d. Algorithm**

1. Start the program
2. Import the scanner
3. Prompt the user to enter 3 numbers
4. Declare double variables for each of the 3 input numbers
5. Create a separate method to find the smallest of the 3 numbers – should take 3 doubles as inputs
6. Declare a double variable for the smallest number
7. Use if statements to determine the smallest of the 3 numbers
8. Print the smallest number
9. End the method that finds the smallest number
10. Call the method that finds the smallest number in the main method using the user’s 3 numbers as inputs for the method
11. End the main method
12. End the program

**Problem 3.d. Running Screenshot**

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**Problem 3.d. Code**

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Assignment 3

SmallestOfDoubles: number number number; number

program takes in 3 doubles from the user and determines/prints

which out which one is the smallest

ex1: user inputs 12, 12, 12 - programs outputs 12.0

ex2: user inputs 100.2, 100.3 100.4 - program outputs 100.2

ex3: user inputs 9, 3, 7 - program outputs 3.0

ex4: user inputs 11, -4, -7 - program outputs -7.0

ex5: user inputs x, y, z - program outputs error

ex6: user inputs 32.4, 32.4, 39 - program outputs 32.4

\*/

import java.util.Scanner;

public class SmallestOfDoubles {

public static void main(String [] args){

//import scanner

Scanner input = new Scanner(System.in);

//prompt user to enter 3 numbers and declare double variables for each

System.out.print("Please enter 3 numbers: ");

double num1 = input.nextDouble();

double num2 = input.nextDouble();

double num3 = input.nextDouble();

//call Smallest method to determine smallest number of the 3

Smallest(num1, num2, num3);

}

//create method to find the smallest of 3 numbers

public static void Smallest(double x, double y, double z){

//declare variable for the smallest number

double smallestNumber;

//use if statements to determine which number is the smallest

if(x <= y && x <= z){

smallestNumber = x;

}

else if (y <= x && y <= z){

smallestNumber = y;

}

else{

smallestNumber = z;

}

//print the smallest number

System.out.println("The smallest number is " + smallestNumber);

}

}