## CSCI 145 PA \_\_9\_\_ Submission

## Due Date:\_\_\_May 2, 2023\_\_\_ Late (date and time):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Name(s):\_\_\_\_\_\_Ivan Leung\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exercise 1 -- need to submit source code and I/O  
 -- check if completely done \_\_x\_\_ ; otherwise, discuss issues below

Pseudocode below if applicable:

Source code below:

**package** pa9;

/\* Java Class: CSCI 145

Modified by: Ivan Leung

Class: Mon/Wed

Date: Apr 26 2023

Description:

I certify that the code below is my own work.

Exception(s): N/A

\*/

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

//Coin.java Author: Lewis/Loftus

//

//Represents a coin with two sides that can be flipped.

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**public** **class** Coin {

**private** **final** **int** HEADS = 0;

**private** **final** **int** TAILS = 1;

**private** **int** face;

**private** **double** bias;

// -----------------------------------------------------------------

// Sets up the coin with no bias and flipping it initially.

// -----------------------------------------------------------------

**public** Coin()

{

bias = 0.5;

flip();

}

// -----------------------------------------------------------------

// Sets up the coin with bias and flipping it initially.

// -----------------------------------------------------------------

**public** Coin(**double** bias) {

**this**.bias = (bias >= 0 && bias <= 1 ? bias : 0.5);

flip();

}

// -----------------------------------------------------------------

// Flips the coin by randomly choosing a face value.

// -----------------------------------------------------------------

**public** **void** flip() {

face = (Math.*random*() <= bias ? HEADS : TAILS);

}

// -----------------------------------------------------------------

// Returns true if the current face of the coin is heads.

// -----------------------------------------------------------------

**public** **boolean** isHeads() {

**return** (face == HEADS);

}

// -----------------------------------------------------------------

// Returns the current face of the coin as a string.

// -----------------------------------------------------------------

**public** String toString()

{

String faceName;

**if** (face == HEADS)

faceName = "Heads";

**else**

faceName = "Tails";

**return** faceName;

}

}

**package** pa9;

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**public** **class** TestCoin {

**public** **static** **void** main(String[] args) {

Coin fairCoin = **new** Coin();

**final** **double** biasedRate1 = 0.8;

**final** **double** biasedRate2 = 0.2;

Coin biasedCoin1 = **new** Coin(biasedRate1);

Coin biasedCoin2 = **new** Coin(biasedRate2);

**int** totalHeadsFair = 0;

**int** totalHeadsBiased1 = 0;

**int** totalHeadsBiased2 = 0;

**for** (**int** i = 0; i < 100; ++i) {

fairCoin.flip();

biasedCoin1.flip();

biasedCoin2.flip();

**if** (fairCoin.isHeads()) {

++totalHeadsFair;

}

**if** (biasedCoin1.isHeads()) {

++totalHeadsBiased1;

}

**if** (biasedCoin2.isHeads()) {

++totalHeadsBiased2;

}

}

System.***out***.println("Total heads...");

System.***out***.println("Fair coin: " + totalHeadsFair);

System.***out***.println("Coin with " + (**int**) (biasedRate1 \* 100) + "% bias: " + totalHeadsBiased1);

System.***out***.println("Coin with " + (**int**) (biasedRate2 \* 100) + "% bias: " + totalHeadsBiased2);

}

}

Input/output below:

Total heads...

Fair coin: 49

Coin with 80% bias: 76

Coin with 20% bias: 20

Exercise 2 -- need to submit source code and I/O  
 -- check if completely done \_\_x\_\_ ; otherwise, discuss issues below

Pseudocode below if applicable:

Source code below:

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Description:

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Exception(s): N/A

\*/

**import** java.util.Scanner;

**public** **class** ReverseArray {

**public** **static** **void** main(String[] args) {

**int**[] array;

**int** count;

Scanner scan = **new** Scanner(System.***in***);

System.***out***.print("How many values? ");

count = scan.nextInt();

array = **new** **int**[count];

System.***out***.print("Enter " + count + " values: ");

**for** (**int** i = 0; i < count; ++i) {

array[i] = scan.nextInt();

}

scan.close();

System.***out***.println("Before reverse: ");

**for** (**int** element : array) {

System.***out***.print(" " + element);

}

System.***out***.println();

**for** (**int** i = 0; i < count / 2; ++i) {

**int** tmp = array[i];

array[i] = array[count - 1 - i];

array[count - 1 - i] = tmp;

}

System.***out***.println("After reverse: ");

**for** (**int** element : array) {

System.***out***.print(" " + element);

}

System.***out***.println();

}

}

Input/output below:

How many values? 6

Enter 6 values: 89 35 75 12 62 12

Before reverse:

89 35 75 12 62 12

After reverse:

12 62 12 75 35 89

Exercise 3 -- need to submit source code and I/O  
 -- check if completely done \_\_x\_\_ ; otherwise, discuss issues below

Pseudocode below if applicable:

Source code below:

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Exception(s): N/A

\*/

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

//Square.java

//

//Define a Square class with methods to create and read in

//info for a square matrix and to compute the sum of a row,

//a col, either diagonal, and whether it is magic.

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**import** java.util.Scanner;

**public** **class** Square {

**int**[][] square;

// --------------------------------------

// create new square of given size

// --------------------------------------

**public** Square(**int** size) {

square = **new** **int**[size][size];

}

// --------------------------------------

// return the sum of the values in the given row

// --------------------------------------

**public** **int** sumRow(**int** row) {

**int** sum = 0;

**for** (**int** col = 0; col < square.length; ++col) {

sum += square[row][col];

}

**return** sum;

}

// --------------------------------------

// return the sum of the values in the given column

// --------------------------------------

**public** **int** sumCol(**int** col) {

**int** sum = 0;

**for** (**int** row = 0; row < square.length; ++row) {

sum += square[row][col];

}

**return** sum;

}

// --------------------------------------

// return the sum of the values in the main diagonal

// --------------------------------------

**public** **int** sumMainDiag() {

**int** sum = 0;

**for** (**int** i = 0; i < square.length; ++i) {

sum += square[i][i];

}

**return** sum;

}

// --------------------------------------

// return the sum of the values in the other ("reverse") diagonal

// --------------------------------------

**public** **int** sumOtherDiag() {

**int** sum = 0;

**for** (**int** row = 0, col = square.length - 1; row < square.length; ++row, --col) {

sum += square[row][col];

}

**return** sum;

}

// --------------------------------------

// return true if the square is magic (all rows, cols, and diags have

// same sum), false otherwise

// --------------------------------------

**public** **boolean** magic() {

**int** equal = sumMainDiag();

**if** (sumOtherDiag() != equal) {

**return** **false**;

}

**for** (**int** i = 0; i < square.length; ++i) {

**if** (sumRow(i) != equal || sumCol(i) != equal) {

**return** **false**;

}

}

**return** **true**;

}

// --------------------------------------

// read info into the square from the input stream associated with the

// Scanner parameter

// --------------------------------------

**public** **void** readSquare(Scanner scan) {

**for** (**int** row = 0; row < square.length; row++)

**for** (**int** col = 0; col < square.length; col++)

square[row][col] = scan.nextInt();

}

// ----------------------------------------

// print the contents of the square, neatly formatted

// ----------------------------------------

**public** **void** printSquare() {

**for** (**int** row = 0; row < square.length; ++row) {

**for** (**int** col = 0; col < square.length; ++col) {

System.***out***.print(" " + square[row][col]);

}

System.***out***.println();

}

}

}

**package** pa9;

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Exception(s): N/A

\*/

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

//SquareTest.java

//

//Uses the Square class to read in square data and tell if

//each square is magic.

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**import** java.util.Scanner;

**import** java.io.File;

**import** java.io.IOException;

**public** **class** SquareTest {

**public** **static** **void** main(String[] args) **throws** IOException {

Scanner scan = **new** Scanner(**new** File("C:\\Users\\ivanl\\OneDrive\\Desktop\\MagicData.txt"));

**int** count = 1;

// count which square we're on

**int** size = scan.nextInt(); // size of next square

// Expecting -1 at bottom of input file

**while** (size != -1) {

// create a new Square of the given size

Square square = **new** Square(size);

// call its read method to read the values of the square

square.readSquare(scan);

System.***out***.println("\n\*\*\*\*\*\*\*\* Square " + count + " \*\*\*\*\*\*\*\*\n");

// print the square

square.printSquare();

// print the sums of its rows

System.***out***.println("\nThe sum of each row...");

**for** (**int** i = 0; i < size; ++i) {

System.***out***.println("Row " + (i + 1) + ": " + square.sumRow(i));

}

// print the sums of its columns

System.***out***.println("\nThe sum of each column...");

**for** (**int** i = 0; i < size; ++i) {

System.***out***.println("Column " + (i + 1) + ": " + square.sumCol(i));

}

// print the sum of the main diagonal

System.***out***.println("\nThe sum of the main diagonal: " + square.sumMainDiag());

// print the sum of the other diagonal

System.***out***.println("The sum of the other diagonal: " + square.sumOtherDiag());

// determine and print whether it is a magic square

System.***out***.println("The square is " + (square.magic() ? "" : "not") + " a magic square.");

// get size of next square

++count;

size = scan.nextInt();

}

}

}

Input/output below:

\*\*\*\*\*\*\*\* Square 1 \*\*\*\*\*\*\*\*

8 1 6

3 5 7

4 9 2

The sum of each row...

Row 1: 15

Row 2: 15

Row 3: 15

The sum of each column...

Column 1: 15

Column 2: 15

Column 3: 15

The sum of the main diagonal: 15

The sum of the other diagonal: 15

The square is a magic square.

\*\*\*\*\*\*\*\* Square 2 \*\*\*\*\*\*\*\*

30 39 48 1 10 19 28

38 47 7 9 18 27 29

46 6 8 17 26 35 37

5 14 16 25 34 36 45

13 15 24 33 42 44 4

21 23 32 41 43 3 12

22 31 40 49 2 11 20

The sum of each row...

Row 1: 175

Row 2: 175

Row 3: 175

Row 4: 175

Row 5: 175

Row 6: 175

Row 7: 175

The sum of each column...

Column 1: 175

Column 2: 175

Column 3: 175

Column 4: 175

Column 5: 175

Column 6: 175

Column 7: 175

The sum of the main diagonal: 175

The sum of the other diagonal: 175

The square is a magic square.

\*\*\*\*\*\*\*\* Square 3 \*\*\*\*\*\*\*\*

48 9 6 39

27 18 21 36

15 30 33 24

12 45 42 3

The sum of each row...

Row 1: 102

Row 2: 102

Row 3: 102

Row 4: 102

The sum of each column...

Column 1: 102

Column 2: 102

Column 3: 102

Column 4: 102

The sum of the main diagonal: 102

The sum of the other diagonal: 102

The square is a magic square.

\*\*\*\*\*\*\*\* Square 4 \*\*\*\*\*\*\*\*

6 2 7

1 5 3

2 9 4

The sum of each row...

Row 1: 15

Row 2: 9

Row 3: 15

The sum of each column...

Column 1: 9

Column 2: 16

Column 3: 14

The sum of the main diagonal: 15

The sum of the other diagonal: 14

The square is not a magic square.

\*\*\*\*\*\*\*\* Square 5 \*\*\*\*\*\*\*\*

3 16 2 13

6 9 7 12

10 5 11 8

15 4 14 1

The sum of each row...

Row 1: 34

Row 2: 34

Row 3: 34

Row 4: 34

The sum of each column...

Column 1: 34

Column 2: 34

Column 3: 34

Column 4: 34

The sum of the main diagonal: 24

The sum of the other diagonal: 40

The square is not a magic square.

\*\*\*\*\*\*\*\* Square 6 \*\*\*\*\*\*\*\*

17 24 15 8 1

23 5 16 14 7

4 6 22 13 20

10 12 3 21 19

11 18 9 2 25

The sum of each row...

Row 1: 65

Row 2: 65

Row 3: 65

Row 4: 65

Row 5: 65

The sum of each column...

Column 1: 65

Column 2: 65

Column 3: 65

Column 4: 58

Column 5: 72

The sum of the main diagonal: 90

The sum of the other diagonal: 60

The square is not a magic square.

\*\*\*\*\*\*\*\* Square 7 \*\*\*\*\*\*\*\*

30 39 48 1 10 28 19

38 47 7 9 18 29 27

46 6 8 17 26 37 35

5 14 16 25 34 45 36

13 15 24 33 42 4 44

21 23 32 41 43 12 3

22 31 40 49 2 20 11

The sum of each row...

Row 1: 175

Row 2: 175

Row 3: 175

Row 4: 175

Row 5: 175

Row 6: 175

Row 7: 175

The sum of each column...

Column 1: 175

Column 2: 175

Column 3: 175

Column 4: 175

Column 5: 175

Column 6: 175

Column 7: 175

The sum of the main diagonal: 175

The sum of the other diagonal: 168

The square is not a magic square.

*Add more exercises as needed*

Exercise 4 -- need to submit source code and I/O  
 -- check if completely done \_\_x\_\_ ; otherwise, discuss issues below

Pseudocode below if applicable:

Source code below:

Please see extra credit.

Input/output below:

Answer for Question 1

Interface contains only abstract methods while class can contain all type of methods. Interface can only contain static variables, and constant variables while class can contain all type of variables. Interface cannot have constructors while class can have multiple constructors.

Answer for Question 2

Since array has fixed size, ArrayList is great choice when dynamic size is needed. Also, inserting elements into ArrayList can be easily done.

Extra Credit – provide if applicable

Pseudocode below if applicable:

Source code below:

**package** pa9;

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Description:

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Exception(s): N/A

\*/

**import** java.util.Scanner;

**public** **class** VoteCount {

**public** **static** **void** main(String[] args) {

**final** **int** SENTINEL\_VALUE = 0;

**final** **int** TOTAL\_CANDIDATES = 10;

**final** **int** MIN\_ID = 1;

**final** **int** MAX\_ID = 10;

**int**[] candidates = **new** **int**[TOTAL\_CANDIDATES];

**int** vote;

**int** validVotes;

**int** maxVote;

**int** winner;

**int** totalTie;

**int**[] tieCandidateID;

**boolean**[] isTie = **new** **boolean**[TOTAL\_CANDIDATES];

Scanner scan = **new** Scanner(System.***in***);

validVotes = 0;

System.***out***.print("Enter votes: ");

**do** {

vote = scan.nextInt();

**if** (vote >= MIN\_ID && vote <= MAX\_ID) {

++candidates[vote - 1];

++validVotes;

}

} **while** (vote != SENTINEL\_VALUE);

scan.close();

winner = 0;

maxVote = candidates[0];

System.***out***.println("\nNumber of valid votes: " + validVotes);

System.***out***.println("Results (candidate id and number of votes):");

**for** (**int** id = 0; id < TOTAL\_CANDIDATES; ++id) {

**if** (candidates[id] > 0) {

System.***out***.println((id + 1) + "\t" + candidates[id]);

**if** (candidates[id] > maxVote) {

maxVote = candidates[id];

winner = id;

}

}

}

totalTie = 0;

**for** (**int** id = 0; id < TOTAL\_CANDIDATES; ++id) {

**if** (candidates[id] == maxVote) {

isTie[id] = **true**;

++totalTie;

}

}

**if** (totalTie > 1) {

totalTie = (**int**) (Math.*random*() \* totalTie + 1);

**for** (**int** id = 0; id < TOTAL\_CANDIDATES; ++id) {

**if** (isTie[id] && totalTie > 0) {

winner = id;

--totalTie;

}

}

}

System.***out***.println("\nWinner: candidate " + (winner + 1));

}

}

Input/output below:  
  
Enter votes: 10 3 4 8 3 5 8 8 11 5 5 3 0

Number of valid votes: 11

Results (candidate id and number of votes):

3 3

4 1

5 3

8 3

10 1

Winner: candidate 5