

Assignment 01

Submitted to:

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Submitted by:

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## Entry file

// App.java

**package** academic.cse110.assignment01;

**import** **java.util.Scanner**;

**import** **academic.cse110.assignment01.assignments.T01\_RandomMonth**;

**import** **academic.cse110.assignment01.assignments.T02\_Lottery**;

**import** **academic.cse110.assignment01.assignments.T03\_GameRockPaperScissors**;

**import** **academic.cse110.assignment01.assignments.T04\_PointInsideCircle**;

**import** **academic.cse110.assignment01.assignments.T05\_AreaRegularPolygon**;

**import** **academic.cse110.assignment01.assignments.T06\_UnicodeConversion**;

**import** **academic.cse110.assignment01.assignments.T07\_HexToBinary**;

**import** **academic.cse110.assignment01.assignments.T08\_OrderThreeCities**;

**import** **academic.cse110.assignment01.assignments.T09\_GenerateVehiclePlateNumbers**;

**import** **academic.cse110.assignment01.assignments.T10\_ASCIICharacterTable**;

**import** **academic.cse110.assignment01.assignments.T11\_CompareLoans**;

**import** **academic.cse110.assignment01.assignments.T12\_ComputeE**;

**import** **academic.cse110.assignment01.assignments.T13\_DecimalToOctal**;

**import** **academic.cse110.assignment01.assignments.T14\_BitLevelOperations**;

**import** **academic.cse110.assignment01.assignments.T15\_ComputeMeanAndStandardDeviation**;

**public** **class** **App** {

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

**try** (Scanner cliInput = **new** Scanner(System.in)) {

**int** assignmentChoice;

System.out.println();

System.out.println("Assignment\t: 01");

System.out.println("\tSubmitted to\t: Ahmed Abdal Shafi Rasel (AASR), Lecturer, Department of CSE");

System.out.println();

System.out.println("Name\t\t: Md Asaduzzaman Atik");

System.out.println("Student ID\t: 2023-1-60-130");

System.out.println("Couse title\t: Object Oriented Programming");

System.out.println("Couse code\t: CSE110");

System.out.println("Section\t\t: 16");

System.out.println("Semester\t: Spring 2024");

**do** {

System.out.println();

System.out.println();

System.out.println("Choose an assignment number to explore:");

System.out.println("\t1. Random month");

System.out.println("\t2. Lottery");

System.out.println("\t3. Game - Rock, Paper, Scissors");

System.out.println("\t4. Point Inside Circle");

System.out.println("\t5. Area of a Regular Polygon");

System.out.println("\t6. Unicode Conversion");

System.out.println("\t7. Hex to Binary");

System.out.println("\t8. Order Three Cities");

System.out.println("\t9. Generate Vehicle Plate Numbers");

System.out.println("\t10. Display the ASCII Character Table");

System.out.println("\t11. Financial Application: Compare Loans");

System.out.println("\t12. Compute e");

System.out.println("\t13. Decimal to Octal");

System.out.println("\t14. Computer Architecture: Bit-Level Operations");

System.out.println("\t15. Statistics: Compute Mean and Standard Deviation");

System.out.println("\t0. Exit");

System.out.print("\nEnter your choice: ");

assignmentChoice = cliInput.nextInt();

System.out.println();

System.out.println();

**switch**(assignmentChoice) {

**case** **1** -> T01\_RandomMonth.getRandomMonth();

**case** **2** -> T02\_Lottery.lotteryPrize(cliInput);

**case** **3** -> T03\_GameRockPaperScissors.playRockPaperScissor(cliInput);

**case** **4** -> T04\_PointInsideCircle.checkPointInsideCircle(cliInput);

**case** **5** -> T05\_AreaRegularPolygon.calculatePolygonArea(cliInput);

**case** **6** -> T06\_UnicodeConversion.convertCharToUnicode(cliInput);

**case** **7** -> T07\_HexToBinary.convertHextToBinary(cliInput);

**case** **8** -> T08\_OrderThreeCities.orderCities(cliInput);

**case** **9** -> T09\_GenerateVehiclePlateNumbers.generatePlateNumber();

**case** **10** -> T10\_ASCIICharacterTable.displayASCIICharacterTable();

**case** **11** -> T11\_CompareLoans.compareLoans(cliInput);

**case** **12** -> T12\_ComputeE.computeEValues(cliInput);

**case** **13** -> T13\_DecimalToOctal.convertDecimalToOctal(cliInput);

**case** **14** -> T14\_BitLevelOperations.showBits(cliInput);

**case** **15** -> T15\_ComputeMeanAndStandardDeviation.calculateStatistics(cliInput);

**case** **0** -> {

System.out.println("Exiting the program...");

**break**;

}

**default** -> System.out.println("Invalid choice. Please try again.");

}

} **while** (assignmentChoice != **0**);

}

}

}

## Task 01: Random Month

// T01\_RandomMonth.java

**package** academic.cse110.assignment01.assignments;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T01\_RandomMonth** {

**public** **static** **void** **getRandomMonth**() {

String[] months = {"January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December"};

**int** randomIndex = (**int**) (Math.random() \* months.length);

System.out.println("The corresponding month name for the randomly generated number \"" + (randomIndex + **1**) + "\" is \"" + months[randomIndex] + "\"");

}

}

## Task 2: Lottery

// T02\_Lottery.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Random**;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T02\_Lottery** {

**public** **static** **void** **lotteryPrize**(Scanner scanner) {

Random random = **new** Random();

**int** lotteryNumber = random.nextInt(**900**) + **100**;

**int** lotteryDigit1 = lotteryNumber / **100**;

**int** lotteryDigit2 = (lotteryNumber / **10**) % **10**;

**int** lotteryDigit3 = lotteryNumber % **10**;

**int** userInputtedLotteryNumber;

System.out.print("Please enter yout 3-digit lottery number: ");

userInputtedLotteryNumber = scanner.nextInt();

**if** (userInputtedLotteryNumber < **100** || userInputtedLotteryNumber > **999**) {

System.out.println("Invalid input. Please enter a 3-digit number.");

**return**;

}

**int** userInputtedLotteryDigit1 = userInputtedLotteryNumber / **100**;

**int** userInputtedLotteryDigit2 = (userInputtedLotteryNumber / **10**) % **10**;

**int** userInputtedLotteryDigit3 = userInputtedLotteryNumber % **10**;

**boolean** exactMatch = (userInputtedLotteryNumber == lotteryNumber);

**boolean** allDigitsMatch =

(userInputtedLotteryDigit1 == lotteryDigit1 || userInputtedLotteryDigit1 == lotteryDigit2 || userInputtedLotteryDigit1 == lotteryDigit3) &&

(userInputtedLotteryDigit2 == lotteryDigit1 || userInputtedLotteryDigit2 == lotteryDigit2 || userInputtedLotteryDigit2 == lotteryDigit3) &&

(userInputtedLotteryDigit3 == lotteryDigit1 || userInputtedLotteryDigit3 == lotteryDigit2 || userInputtedLotteryDigit3 == lotteryDigit3);

**boolean** anyDigitMatch =

(userInputtedLotteryDigit1 == lotteryDigit1 || userInputtedLotteryDigit1 == lotteryDigit2 || userInputtedLotteryDigit1 == lotteryDigit3) ||

(userInputtedLotteryDigit2 == lotteryDigit1 || userInputtedLotteryDigit2 == lotteryDigit2 || userInputtedLotteryDigit2 == lotteryDigit3) ||

(userInputtedLotteryDigit3 == lotteryDigit1 || userInputtedLotteryDigit3 == lotteryDigit2 || userInputtedLotteryDigit3 == lotteryDigit3);

**if** (exactMatch) {

System.out.println("Congratulations! You won the grand prize of $10,000!");

} **else** **if** (allDigitsMatch) {

System.out.println("Congratulations! You won $3,000! All digits match.");

} **else** **if** (anyDigitMatch) {

System.out.println("You won $1,000! At least one digit matches.");

} **else** {

System.out.println("Sorry, no match this time. Better luck next time!");

}

System.out.println("The winning number was: " + lotteryNumber);

}

}

## Task 3: Game - Rock, Paper, Scissors

// T03\_GameRockPaperScissors.java

|  |  |
| --- | --- |
|  | **package** academic.cse110.assignment01.assignments;  **import** **java.util.Random**;  **import** **java.util.Scanner**;  /\*\*  \*  \* @author mrasadatik  \*/  **public** **class** **T03\_GameRockPaperScissors** {  **public** **static** **void** **playRockPaperScissor**(Scanner scanner) {  scanner.nextLine();    Random random = **new** Random();    String[] moves = {"scissors", "rock", "paper"};    **while** (**true**) {  System.out.println("Rock Paper Scissors! Let's play!");  System.out.println("Choose:");  System.out.println("\t0. Scissors");  System.out.println("\t1. Rock");  System.out.println("\t2. Paper");  System.out.println("\tOr type \"quit\" to EXIT!");  String userChoice;  **do** {  System.out.print("Enter your choice: ");  userChoice = scanner.nextLine();  **if** (!userChoice.equalsIgnoreCase("quit") && !userChoice.matches("[012]")) {  System.out.println("Invalid option. Please choose scissors (0), rock (1), or paper (2), or type \"quit\" to exit.");  }  } **while** (!userChoice.equalsIgnoreCase("quit") && !userChoice.matches("[012]"));  **if** (userChoice.equalsIgnoreCase("quit")) {  System.out.println("Thanks for playing!");  **break**;  }  **int** userMove = Integer.parseInt(userChoice);    **int** computerMove = random.nextInt(**3**);  System.out.println("You chose: " + moves[Integer.parseInt(userChoice)]);  System.out.println("Computer chose: " + moves[computerMove]);    **if** (userMove == computerMove) {  System.out.println("It's a tie!");  } **else** **if** ((userMove == **0** && computerMove == **2**) ||  (userMove == **1** && computerMove == **0**) ||  (userMove == **2** && computerMove == **1**)) {  System.out.println("You won!");  } **else** {  System.out.println("You lose.");  }  }  }  } |

## Task 4: Point Inside Circle

// T04\_PointInsideCircle.java

|  |  |
| --- | --- |
|  | **package** academic.cse110.assignment01.assignments;  **import** **java.util.Scanner**;  /\*\*  \*  \* @author mrasaadatik  \*/  **public** **class** **T04\_PointInsideCircle** {  **public** **static** **void** **checkPointInsideCircle**(Scanner scanner) {  System.out.print("Enter the x-coordinate of the point: ");  **double** x = scanner.nextDouble();    System.out.print("Enter the y-coordinate of the point: ");  **double** y = scanner.nextDouble();    **double** distanceSquared = Math.pow(x, **2**) + Math.pow(y, **2**);    **if** (distanceSquared <= **10** \* **10**) {  System.out.println("(" + x + ", " + y + ") is inside the circle.");  } **else** {  System.out.println("(" + x + ", " + y + ") is outside the circle.");  }  }  } |

## Task 5: Area of a Regular Polygon

// T05\_AreaRegularPolygon.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T05\_AreaRegularPolygon** {

**public** **static** **void** **calculatePolygonArea**(Scanner scanner) {

**int** n;

**double** s;

**do** {

System.out.print("Enter the number of sides: ");

n = scanner.nextInt();

**if** (n < **3**) {

System.out.println("Invalid: The number of sides must be greater than or equal to 3.");

}

**if** (n % **180** == **0**) {

System.out.println("Invalid: The formula involves division by zero. Please choose a different number of sides.");

}

} **while**(n < **3** || (n % **180** == **0**));

**do** {

System.out.print("Enter the side: ");

s = scanner.nextDouble();

**if** (s <= **0**) {

System.out.println("Invalid: The side length must be greater than 0.");

}

} **while**(s <= **0**);

**double** area = (n \* Math.pow(s, **2**)) / (**4** \* Math.tan(Math.PI / n));

System.out.println("The area of the polygon is " + area);

}

}

## Task 6: Unicode Conversion

// T06\_UnicodeConversion.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T06\_UnicodeConversion** {

**public** **static** **void** **convertCharToUnicode**(Scanner scanner) {

System.out.print("Enter a character: ");

**char** inputChar = scanner.next().charAt(**0**);

System.out.println("The Unicode for the character " + inputChar + " is " + (**int**) inputChar);

}

}

## Task 7: Hex to Binary

// T07\_HexToBinary.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T07\_HexToBinary** {

**public** **static** **void** **convertHextToBinary**(Scanner scanner) {

System.out.print("Enter a hex digit: ");

**char** hexDigit = scanner.next().charAt(**0**);

**int** decimalValue = Character.digit(hexDigit, **16**);

String binaryValue = Integer.toBinaryString(decimalValue);

System.out.println("The binary value is " + binaryValue);

}

}

## Task 8: Order Three Cities

// T08\_OrderThreeCities.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T08\_OrderThreeCities** {

**public** **static** **void** **orderCities**(Scanner scanner) {

scanner.nextLine();

System.out.print("Enter the first city: ");

String city1 = scanner.nextLine();

System.out.print("Enter the second city: ");

String city2 = scanner.nextLine();

System.out.print("Enter the third city: ");

String city3 = scanner.nextLine();

String firstCity, secondCity, thirdCity;

**if** (city1.compareToIgnoreCase(city2) < **0** && city1.compareToIgnoreCase(city3) < **0**) {

firstCity = city1;

**if** (city2.compareToIgnoreCase(city3) < **0**) {

secondCity = city2;

thirdCity = city3;

} **else** {

secondCity = city3;

thirdCity = city2;

}

} **else** **if** (city2.compareToIgnoreCase(city1) < **0** && city2.compareToIgnoreCase(city3) < **0**) {

firstCity = city2;

**if** (city1.compareToIgnoreCase(city3) < **0**) {

secondCity = city1;

thirdCity = city3;

} **else** {

secondCity = city3;

thirdCity = city1;

}

} **else** {

firstCity = city3;

**if** (city1.compareToIgnoreCase(city2) < **0**) {

secondCity = city1;

thirdCity = city2;

} **else** {

secondCity = city2;

thirdCity = city1;

}

}

System.out.println("The three cities in alphabetical order are " + firstCity + " " + secondCity + " " + thirdCity);

}

}

## Task 9: Generate Vehicle Plate Numbers

// T09\_GenerateVehiclePlateNumbers.java

**package** academic.cse110.assignment01.assignments;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T09\_GenerateVehiclePlateNumbers** {

**public** **static** **void** **generatePlateNumber**() {

String plateNumber = "";

**for** (**int** i = **0**; i < **3**; i++) {

**char** randomLetter = (**char**) ('A' + Math.random() \* ('Z' - 'A' + **1**));

plateNumber += randomLetter;

}

**for** (**int** i = **0**; i < **4**; i++) {

**int** randomDigit = (**int**) (Math.random() \* **10**);

plateNumber += randomDigit;

}

System.out.println("Generated Plate Number: " + plateNumber);

}

}

## Task 10: Display the ASCII Character Table

// T10\_ASCIICharacterTable.java

**package** academic.cse110.assignment01.assignments;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T10\_ASCIICharacterTable** {

**final** **private** **static** **int** CHAR\_PER\_LINE = **10**;

**public** **static** **void** **displayASCIICharacterTable**() {

**for** (**char** ch = '!'; ch <= '~'; ch++) {

System.out.print(ch);

**if** ((ch - '!') % CHAR\_PER\_LINE == CHAR\_PER\_LINE - **1**) {

System.out.println();

} **else** {

System.out.print("\t");

}

}

}

}

## Task 11: Financial Application: Compare Loans

// T11\_CompareLoans.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T11\_CompareLoans** {

**public** **static** **void** **compareLoans**(Scanner scanner) {

System.out.print("Loan Amount: ");

**double** loanAmount = scanner.nextDouble();

System.out.print("Number of Years: ");

**int** numberOfYears = scanner.nextInt();

System.out.println("Interest Rate\t\tMonthly Payment\t\tTotal Payment");

**for** (**double** annualInterestRate = **5.0**; annualInterestRate <= **8.0**; annualInterestRate += **0.125**) {

**double** monthlyInterestRate = annualInterestRate / **1200**;

**double** monthlyPayment = (loanAmount \* monthlyInterestRate) / (**1** - Math.pow(**1** + monthlyInterestRate, -numberOfYears \* **12**));

**double** totalPayment = monthlyPayment \* numberOfYears \* **12**;

System.out.printf("%.3f%%\t\t\t%.2f\t\t\t%.2f\n", annualInterestRate, monthlyPayment, totalPayment);

}

}

}

## Task 12: Compute e

// T12\_ComputeE.java

|  |  |
| --- | --- |
|  | **package** academic.cse110.assignment01.assignments;  **import** **java.util.Scanner**;  /\*\*  \*  \* @author mrasadatik  \*/  **public** **class** **T12\_ComputeE** {  **public** **static** **void** **computeEValues**(Scanner scanner) {  **for** (**int** i = **10000**; i <= **100000**; i += **10000**) {  **double** eValue = computeE(i);  System.out.println("e for i = " + i + ": " + eValue);  }    **int** userInput;    **do** {  System.out.print("Enter the value of i: ");  userInput = scanner.nextInt();  **if** (userInput < **0**) {  System.out.println("Invalid input: i must be a non-negative integer");  }  } **while** (userInput < **0**);    **double** eValue = computeE(userInput);  System.out.println("e for i = " + userInput + ": " + eValue);  }    **private** **static** **double** **computeE**(**int** i) {  **double** e = **1.0**;  **double** factorial = **1.0**;  **for** (**int** j = **1**; j <= i; j++) {  factorial \*= j;  e += **1.0** / factorial;  }  **return** e;  }  } |

## Task 13: Decimal to Octal

// T13\_DecimalToOctal.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T13\_DecimalToOctal** {

**public** **static** **void** **convertDecimalToOctal**(Scanner scanner) {

**int** decimalNumber;

String octalValue = "";

**do** {

System.out.print("Enter a decimal integer: ");

decimalNumber = scanner.nextInt();

**if** (decimalNumber < **0**) {

System.out.println("Invalid: Please enter a non-negative decimal integer.");

}

} **while** (decimalNumber < **0**);

**if** (decimalNumber == **0**) {

octalValue = "0";

} **else** {

**while** (decimalNumber > **0**) {

**int** remainder = decimalNumber % **8**;

octalValue = remainder + octalValue;

decimalNumber /= **8**;

}

}

System.out.println("The octal value is: " + octalValue);

}

}

## Task 14: Computer Architecture: Bit-Level Operations

// T14\_BitLevelOperations.java

|  |  |
| --- | --- |
|  | **package** academic.cse110.assignment01.assignments;  **import** **java.util.Scanner**;  /\*\*  \*  \* @author mrasadatik  \*/  **public** **class** **T14\_BitLevelOperations** {  **public** **static** **void** **showBits**(Scanner scanner) {  **short** number;    System.out.print("Enter a short integer: ");  number = scanner.nextShort();    System.out.print("The bits are ");  **for** (**int** i = **15**; i >= **0**; i--) {  **int** bit = (number >> i) & **1**;  System.out.print(bit);  }  System.out.println();  }  } |

## Task 15: Statistics: Compute Mean and Standard Deviation

// T15\_ComputeMeanAndStandardDeviation.java

**package** academic.cse110.assignment01.assignments;

**import** **java.util.Scanner**;

/\*\*

\*

\* @author mrasadatik

\*/

**public** **class** **T15\_ComputeMeanAndStandardDeviation** {

**public** **static** **void** **calculateStatistics**(Scanner scanner) {

**double** sum = **0**;

**double** sumOfSquares = **0**;

System.out.println("Enter ten numbers:");

**double**[] numbers = **new** **double**[**10**];

**for** (**int** i = **0**; i < **10**; i++) {

System.out.print("Enter number " + (i + **1**) + ": ");

numbers[i] = scanner.nextDouble();

}

**for** (**double** number : numbers) {

sum += number;

}

**double** mean = sum / numbers.length;

System.out.println("Mean: " + mean);

**for** (**double** number : numbers) {

sumOfSquares += Math.pow((number - mean), **2**);

}

**if** (numbers.length - **1** == **0**) {

System.out.println("Division by zero. Unable to calculate standard deviation.");

System.out.println("Exiting...");

**return**;

}

**double** standardDeviation = Math.sqrt(sumOfSquares / (numbers.length - **1**));

System.out.println("Standard Deviation: " + standardDeviation);

}

}

THE END