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4. Exercises on Input, Decision and Loop

4.1 Add 2 Integer (input)

Write a program called Add2Integer that prompts user to enter two integers. The program shall read the two integers as int; compute their sum; and print the result.

```
import java.util.Scanner;

public class Add2Integer {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);
        System.out.print ("Enter first integer: ");
        int numOne = scan.nextInt();
        System.out.print ("Enter second integer: ");
        int numTwo = scan.nextInt();
        scan.close();

        int sum = numOne + numTwo;
        System.out.println ("The sum is: " + sum);
    }
}
```

Output :

Enter First number: 8

Enter second number: 9

The sum is: 17

4.2 SumProductMinMax3 (Arithmetic & Min / Max)

Write a program called `SumProductMinMax3`, that prompts user for three integers. The program shall read the inputs as int; compute the sum, product, minimum and maximum of the three integers; and print the results.

```

import java.util.Scanner;

public class SumProductMinMax3 {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);
        System.out.print ("Enter 1st integer: ");
        int numOne = scan.nextInt();
        System.out.print ("Enter 2nd Integer: ");
        int numTwo = scan.nextInt();
        System.out.print ("Enter 3rd integer: ");
        int numThree = scan.nextInt();
        scan.close();

        int sum= numOne + numTwo + numThree;
        int product = numOne * numTwo * numThree;
        System.out.println ("The sum is: " + sum);
        System.out.println ("The product is: " + product);

        int min, max;

        if (numOne > numTwo && numOne > numThree) {
            max = numOne;
            if (numTwo < numThree) {
                min = numTwo;
            } else {
                min = numThree;
            }
        }
    }
}

```

```

        System.out.println ("The sum is: " + sum);
        System.out.println ("The product is: " + product);
        System.out.println ("The min is: " + min);
        System.out.println ("The max is: " + max);
    }
}

```

Output:

Enter 1st Integer: 8

Enter 2nd Integer: 2

Enter 3rd Integer: 9

The sum is: 19

The product is: 144

The min is: 2

The max is: 9

4.3 Circle Computation (double & printf())

Write a program called `CircleComputation` that prompts user for the radius of a circle (single floating point number). This program shall read both inputs as double; compute the diameter, circumference, and area of the circle in double; and print the values rounded to 2 decimal places. Use system-provided constant `Math.PI` for pi.

```
import java.util.Scanner;
public class CircleComputation {
    public static void main (String args[]) {
        Scanner scan = new Scanner (System.in);
        System.out.print ("Enter radius: ");
        double radius = scan.nextDouble();
        scan.close();
        double diameter = 2.0 * radius;
        double area = Math.PI * radius * radius;
        double circumference = 2.0 * Math.PI * radius;
        System.out.printf ("Diameter is: %.2f\n", diameter);
        System.out.printf ("Area is: %.2f\n", area);
        System.out.printf ("Circumference is: %.2f\n", circumference);
    }
}
```

Output:

Entry radius: 2.0

Diameter is: 4.00

Area is: 12.57

Circumference: 12.57

4.4 Swap2Integers

Write a C# program called Swap2Integers that prompts user for two integers. The program shall read the inputs as int, save in two variables called number1 and number2; swap the contents of the two variables; and prints the results.

```
using System;
import java.util.Scanner;

public class Swap2Integers {
    public static void main(String args[]) {
        Scanner scan = new Scanner(System.in);
        System.out.print("Enter first integer: ");
        int numOne = scan.nextInt();
        System.out.print("Enter second integer: ");
        int numTwo = scan.nextInt();

        int temp;
        temp = numOne;
        numOne = numTwo;
        numTwo = temp;

        System.out.println("After the swap, first integer is: " +
                           numOne + ", second integer is: " +
                           numTwo);
    }
}
```

Output:

ENTER first integer: 9

ENTER second integer: -9

AFTER the swap, first integer is: -9, second integer is: 9.

4.5 Income Tax Calculator (Decision)

The progressive income tax rate is mandated as follows:

Taxable Income	Rate (%)
First \$ 20,000	0
Next \$ 20,000	10
Next \$ 20,000	20
Next \$ 20,000	30

For example, suppose that the taxable income is \$95000, the income tax payable is $\$20,000 * 0\% + \$20,000 * 10\% + \$20,000 * 20\% + \$25,000 * 30\%$.

Write a program called IncomeTaxCalculator that reads the taxable income (in int). The program shall calculate the income tax payable (in double); and print the result rounded to 2 decimal places.

```
import java.util.Scanner;
public class IncomeTaxCalculator {
    public static void main(String args[]) {
        Scanner scan = new Scanner(System.in);
        System.out.print("Enter the taxable income ($ ");
        int income = scan.nextInt();
        scan.close();

        double taxPayable;
        if (income <= 20000) {
            taxPayable = income * 0;
        } else if (income > 20000 & income <= 40000) {
            taxPayable = 20000 * 0 + (income - 20000) * 10;
        } else if (income > 40000 & income <= 60000) {
            taxPayable = 20000 * 0 + 20000 * 10 + (income - 40000) * 20;
        } else {
            taxPayable = 20000 * 0 + 20000 * 10 + 20000 * 20 + (income - 60000) * 30;
        }
        System.out.println("The income tax payable is " + taxPayable);
    }
}
```

```

else if (income <= 40000) {
    taxPayable = (double) (income - 20000) * 0.1;
}

else if (income <= 60000) {
    taxpayable = (double) (20000) * 0.1 + (double) (income - 40000)
        * 0.2;
}

else {
    taxpayable = (double) (20000) * 0.1 + (double) (20000) * 0.2 +
        (double) (income - 60000) * 0.3;
}

System.out.printf ("The income tax payable is: $%.2f\n", taxPayable);

```

Output:
 Entry in taxable income: \$ 41234
 The income tax payable is: \$ 2246.80

4.6 Income Tax Calculator With Sentinel (Decision & Loop)

Based on the previous exercise, write a program called IncomeTaxCalculatorWithSentinel which shall repeat the calculation until user enter -1.

```

import java.util.Scanner;

public class IncomeTaxCalculatorWithSentinel {
    public static void main (String args[]) {
        Scanner scan = new Scanner (System.in);
    }
}

```

```

while (true) {
    System.out.print("Enter the taxable income (or -1 to
end) : $ ");
    int income = scan.nextInt();
    if (income == -1) {
        System.out.println("bye!");
        break;
    } else {
        double taxPayable;
        if (income <= 20000) {
            taxPayable = income * 0;
        } else if (income <= 40000) {
            taxPayable = (double) (income - 20000) * 0.1;
        } else if (income <= 60000) {
            taxPayable = (double) (20000) * 0.1 + (double)
(income - 40000) * 0.2;
        } else {
            taxPayable = (double) (20000) * 0.1 + (double)
(20000) * 0.2 + (double) (income - 60000)
* 0.3;
        }
        System.out.printf("Your income tax payable is: $%.2f\n",
                           taxPayable);
        System.out.println();
    }
}

```

ENTER the taxable income (or -1 to end): \$ 41000

The income tax payable is: \$ 2200.00

ENTER the taxable income (or -1 to end): \$ 62000

The income tax payable is: \$ 6600.00

ENTER the taxable income (or -1 to end): \$ -1

bye!

4.7 Pension Contribution Calculator With Sentinel (Decision & Loop)

Based on the previous Pension Contribution Calculator. Write a program called "Pension Contribution Calculator With Sentinel" which shall repeat the calculations until user enter -1 for the Salary.

```
import java.util.Scanner;

public class PensionContributionCalculatorWithSentinel {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);

        while (true){
            System.out.print("Enter the monthly salary (or -1 to end : $");
            int salary = scan.nextInt();

            if (salary == -1){
                System.out.println("Bye!");
                break;
            } else {
                System.out.print("Enter the age: ");
            }
        }
    }
}
```

```
byte age = scan.nextByte();
```

```
System.out.print("The employee's contribution is: $");
```

```
float employeeContr = scan.nextFloat();
```

```
System.out.print ("The employer's contribution is: $" + j);
```

```
float employerContr = scan.nextFloat();
```

```
System.out.printf("The total contribution is: $%.2f\n");
```

$\text{float}(\text{employee_contr} + \text{employer_contr})$

System.out.println();

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output:

ENTER the monthly salary (or -1 to end): \$5123

Enter the age: 21

The employee's contribution is : \$ 1024.60

The employer's contribution is: \$ 870.91

The total contribution is: \$ 1895.51

Enter the monthly salary (or -1 to end): \$ 5123

Enter the age : 64

The employee's contribution is: \$2384.26

The employer's contribution is: \$ 461.07

The total contribution is: \$ 845.30

ENRY THE monthly salary (corresponding) : \$ -1

Physical fitness and heart rate variability during exercise

4.8 Sales Tax Calculator (Decision & Loop)

A sales tax of 7% is levied on all goods and services consumed. It is also mandatory that all the price tags should include the sales tax! For example, if an item has a price tag of \$107, the actual price is \$100 and \$7 goes to the sales tax.

Write a program using a loop to continuously input the tax-inclusive price (in double); compute the actual price and the sales tax (in double); and print the results rounded to 2 decimal places. The program shall terminate in response to input of -1; and print the total price, total actual price, and total sales tax.

```

import java.util.Scanner;
public class SalesTaxCalculator {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);
        double priceTotal=0, actualPriceTotal=0, salesTaxTotal=0,
               actualPrice, salesTax;
        while (true) {
            System.out.print("Enter the tax-inclusive price in
                           dollars (or -1 to end): ");
            double taxIncPrice = scan.nextDouble();
            if (taxIncPrice != -1.0) {
                System.out.println("Total price is: $" + priceTotal);
                System.out.println("Total actual price is: $" + actualPriceTotal);
                System.out.println("Total sales tax is: $" + salesTaxTotal);
                break;
            }
        }
    }
}

```

```

else {
    actualPrice = taxIncPrice - (taxIncPrice % 100);
    salesTax = taxIncPrice - actualPrice;
    System.out.println("Actual Price is: $" + actualPrice + ", Sales Tax is: $" + salesTax);

    System.out.println();
    priceTotal += taxIncPrice;
    actualPriceTotal += actualPrice;
    salesTaxTotal += salesTax;
}

}
}

```

output:

Enter the tax-inclusive price in dollars (or -1 to end): 107

Actual Price is: \$100.00, Sales Tax is: \$7.00

Enter the tax-inclusive price in dollars (or -1 to end): 214

Actual Price is: \$200.00, Sales Tax is: \$14.00

Enter the tax-inclusive price in dollars (or -1 to end): 321

Actual Price is: \$300.00, Sales Tax is: \$21.00

Enter the tax-inclusive price in dollars (or -1 to end): -1

Total Price is: \$642.00

Total Actual Price is: \$600.00

Total Sales Tax is: \$42.00

4.9 ReverseInt (Loop with Modulus / Divide)

Write a program that prompts user for a positive integer. The program shall read the input as int; and print the "reverse" of the input integer.

```
import java.util.Scanner;

public class ReverseInt {
    public static void main(String args[]) {
        Scanner scan = new Scanner(System.in);
        System.out.print("Enter a positive integer: ");
        int inputInt = scan.nextInt();

        int dig;
        System.out.print("The reverse is: ");

        while (inputInt > 0) {
            dig = inputInt % 10;
            System.out.print(dig);
            inputInt /= 10;
        }
    }
}
```

Output:

Enter a positive integer: 12345

The reverse is : 54321

4.10 SumOfDigit Int (Loop with Modulus / Divide)

Write a program that prompts user for a positive integer. The program shall read the input as int; compute and print the sum of all its digits.

```

import java.util.Scanner;

public class SumOfDigitsInt {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);
        System.out.print ("Enter a positive integer: ");
        int inputInt = scan.nextInt();

        int sum=0, digi;
        while (inputInt >0){
            digi = inputInt % 10;
            sum += digi;
            inputInt /= 10;
        }
        System.out.print ("The sum of all digits is: " + sum);
    }
}

```

Output:

Enter a positive integer: 12345

The sum of all digits is: 15

4.11 Input validation (Loop with boolean flag)

Your program often needs to validate the user's inputs, eg: marks shall be between 0 and 100. Write a program that prompts user for an integer between 0-100 or 90-100. The program shall read the input as int; and repeat until the user enters a valid input.

```
import java.util.Scanner;
```

```

public class InputValidation {
    public static void main (String args[]) {
        Scanner scan = new Scanner (System.in);
        while (true) {
            System.out.print ("Enter a number between 0-10 or
                90 - 100 : ");
            int input = scan.nextInt();
            if ((input >= 0 & input <= 10) || (input >= 90 & input <= 100))
                System.out.println ("You have entered: " + input);
            break;
        } else {
            System.out.println ("Invalid input, try again....");
        }
    }
}

```

Output:

```

ENTER a number between 0-10 or 90-100: -1
Invalid input, try again...
ENTER a number between 0-10 or 90-100: 50
Invalid input, try again...
ENTER a number between 0-10 or 90-100: 95
You have entered: 95

```

4.12. AverageWithInput Validation (Loop with boolean flag)

Write a program that prompts user for math mark (between 0-100 in int) of 3 students; compute the average (in double); and prints the result rounded to 2 decimal places. Your program needs to perform input validation.

```

import java.util.Scanner;

public class AverageWithInputValidation {
    public static void main (String args[]){
        Scanner scan = new Scanner (System.in);
        double sum = 0;

        for (int studentNo = 1; studentNo <= 3; studentNo ++){
            while (true){
                System.out.print ("Enter the mark (0-100) for
                                  student " + studentNo + ": ");
                int studentMarks = scan.nextInt();

                if (studentMarks >= 0 && studentMarks <= 100){
                    sum += studentMarks;
                    break;
                }
                else {
                    System.out.println ("Invalid input, try again...");
                    continue;
                }
            }
        }

        System.out.printf ("The average is: %.2f\n", (double)(sum)/3);
    }
}

```

Output:

Enter the mark (0-100) for student 1: 56
 Enter the mark (0-100) for student 2: 101
 Invalid input try again...
 Enter the mark (0-100) for student 2: 99
 Enter the mark (0-100) for student 3: 45
 The average is: 66.67