Midterm Test 1

This is a preview of the published version of the quiz

Started: Nov 20 at 10:23am

Quiz Instructions

- This is an online test.
- Exam Time: October 27, Friday, 12:10 - 2:40 (additional 10 min to set up your IDE + 2.5 Hr Test)
- Once you finish solving the exam, please make sure to submit your answers through Canvas.
- The submission page will be closed after the due date & time, so make sure to finish the submission in time.

- Please double check that JAVA JDK and your IDE is properly installed on your computer.
- Once it is confirmed, please start the exam from 12:10 PM.
- You are allowed to make up to two multiple attempts and the highest score will be kept.

- There are 10 multiple choice or simple questions, followed by 8 coding questions.

Question 1 2 pts

List all primitive data types and write down how many bytes each type require.

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byte 1 byte
short 2 byte
int 4 byte
long 8 byte
float 4 byte
double 8 byte
boolean 1 bit
char 2 byte

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Question 2 2 pts

Choose the case when automatic type casting occurs.

- ✓ Short to int
- ✓ int to Long
- ✓ Byte to int
- ○ Long to int

Question 3

2 pts

Which one is not the correct explanation about Integer Overflow?

- The minimum value wraps around to the maximum value.
- It occurs when an arithmetic operation attempts to create a numeric value that is outside of the range that can be represented with a given number of digits.
- The maximum value wraps around to the minimum value.
- Java's integer arithmetic operators don't detect overflows.

Question 4

2 pts

Choose the correct explanation about String Type.

- String is a class.
- String object is mutable.
- String type can only contain letters.
- String is a primitive type.

Question 5

2 pts

Which of the following is a valid variable name in Java?

- float
- 3times
- my_var
- -myVar

Question 6

2 pts

Which one is not the correct explanation about Stack and Heap memory?

- Stack memory is fast to access with short life span.
- Heap allows dynamic allocation of memory.
- Stack memory is managed in a FIFO mode.
- Heap memory size is greater than Stack.

Question 7

2 pts

Which one is not the correct explanation about Static and instance keyword?

- Static keyword belongs to an object.
- We can call a static method without creating an object.
- Instance keyword belongs to the instance of the class.
- Instance variables are used to represent object-level data.

Question 8

2 pts

Which one is not the correct explanation about Constructors in Java?

- Constructors do not have a return type.
- Constructors must have the same name as the class itself.
- Constructors can be invoked directly as a normal method.
- We can define multiple constructors within a class, each with a distinct set of parameters.

Question 9

2 pts

Which one is not correct about 'This' keyword in Java?

- this keyword can be used to refer to instance's data field.
- this keyword refers to the current object context.
- this keyword can not be used in a static context.
- this keyword refers to a member of the superclass.

Question 10

2 pts

What happens if a class does not have an access modifier?

- The class can be accessed within the same package.
- The class can be accessed within the same package and by subclasses in other packages.
- The class can be accessed only within the class in which it is declared.
- The class can be accessed from anywhere.

Question 11

10 pts

Write a code block to calculate profit or loss. Once you are done, copy and paste the entire source code into the answer block below.

```java
import java.util.Scanner;

class profitandLoss
{

    public static void main(String[] args) {
        Scanner s= new Scanner(System.in);
        System.out.println("Enter the Cost price:");
        double cp=s.nextDouble();
        System.out.println("Enter the Selling price:");
        double sp=s.nextDouble();

    // Write a code block that can calculate profit or loss.
    // If the selling price is greater than the cost price,
    //          the program calculates the profit and prints the profit (ex. profit: 200)
    // If the selling price is less than the cost price,
    //          the program calculates the loss and prints the loss  (ex. loss: 100)
    // If the selling price is equal to the cost price,
    //          the program prints "No Profit and No Loss".


    }
}
```

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Question 12 10 pts

Create a static method named 'printFibonacciSeries' that prints out the first 'n' numbers in the Fibonacci Sequence. In Fibonacci Series, the next number is the sum of previous two numbers.

- The first two numbers of Fibonacci Series are 0 and 1.
- Make sure to print the sequence in a single line, not as multiple lines.

Once you are done, copy and paste the entire source code into the answer block below.

Q11 Solution)

```
import java.util.Scanner;

class profitandLoss
{

    public static void main(String[] args) {
        Scanner s= new Scanner(System.in);
        System.out.println("Enter the Cost price:");
        double cp=s.nextDouble();
        System.out.println("Enter the Selling price:");
        double sp=s.nextDouble();

         if(sp>cp)
        {
            System.out.println("Profit : " + (sp-cp));
        }
        else if(sp<cp)
        {
            System.out.println("Loss : " + (cp-sp));
        }
        else
        {
            System.out.println("No Profit and No Loss");
        }


    }
}
```

Q12 Solution)

```
public class FibonacciExample {

    public static void printFibonacciSeries( int n){
        int a = 0, b = 1;

        for (int i = 0; i < n; i++){
            System.out.print(a + " ");
            int temp = a;
            a = b;
            b = temp + a;
        }
    }

    public static void main(String[] args) {
        printFibonacciSeries(10);
    }
}
```

```java
public class FibonacciExample {

    1 usage
    public static void printFibonacciSeries( int n){
        int a = 0, b = 1;

        // Write a static method 'printFibonacciSeries'
        // that accepts an integer number n and printout a string of n Fibonacci Series.
        // For example, if n = 10, the output should be 0 1 1 2 3 5 8 13 21 34

        }
    }

    public static void main(String[] args) {
        printFibonacciSeries( n: 10);
    }
}
```

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Question 13 10 pts

Create a static method named 'printDiamond' that takes an integer 'n' and prints a diamond shape pattern using nested for loops. Once you are done, copy and paste the entire source code into the answer block below.

```java
public class DiamondExample {
    1 usage
    public static void printDiamond(int n){
        // static method 'printDiamond' accept an integer 'n' and
        // prints a diamond shape using two nested for loops.
        // For example, if you call printDiamond(5),
        //    *
        //   ***
        //  *****
        // *******
        //  *****
        //   ***
        //    *
        //
        // For the i-th row, there are n - i blank space,
        // followed by (2*i - 1) stars.
        // Write two nested for loops, where the first nested loop
        // prints the top half of the diamond, and the second nested loop
        // prints the bottom half of the diamond.
    }

    public static void main(String[] args) {
        printDiamond( n: 5);
    }
}
```

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Question 14 10 pts

Create a static method named 'quadraticEquation' that accepts three double number a, b, c and calculate the root of a quadratic equation $ax^2 + bx + c = 0$. Once you are done, copy and paste the entire source code into the answer block below.

Q13. Solution)

```
public class DiamondExample {
    public static void printDiamond(int n){

        for (int i = 0; i < n; i++){

            for (int j = 0; j < n-i; j++){
                System.out.print(" ");
            }

            for (int k = 0; k < 2 * i -1; k++){
                System.out.print("*");
            }

            System.out.println();
        }

        for (int i = n-2; i > 0; i--){

            for (int j = 0; j < n-i; j++){
                System.out.print(" ");
            }

            for (int k = 0; k < 2 * i -1; k++){
                System.out.print("*");
            }

            System.out.println();
        }


    }

    public static void main(String[] args) {
        printDiamond(5);
    }
}
```

- You may use Math.sqrt( ) to calculate the square root.

```
public class QuadraticExample {
    1 usage
    public static void quadraticEquation(double a, double b, double c) {
        double determinant = b * b - 4 * a * c;
        double root1, root2;

    // write a static method quadraticEquation that accepts three double number a, b, c
    // and calculate the root of a quadratic equation a*x^2 + b*x + c = 0
    // The method should be able to detect whether there are two complex roots, or one real root,
    // or two real and different roots. For each case, the quadraticEquation should print out
    // as follows.
    // For example,
    // quadraticEquation(1, 2, 2) -> Two complex roots: -1.0+1.0j and -1.0-1.0j
    //quadraticEquation(1, 2, 1) -> One real Root: -1.0
    //quadraticEquation(1, 2, 0.5) -> Two real and different roots: -0.2928932188134524 and -1.7071067811865475

    }

    public static void main(String[] args) {
        quadraticEquation( a: 1,  b: 2,  c: 0.5);
    }
}
```

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Question 15 10 pts

Create a static method named 'DifferenceOfSquaresCalculator' that accepts an integer input 'n' and calculate the difference between the square of the sum and the sum of the squares of the first 'n' natural numbers.

- The square of the sum is $(1+2+\cdots+n)^2$, whereas the sum of the squares is $1^2+2^2+\cdots+n^2$.
- Hence, you need to calculate $(1+2+\cdots+n)^2-(1^2+2^2+\cdots+n^2)$.
- Once you are done, copy and paste the entire source code into the answer block below.

Q14. Solution)

```
public class QuadraticExample {
    public static void quadraticEquation(double a, double b, double c) {

        double determinant = b * b - 4 * a * c;
        double root1, root2;


        if (determinant > 0) {
            root1 = (-b + Math.sqrt(determinant))/(2*a);
            root2 = (-b - Math.sqrt(determinant))/(2*a);
            System.out.println("Two real and different roots: " +
                    root1 + " and " + root2);
        } else if (determinant == 0) {
            root1 = (-b)/(2*a);
            System.out.println("One real Root: " + root1);
        } else {
            double realpart = (-b)/(2*a);
            double imaginarypart = (Math.sqrt(-1 * determinant))/(2*a);
            System.out.println("Two complex roots: " + realpart + "+" +
                    imaginarypart + "j and " + realpart + "-" +
                    imaginarypart + "j");
        }
    }

    public static void main(String[] args) {
        quadraticEquation(1, 2, 0.5);
    }
}
```

```java
public class DifferenceofSquaresExample {
    1 usage
    public static void DifferenceOfSquaresCalculator( int n) {
    // write a static method DifferenceOfSquaresCalculator that accepts an integer input 'n'
    // and calculate the difference between the square of the sum and the sum of the squares
    // of the first n natural numbers. For example, the square of the sum of the first
    // ten natural numbers is (1 + 2 + ... + 10)² = 55² = 3025 and the sum of the squares
    // of the first ten natural numbers is 1² + 2² + ... + 10² = 385. Hence, the
    // difference between the square of the sum and the sum of the squares is 3025 - 385 = 2640
    // for n = 10.
    // Once the difference of squares is calculated, print out the difference.
    }

    public static void main(String[] args) {
        DifferenceOfSquaresCalculator( n: 10);
        //the output should be "The difference of Squares is 2640"
    }
}
```

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Question 16

10 pts

Create a static method named 'shouldWakeUp' that has 2 parameters. The first parameter is a boolean type and represents if the dog is currently barking or not. The second parameter is an integer type and represents the hour of the day (The range is between 0 and 23).

- If the dog is barking before 8 or after 22 hours, shouldWakeUp returns true.
- otherwise, it returns false. If the hour parameter is less than 0 or greater than 23, it also returns false.
- Once you are done, copy and paste the entire source code into the answer block below.

Q15. Solution)

```
public class DifferenceOfSquaresExample {

    public static int squareOfSums(int n){
        int sum = 0;
        for (int i = 0; i <= n; i++) {
            sum += i;
        }
        return sum * sum;
    }

    public static int sumOfSquares(int n){
        int sum = 0;
        for (int i = 0; i <= n; i++) {
            sum += i * i;
        }
        return sum;
    }

    public static void DifferenceofSquaresCalculator(int n){
            int diffSum = squareOfSums(n) - sumOfSquares(n);
            System.out.println("The difference of Square is " + diffSum);
        }

    public static void main(String[] args) {
        DifferenceofSquaresCalculator(10);
    }


}
```

```java
public class BarkingDogAlarm {
        public static void main(String[] args) {
            shouldWakeUp ( barking: true,  hourOfDay: 1);
            shouldWakeUp ( barking: false,  hourOfDay: 2);
            shouldWakeUp ( barking: true,  hourOfDay: 8);
            shouldWakeUp ( barking: true,  hourOfDay: -1);
        }
        4 usages
        public static boolean shouldWakeUp(boolean barking, int hourOfDay) {

        // Write a static method 'shouldWakeUp' that has 2 parameters.
        // The first parameter is a boolean type and represents if the dog is currently barking.
        // The second parameter is an integer type and represents the hour of the day (0 to 23)
        // If the dog is barking before 8 or after 22 hours, shouldWakeUp return true.
        // otherwise, it return false. If the hour parameter is less than 0 or greater than 23,
        // it return false.
        }
    }
```

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Question 17 15 pts

Write a class named 'Triangle' that has three private double parameters, which is the length of each sides for the given triangle. The class has a constructor that accepts three double parameters and two methods that can calculate the perimeter and area of the given triangle.

- The perimeter can be calculated as perimeter = side1 + side2 + side3.
- The area of the triangle can be calculated by Heron's Formula
  - First, denote s = (side1 + side2 + side3)/2.
  - Then, the area of the triangle is = $\sqrt{s \cdot (s - \text{side1}) \cdot (s - \text{side2}) \cdot (s - \text{side3})}$
- You may use Math.sqrt() to calculate the square root.
- Once you are done, copy and paste the entire source code into the answer block below.

Q16. Solution)

```
public class BarkingDogAlarm {
        public static void main(String[] args) {
            shouldWakeUp (true, 1);
            shouldWakeUp (false, 2);
            shouldWakeUp (true, 8);
            shouldWakeUp (true, -1);
        }

        public static boolean shouldWakeUp(boolean barking, int hourOfDay) {

            if (hourOfDay < 0 || hourOfDay >23) {
                System.out.println("False");
                return false;
            } else if ((barking == true) && (hourOfDay < 8 || hourOfDay > 22)) {
                System.out.println("True");
                return true;
            } else {
                System.out.println("False");
                return false;
            }

        }
    }
```

```java
class Triangle {
    no usages
    private double side1, side2, side3;

    // Create a Triangle class that accepts three double parameters
    // and calculate the perimeter and area of the given triangle.

    // Write a Constructor with three input parameters

    // Write two methods 1) getPerimeter that can calculate the perimeter
    // and 2) getArea that can calculate the area of the given triangle.
    // The area can be calculated using the Heron's Formula.
}

public class TriangleExample {

    public static void main(String[] args) {
        Triangle T1 = new Triangle(5, 5, 5);
        System.out.println("The area of the Triangle is " + T1.getArea());
        System.out.println("The perimeter of the Triangle is " + T1.getPerimeter());
        // The output should be as follows
        // The area of the Triangle is 10.825317547305483
        // The perimeter of the Triangle is 15.0
    }
}
```

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Question 18 5 pts

Write a Java program to print the odd numbers from 1 to 20.

- The output should be as follows; 1 3 5 7 9 11 13 15 17 19
- Once you are done, copy and paste the entire source code into the answer block below.

Q17. Solution)

```
class Triangle {
    private double side1, side2, side3;

    public Triangle(double side1, double side2, double side3) {
        this.side1 = side1;
        this.side2 = side2;
        this.side3 = side3;
    }

    public double getPerimeter() {
        return side1 + side2 + side3;
    }

    public double getArea(){
        double s = (side1 + side2 + side3)/2;
        return Math.sqrt(s * (s-side1) * (s-side2) * (s-side3));
    }


}

public class TriangleExample {

    public static void main(String[] args) {
        Triangle T1 = new Triangle(5, 5, 5);
        System.out.println("The area of the Triangle is " + T1.getArea());
        System.out.println("The perimeter of the Triangle is " + T1.getPerimeter());
    }
}
```

```java
public class OddSumExample {

    public static void main(String[] args) {

    // Write a Java program to print the odd numbers from 1 to 20
    // The output should be as follows; 1 3 5 7 9 11 13 15 17 19
        }
}
```

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Q18. Solution)

```
public class OddSumExample {

    short t = 100;
    int b = t;


    public static void main(String[] args) {
        for (int i = 1; i < 20; i++){
            if (i % 2 != 0 ){
                System.out.print(i + " ");
            }
        }
    }
}
```