SECTION A (20 Multiple Choice Questions. 20 Marks)

Each question has one correct answer. Write your answer in the space provided on the **Answer Sheet**. 1 mark for each correct answer and no penalty for wrong answer.

1. What is the minimum possible amount of memory space needed to store a boolean value?

    A. One bit.
    B. Two bits.
    C. One byte.
    D. Four bytes.
    E. The memory space is dependent on the machine architecture.

2. Which of the following statements is/are true about information hiding?

    i. Appropriate information hiding allows the implementer of a class to freely change the class internal details without the need to modify the client classes.
    ii. Appropriate information hiding hides the internal details so that implementation secrets can be protected from competitors.
    iii. Appropriate information hiding allows the public methods' names of a class to be modified without the need to change the internal details.
    iv. Information hiding in Java is enforced during compile-time and not during run-time.

    A. Only (i) and (iv).
    B. Only (ii) and (iii).
    C. Only (i) and (iii).
    D. Only (i).
    E. Only (iii).

3. Which of the following statements is/are true about symbolic constants?

    i. Using symbolic constants allows the program to use less memory during execution.
    ii. Using symbolic constants can make the program more readable.
    iii. Symbolic constants can be declared in a method.
    iv. A class constant must always be declared public.

    A. Only (ii).
    B. Only (i) and (ii).
    C. Only (ii) and (iii).
    D. Only (iii) and (iv).
    E. Only (ii) , (iii) and (iv).

4. What is the output of the following program fragment?

```
int i;
for ( i = 1; i < 4; i++ ) {
    int k = 0;
    k += i;
    System.out.print( k + ", " );
}
System.out.println( i );
```

A. 1, 1, 1, 4
B. 1, 2, 3, 3
C. 1, 2, 3, 4
D. 1, 2, 3, 4, 4
E. 1, 3, 6, 4

5. Which of the following statements is/are true about constructors?

   i.   A constructor must be named exactly the same as the class name which it is defined in.
   ii. A constructor must always return a value.
   iii. A constructor must not be defined after any other method definition in the class.
   iv. User can define a user-defined class without defining a constructor.

   A. Only (i).
   B. Only (i) and (ii).
   C. Only (iii) and (iv).
   D. Only (i) and (iv).
   E. Only (i) , (iii) and (iv).

6. What is the output of the following program fragment?

```
double a = 10; int b;
a = b = a / 4;
System.out.println( a + ", " + b );
```

A. 2.0, 2
B. 2.0, 3
C. 2.5, 2
D. 2.5, 3
E. It causes a compile-time error.

7. The following program fragment is supposed to output the 8-number sequence: 2 4 6 10 16 26 42 68. With the exception of the first two numbers, each number is the sum of the previous two. Complete the program fragment by choosing the correct expression to fill in the box.

```
int x1 = 0, x2 = 2, x3;

for ( int k = 0; k < 8; k++ ) {
    x3 = x1 + x2;  0+2

    [                    ]
    System.out.print( x3 + " " );
}
```

A. x3 = x2;   x2 = x1;

B. x2 = x3;   x1 = x2;

C. x2 = x1;   x3 = x2;

D. x1 = x2;   x2 = x3;

E. x1 = x3;   x3 = x2;

8. What is the output of the following program fragment?

```
for ( int i = 1; i <= 3; i++ )
    switch( 2 ) {
        case 1:  for ( int k = 1; k <= 3; k++ ) {
                    System.out.print( "A" );
                    break;
                }
        case 2:  System.out.print( "B" );
                 break;
        case 3:  System.out.print( "C" );
        default: System.out.print( "D" );
                 break;
    }
```

A. D

B. DABCD

C. DABBCD

D. DAAABCD

E. Program fragment causes compilation error.

9. In general, which of the following expressions is the correct way to test whether two floating-point variables, x and y, are approximately equal in value? The constant EPSILON is assumed to be defined as follows:

```
final double EPSILON = 1e-8;
```

A. x == y

B. x-y <= EPSILON

C. x <= y+EPSILON || x >= y-EPSILON

D. -EPSILON <= x-y && x-y <= EPSILON

E. -EPSILON <= x-y || x-y <= EPSILON

10. What are the values of s, t, and u respectively in the following separate statements?

i.   String s = "yes" + 2 + 3;
ii. String t = 2 + 3 + "yes";
iii. String u = 2 + 3 + 4;

A. (i) "yes23", (ii) "23yes", (iii) "234"

B. (i) "yes23", (ii) "5yes",   (iii) "9"

C. (i) "yes5",   (ii) "5yes",   (iii) Error

D. (i) "yes23", (ii) "23yes", (iii) Error

E. (i) "yes23", (ii) "5yes",   (iii) Error

11. What does the following method do?

```
public static String mystery( String s ) {
    String t = "";
    for ( int i = 0; i < s.length(); i++ )
        t = s.substring(i, i+1) + t;
    return t;
}
```

A. It returns a string that is the same as the input string.

B. It returns a string that is the reverse of the input string.

C. It returns a string made up of every other character in the input string.

D. It returns an empty string.

E. None of the above.

12. What is the output of the following program fragment?

```
int a = 3, b = 2, c = 5, t = 0;
int x = ( (t=(a<b)? a:b) < c )? t:c;
System.out.println( x );
```

    A. 0

    B. 2

    C. 3

    D. 5

    E. An error occurs.

13. What is the value of x?

```
String s = "I Love Java and Java Loves me.";
int x = s.substring(s.indexOf("J"),s.length()).indexOf("J");
```

    A. 0

    B. 1

    C. 7

    D. 9

    E. 16

14. What is the output of the following program fragment?

```
class Silly
{
    static int f(int a) {
        return a++;
    }

    public static void main(String[] args) {
        int a = 10;
        f( a = f(a = f(a)) );
        System.out.println(a);
    }
}
```

    A. 10

    B. 11

    C. 12

    D. 13

    E. The class definition causes compile-time error.

15. Given the following program:

```java
import java.util.*;

class Inputs {

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

        System.out.print( "Enter your name: " );
        String n = sc.next();
        System.out.print( "Enter your age: " );
        int a = sc.nextInt();
        System.out.print( "Enter your height (in cm): " );
        double h = sc.nextDouble();

        System.out.println( n + ", " + a + ", " + h );
    } // main
} // Inputs
```

What is the output produced by the last statement if the user's inputs are

```
John Smith<ENTER>
25 176<ENTER>
175.5<ENTER>
```

where <ENTER> indicates where the user presses the Enter key on the keyboard?

A. Program causes run-time error because there are too many inputs.
B. Program causes run-time error because some input is of the wrong data type.
C. John Smith, 25, 176.0
D. John Smith, 25, 175.5
E. John, 25, 175.5

[handwritten: 1 < 100 =) 1+99]
[handwritten: 2 < 99 =) 2+98]
[handwritten: 3 < 98 =) 3+97]

16. What is the output of the following code fragment?

```java
int i = 0, j = 100, s = 0;

while ( ++i < j )
    s += i + j;

System.out.println(i + ", " + j + ", " + s);
```

A. 50, 50, 5000
B. 50, 50, 5050
C. 51, 49, 5000
D. 51, 49, 5050
E. 51, 50, 5000

[handwritten: 50<51, 4900]
[handwritten: 51<50, 5000]

17. Given the following valid program fragment:

```
int a = 4;
int result = square(a);
```

Which of the following codes is a valid implementation of the `square` method?

A. ```
   static int square(int a) {
       return Math.pow(a,2);
   }
   ```

B. ```
   static double square(double a) {
       return Math.pow(a,2);
   }
   ```

C. ```
   static int square(double a) {
       return (int) Math.pow((int)a,2);
   }
   ```

D. ```
   static double square(int a) {
       return (double) Math.pow((double)a,2.0);
   }
   ```

E. None of the above.

18. Given the following class definitions of D1 and D2:

```
class D1 {                    class D2 {
    public int y;                 public void fff( D1 d1 ) {
                                      d1.y = 5;
    public D1( int i ) {              d1 = new D1( 3 );
        y = i;                        System.out.print( d1.y );
    }                             }
}                             }
```
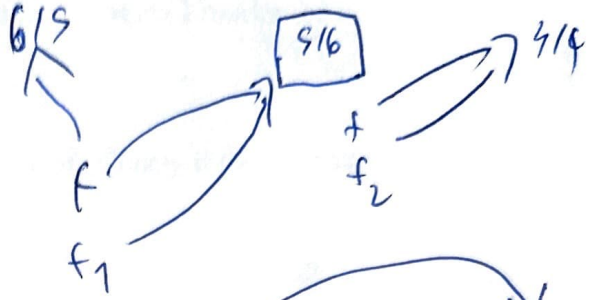
What is the output of the following program fragment?

```
D1 d1 = new D1( 2 );
D2 d2 = new D2();
System.out.print( d1.y );
d2.fff( d1 );
System.out.print( d1.y );
```

A. 255

B. 233

C. 252

D. 232

E. 235

19. Given three boolean variables x, y and z, which of the following expressions is true when all three variables have the same boolean value?

A. x && y && z

B. x || y || z

C. x == y == z

D. (x && y && z) || !(x || y || z)

E. None of the above.

20. What is the output of the following program?

```java
class Fraction
{
    private int num, den;

    public Fraction (int num, int den) {
        this.num = num; this.den = den;
    }

    public String toString() {
        return this.num + "/" + this.den;
    }

    static void swap1(Fraction f1, Fraction f2) {
        Fraction temp = f1; f1 = f2; f2 = temp;
        swap2(f1); swap2(f2);
    }

    static void swap2(Fraction f) {
        f = new Fraction(f.den, f.num);
    }

    public static void main (String[] args) {
        Fraction f1 = new Fraction(3,4),
                 f2 = new Fraction(5,6);

        swap1(f1,f2);
        System.out.println("f1 = " + f1 + ", f2 = " + f2);
    }
}
```
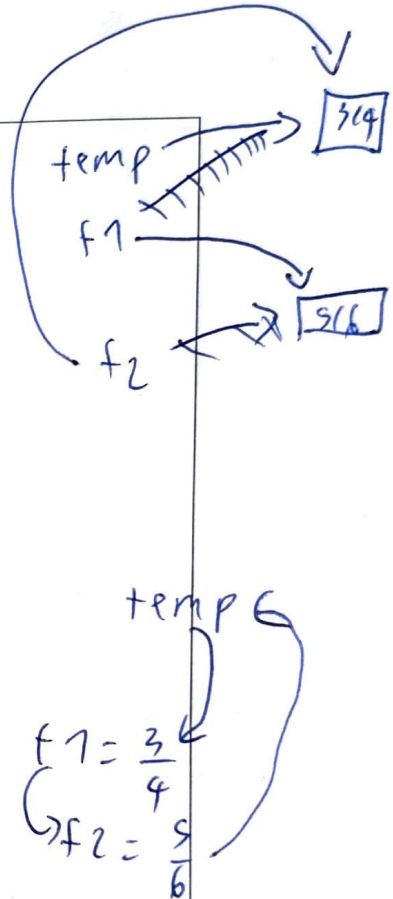
A. f1 = 3/4, f2 = 5/6

B. f1 = 5/6, f2 = 3/4

C. f1 = 4/3, f2 = 6/5

D. f1 = 6/5, f2 = 4/3

E. None of the above.

SECTION B (5 Questions. 10 Marks)

Write your answer in the space provided on the **Answer Sheet**. 2 marks for each correct answer.

21. Write a public static method, `isEmpty`, that returns true if and only if the input string parameter is an <u>empty string</u>.

22. Without using any selection construct (i.e. `if`, `if..else`, `switch..case`, and `?:` operator), rewrite the following code fragment.

```
if (f)
    return true;
else if (g)
    return true;
else if (h)
    return true;
else
    return false;
```

23. Assume that you are given the following method that finds the greatest common divisor (GCD) of two integers *m* and *n*.

```
public static int gcd(int m, int n) {
    . . .
}
```

Write an *overloaded* method that finds the GCD of *three* integers. Do not write more than 3 statements in your method body.

24. Write a public static method, `triangle`, that takes in a positive integer parameter *n*, and prints to the standard output a triangle made up of "*", and each side of the triangle has *n* "*". For example, `triangle(3)` prints out

```
*
**
***
```

and `triangle(5)` prints out

```
*
**
***
****
*****
```

Do not write any other helper method.

25. Write a public static method, remainder, that returns the remainder when the first integer parameter is divided by the second integer parameter. For example, remainder(11,3) returns the integer 2. Do not use the %, %=, / or /= operators, do not use any method in the Math class, and do not declare any local variable in the method. Assume that both parameters are positive.

———— END OF PAPER ————

27: public static boolean isEmpty (String s){
    if (~~~~~~~~ s.trim()equal("")) returntrue;
    return false ;
    }

X

24:

Public static void triangle(int n){
    for(int i=0; i<n; i++){
        for (int j =0 ; j < i; j++){sout "x
        System.out.Println ("* ");
    }
    System.out.Print ("\n");
}
}

25

Publicstatic int remainder(int i, int i2{
    ~~return i-(i/i2);~~
    return i- (i-(i/i2));
    }