UNIVERSITY OF ENGINEERING AND TECHNOLOGY, TAXILA

SOFTWARE ENGINEERING

OOP-LAB 4

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COURSE: OOP-LAB

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TASK-1

Write a Java Program to find the result of the following Expressions.

(Assume a=10 and b=5).

i   **(a<<2)+(b>>2)**
ii   **(b>0)**
iii   **(a+b*100)/10**
iv   **a&b**

PROGRAM FOR ALL 4 PARTS

```java
package lab4;
public class Lab4_task1 {
public static void main(String[] args) {
    int a=10;
    int b=5;
        //PART-1
        //creating int variables where left and right shifts are
calculated
        int shift_left=a<<2;
        int shift_right=b>>2;
        int sum=shift_left+shift_right;
        System.out.println("(a<<2)+(b>>2)="+sum);

            //PART-2
            boolean answ=(b>0);
            System.out.println("(b>0)="+answ);
                //PART-3
                System.out.println("(a+b*100)/10="+(a+b*100)/10);

                //PART-4
                System.out.println("a&b="+(a&b));
}
}
```

```java
1 package lab4;
2 public class Lab4_task1 {
3 public static void main(String[] args) {
4     int a=10;
5     int b=5;
6         //PART-1
7         //creating int variables where left and right shifts are calculated
8         int shift_left=a<<2;
9         int shift_right=b>>2;
10        int sum=shift_left+shift_right;
11        System.out.println("(a<<2)+(b>>2)="+sum);
12
13            //PART-2
14            boolean answ=(b>0);
15            System.out.println("(b>0)="+answ);
16                //PART-3
17                System.out.println("(a+b*100)/10="+(a+b*100)/10);
18
19                //PART-4
20                System.out.println("a&b="+(a&b));
21 }
22 }
```

Problems @ Javadoc 📖 Declaration 🖥 Console × 📃 Coverage
<terminated> Lab4_task1 [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (Oct 16, 2021, 9:41:59 AM – 9:42:02 AM)

```
(a<<2)+(b>>2)=41
(b>0)=true
(a+b*100)/10=51
a&b=0
```

EXPLANATION

Part-1 (a<<2)+(b>>2)

In order to find left shift and right shift

- first convert a and b into binary
  we have
  a=10
  b=5
  Now in binary form we will have
  a=00001010
  b=00000101

  than in order to find (a<<2) ,for this we have to move bits of a to left side on 2 specified positions
  than left shift of a 2 times would be:
  (a<<2)=00101000

  Than in order to find (b>>2),for this we have to move bits of b to the right side upto 2 specified posiitions

  Right shift of b 2 times would be :
  (b>>2)=00000001

Now adding both (a<<2) and (b>>2)

(a<<2)=00101000
(b>>2)=00000001
(a<<2)+(b>>2)=00101001

Now converting the result form (a<<2)+(b>>2) into the decimal form

=0*27 + 0*26 + 1*25 + 0*24 + 1*23 + 0*22 + 0*21 + 1*20

=0+0+32+0+8+0+0+1=41

Part-2   (b>0)

In this statement as we know that b=5 is greater than 0 ,so that's why expression b>0 gives the true answer.

Part-3   (a+b*100)/10

First we have to calculate b*100 so b=5 and

5*100=500

And than it solves parenthesis so a+500

10+500=510

And at last we divide the answer by 10

510/10=51

Part-4   a&b

In order to solve a&b we have to first convert a and b into binary form.

a&b would be

a=00001010

b=00000101

a&b=00000000

TASK-2

Find the result of following expressions.

Part-1 a & (-a);

```java
package lab4;

public class Lab4_task2 {
    public static void main(String[] args)
    {
    int a=5;
    int b=4;
    int answer= a&(-a);
    System.out.println("a&(-a) = " + answer);
}

}
```

```java
package lab4;

public class Lab4_task2 {
    public static void main(String[] args)
    {
    int a=5;
    int b=4;
    int answer= a&(-a);
    System.out.println("a&(-a) = " + answer);
}
}
```

Problems @ Javadoc Declaration Console × Coverage
<terminated> Lab4_task2 [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (Oct 17, 2021, 9:45:06 PM – 9:45:07 PM)

```
a&(-a) = 1
```

EXPLANATION

First convert a into the binary form.

5=00000101

and binary for -a would be
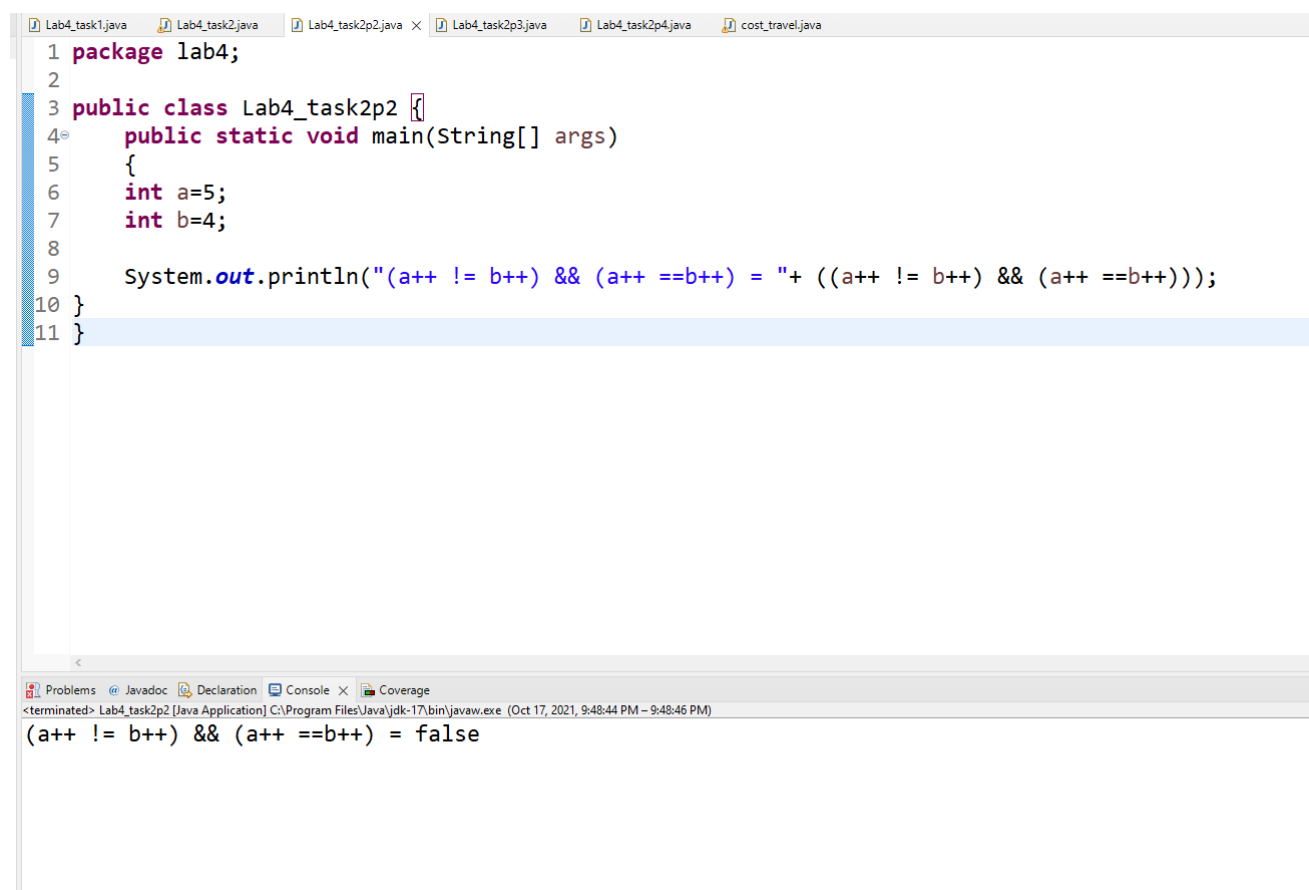
-5=11111011

Now

    a=00000101

    -a=11111011

a&(-a)=00000001

Part-2   (a++ != b++) && (a++ ==b++)

```java
package lab4;

public class Lab4_task2p2 {
    public static void main(String[] args)
    {
    int a=5;
    int b=4;

    System.out.println("(a++ != b++) && (a++ ==b++) = "+ ((a++ != b++)
&& (a++ ==b++)));
}

}
```

```
Lab4_task1.java    Lab4_task2.java    Lab4_task2p2.java ×  Lab4_task2p3.java    Lab4_task2p4.java    cost_travel.java
 1 package lab4;
 2
 3 public class Lab4_task2p2 {
 4⊖     public static void main(String[] args)
 5     {
 6     int a=5;
 7     int b=4;
 8
 9     System.out.println("(a++ != b++) && (a++ ==b++) = "+ ((a++ != b++) && (a++ ==b++)));
10 }
11 }
```

```
Problems  @ Javadoc  Declaration  Console ×  Coverage
<terminated> Lab4_task2p2 [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe  (Oct 17, 2021, 9:48:44 PM – 9:48:46 PM)
(a++ != b++) && (a++ ==b++) = false
```

EXPLANATION

Here in first bracket we compare a and b in such away that a not equal to b which is not true,

Than increment both a and b by 1 and now a becomes 6 and b becomes 5

In 2nd bracket we have that a is equal to b,but it is false and then increment both a and b by 1,now a becomes 7 and b becomes 6.
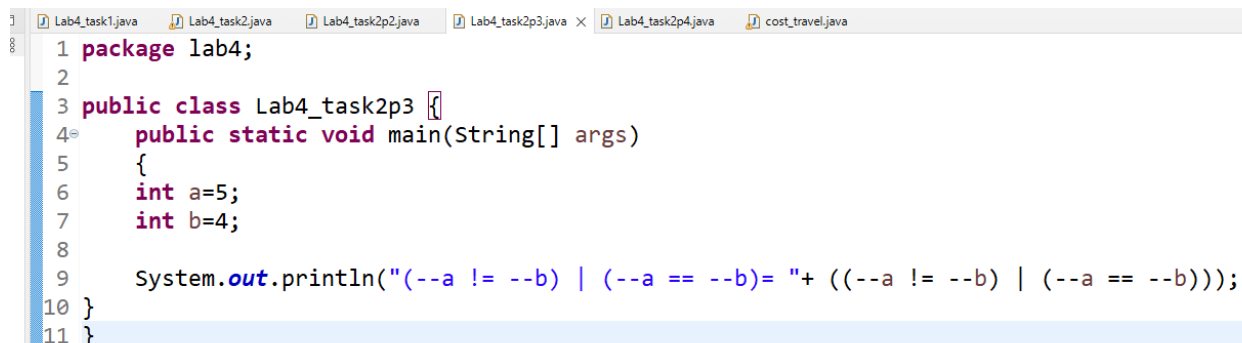
As && is short-circuit AND operator ,which means it will show false if it find any false operation.

So the final result is false.

Part-3 (--a != --b) | (--a == --b)

```
package lab4;

public class Lab4_task2p3 {
    public static void main(String[] args)
    {
    int a=5;
    int b=4;

    System.out.println("(--a != --b) | (--a == --b)= "+ ((--a != --b) |
(--a == --b)));
}
}
```



```
1 package lab4;
2
3 public class Lab4_task2p3 {
4     public static void main(String[] args)
5     {
6     int a=5;
7     int b=4;
8
9     System.out.println("(--a != --b) | (--a == --b)= "+ ((--a != --b) | (--a == --b)));
10 }
11 }
```

Problems @ Javadoc Declaration Console × Coverage
<terminated> Lab4_task2p3 [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (Oct 17, 2021, 9:51:32 PM – 9:51:34 PM)
(--a != --b) | (--a == --b)= true

EXPLANATION

In this expression in 1st bracket ,we have pre increments in both a and b ,hence a becomes 4 and b becomes 3,than by checking condition of not equal which is true in this case.

In 2nd bracket,we perform pre decrement operation on both a and b ,hence a becomes 4 and b becomes 3,tha by checking confdition of equal to which is false in this case.

OR operation in this expression is true on the left side and false on the right side .hence final result is true.

Part-4   (a < 0 ? -a : a)

```
package lab4;

public class Lab4_task2p4 {
     public static void main(String[] args)
     {
     int a=5;
     int b=4;

     System.out.println(" (a < 0 ? -a : a) ="+ ((a < 0 ? -a : a)));
}
}
```

```
 Lab4_task1.java    Lab4_task2.java    Lab4_task2p2.java    Lab4_task2p3.java    Lab4_task2p4.java ×   cost_travel.java
  1 package lab4;
  2
  3 public class Lab4_task2p4 {
  4⊖     public static void main(String[] args)
  5     {
  6         int a=5;
  7         int b=4;
  8
  9         System.out.println(" (a < 0 ? -a : a) ="+ ((a < 0 ? -a : a)));
 10 }
 11 }
```

```
 Problems  @ Javadoc  Declaration  Console ×  Coverage
<terminated> Lab4_task2p4 [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (Oct 17, 2021, 9:55:07 PM – 9:55:08 PM)
 (a < 0 ? -a : a) =5
```

EXPLANATION

In this expression of conditional operator ,it works similar to the if-else stataement:
 First if will check the condition a<0.
If above condition is true it will assign the a to -a
Otherwise it will assign a to a.

In our given value of a which is
      a=5
here a is greater than 0 so condition is false and it assigns a to a.

TASK-3

Convert a negative integer -37 into a binary form. (Do it on paper).

Task - 3

Convert -37 to Binary form.

First lets factorize 37

2	37
2	18 - 1
2	9 - 0
2	4 - 1
2	2 - 0
	1 - 0

= 100101

In Complete byte it would be

= 00100101

Now, find 2's complement representation

00100101

11011010   1's complement

+1
_____

11011011   2's complement

Now,

$-37 = (11011011)_2$