Министерство образования и науки, молодежи и спорта Украины

ГВУЗ "Донецкий национальный технический университет"

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Лабораторная работа №1

по курсу " Введение в программирование на Java"

по теме Операторы в Java "

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Задание на лабораторную работу

Необходимо в основном классе Java - программы создать:

1. 9 методов (один оператор по варианту задания – один метод).
2. 5 методов для проверки приоритетов (методы, в которых используется одновременно два разных оператора – например, «a+b*c» - результат вычисления зависит от приоритета).
3. 5 методов для проверки ассоциативности (методы, в которых один и тот же оператор используется дважды, и результат зависит от порядка выполнения операторов. Например: «a-b-c» - результат зависит от того, вычисляется ли сначала a-b или b-c).
4. 10 методов тестирования. Для каждого метода тестирования провести минимум 3 теста.

Вариант	Операторы								
	арифметические			битовые		отношения	логические		
	1	2	3	4	5	6	7	8	9
3	+	%	-=	|	^=	>	^	!	^=

Ручной расчёт результата работы программы для всех тестов.

a + b % c === 10 + 12 % 8 === 14

a -= b + c === 10 -= 12 + 8 === -10

a ^= b | c === 10 ^= 12 | 8 === 6

a + b % c === 11 + 13 % 9 === 15

a -= b + c === 11 -= 13 + 9 === -11

a ^= b | c === 11 ^= 13 | 9 === 6

a + b % c === 12 + 14 % 10 === 16

a -= b + c === 12 -= 14 + 10 === -12

a ^= b | c === 12 ^= 14 | 10 === 2

a + b % c === 13 + 15 % 11 === 17

a -= b + c === 13 -= 15 + 11 === -13

a ^= b | c === 13 ^= 15 | 11 === 2

a + b % c === 14 + 16 % 12 =18

a -= b + c === 14 -= 16 + 12 === -14

a ^= b | c === 14 ^= 16 | 12 === 18

a + b % c === 15 + 17 % 13 === 19

a -= b + c === 15 -= 17 + 13 === -15

a ^= b | c === 15 ^= 17 | 13 === 18

a ^= b ^ c === 1 ^= 0 ^ 0 === true

a ^= !b ^ !c === 1 ^= !0 ^ !0 === true

a ^= b ^ c === 0 ^= 0 ^ 1 === true

a ^= !b ^ !c === 0 ^= !0 ^ !1 === true

a ^= b ^ c === 1 ^= 1 ^ 0 === false

a ^= !b ^ !c === 1 ^= !1 ^ !0 === false

a ^= b ^ c === 1 ^= 1 ^ 1 === true

a ^= !b ^ !c === 1 ^= !1 ^ !1 === true

a ^= b ^ c === 0 ^= 0 ^ 0 === false

a ^= !b ^ !c === 0 ^= !0 ^ !0 === false

a % b % c === 10 % 12 % 5 === 0

a -= b -= c === 10 -= 12 -= 5 === 3

a ^= b ^= c === 10 ^= 12 ^= 5 === 3

a % b % c === 11 % 13 % 6 === 5

a -= b -= c === 11 -= 13 -= 6 === 4

a ^= b ^= c === 11 ^= 13 ^= 6 === 0

a % b % c === 12 % 14 % 7 === 5

a -= b -= c === 12 -= 14 -= 7 === 5

a ^= b ^= c === 12 ^= 14 ^= 7 === 5

a % b % c === 13 % 15 % 8 === 5

a -= b -= c === 13 -= 15 -= 8 === 6

a ^= b ^= c === 13 ^= 15 ^= 8 === 10

a % b % c === 14 % 16 % 9 === 5

a -= b -= c === 14 -= 16 -= 9 === 7

a ^= b ^= c === 14 ^= 16 ^= 9 === 23

a % b % c === 15 % 17 % 10 === 5

a -= b -= c === 15 -= 17 -= 10 === 8

a ^= b ^= c === 15 ^= 17 ^= 10 === 20

a ^= b ^ c === 1 ^= 0 ^ 0 === true

a ^= b ^= c === 1 ^= 0 ^= 0 === true

a ^= b ^ c === 0 ^= 0 ^ 1 === true

a ^= b ^= c === 0 ^= 0 ^= 1 === true

a ^= b ^ c === 1 ^= 1 ^ 0 === false

a ^= b ^= c === 1 ^= 1 ^= 0 === false

a ^= b ^ c === 1 ^= 1 ^ 1 true

a ^= b ^= c === 1 ^= 1 ^= 1 === true

a ^= b ^ c === 0 ^= 0 ^ 0 === false

a ^= b ^= c === 0 ^= 0 ^= 0 === false

5+8 === 13

5%2 === 1

5-=8 === -3

5|8 === 13

5^=8 === 13

5 > 8 === false

6+9 === 15

6%3 === 0

6-=9 === -3

6|9 === 15

6 ^=9 === 15

6 > 9 === false

7 + 10 === 17

7 % 4 === 3

7-=10 === -3

7|10 === 15

7 ^=10 === 13

7 > 10 === false

8+11 === 19

8%5 === 3

8-=11 === -3

8|11 === 11

8^=11 === 3

8>11 === false

1 ^ 1 === false

1 ^=1 === false

1 ^=1 === false

1 ^ 0 === true

1 ^= 0 === true

1 ^= 0 ===   true

0 ^ 1 === true

0 ^= 1 === true

0 ^= 1 === true

0 ^ 0 === false

0 ^= 0 ===   false

0 ^= 0 ===   false

1 === false

0 === true

Распечатка программы

```
package lab.yegorov;

public class Main {
    public static void main(String args[]) {

        for(int a = 10; a < 16; ++a) {
            priorityTest1(a, a + 2, a - 2);
            priorityTest2(a, a + 2, a - 2);
            priorityTest3(a, a + 2, a - 2);
    }

        priorityTest4(true, false, false);
        priorityTest5(true, false, false);

        priorityTest4(false, false, true);
        priorityTest5(false, false, true);

        priorityTest4(true, true, false);
        priorityTest5(true, true, false);

        priorityTest4(true, true, true);
        priorityTest5(true, true, true);

        priorityTest4(false, false, false);
        priorityTest5(false, false, false);


        for(int a = 10; a < 16; ++a) {
            associativityTest1(a, a + 2, a - 5);
            associativityTest2(a, a + 2, a - 5);
            associativityTest3(a, a + 2, a - 5);
        }

        associativityTest4(true, false, false);
        associativityTest5(true, false, false);

        associativityTest4(false, false, true);
        associativityTest5(false, false, true);

        associativityTest4(true, true, false);
        associativityTest5(true, true, false);

        associativityTest4(true, true, true);
        associativityTest5(true, true, true);

        associativityTest4(false, false, false);
        associativityTest5(false, false, false);

        for(int a = 5; a < 9; ++a) {
            addTest(a, a+3);
            modTest(a, a-3);
            assignmentWithSubtractionTest(a, a+3);
            orTest(a, a+3);
            xorWithAssignmentTest(a, a+3);
            moreTest(a, a+3);
        }

        boolXorTest(true, true);
        boolXorWithAssignmentTest(true, true);
        boolXorWithAssignmentTest2(true, true);
        boolXorTest(true, false);
        boolXorWithAssignmentTest(true, false);
        boolXorWithAssignmentTest2(true, false);

        boolXorTest(false, true);
        boolXorWithAssignmentTest(false, true);
        boolXorWithAssignmentTest2(false, true);

        boolXorTest(false, false);
        boolXorWithAssignmentTest(false, false);
        boolXorWithAssignmentTest2(false, false);

        boolNotTest(true);
        boolNotTest(false);

    }
    public static int add(int a, int b) {
        return a + b;
    }
    public static int mod(int a, int b) {
        return a % b;
    }
    public static int assignmentWithSubtraction(int a, int b) {
        return a -= b;
    }
    public static int or(int a, int b) {
        return a | b;
    }
    public static int xorWithAssignment(int a, int b) {
        return a ^= b;
    }
    public static boolean more(int a, int b) {
        return a > b;
    }
    public static boolean boolXor(boolean a, boolean b) {
        return a ^ b;
    }
    public static boolean boolNot(boolean a) {
        return !a;
    }
    public static boolean boolXorWithAssignment(boolean a, boolean b) {
        return a ^= b;
    }

    //-------//

    public static void priorityTest1(int a, int b, int c) {
        int t;
        if((t = add(a,mod(b,c))) == (a + b % c))
            System.out.println("Priority operators \"a + b % c\" "+ t +" is work!");
        else
            System.out.println("Priority operators \"a + b % c\" not working correctly!");
    }

    public static void priorityTest2(int a, int b, int c) {
        int t;
        if((t = assignmentWithSubtraction(a, add(b, c))) == (a -= b + c))
            System.out.println("Priority operators \"a -= b + c\" "+ t +" is work!");
        else
            System.out.println("Priority operators \"a -= b + c\" not working
correctly!");
    }

    public static void priorityTest3(int a, int b, int c) {
        int t;
        if((t = xorWithAssignment(a, or(b, c))) == (a ^= b | c))
            System.out.println("Priority operators \"a ^= b | c\" "+ t +" is work!");
        else
            System.out.println("Priority operators \"a ^= b | c\" not working
correctly!");
    }

    public static void priorityTest4(boolean a, boolean b, boolean c) {
        boolean t;
        if((t = boolXorWithAssignment(a, boolXor(b, c))) == (a ^= b ^ c))
            System.out.println("Priority operators \"a ^= b ^ c\" "+ t +" is work!");
        else
            System.out.println("Priority operators \"a ^= b ^ c\" not working
correctly!");
    }

    public static void priorityTest5(boolean a, boolean b, boolean c) {
        boolean t;
        if((t = boolXorWithAssignment(a, boolXor(boolNot(b), boolNot(c)))) == (a ^= !b ^
!c))
            System.out.println("Priority operators \"a ^= !b ^ !c\" "+ t +" is work!");
        else
            System.out.println("Priority operators \"a ^= !b ^ !c\" not working
correctly!");
    }

    //-----//

    public static void associativityTest1(int a, int b, int c) {
        int t;
        if((t = mod(mod(a, b), c)) == (a % b % c))
            System.out.println("Associativity operators \"a % b % c\" "+ t +" is work!");
        else
            System.out.println("Associativity operators \"a % b % c\" not working
correctly!");
    }

    public static void associativityTest2(int a, int b, int c) {
        int t;
        if((t = assignmentWithSubtraction(a, assignmentWithSubtraction(b, c))) == (a -= b
-= c))
            System.out.println("Associativity operators \"a -= b -= c\" "+ t +" is
work!");
        else
            System.out.println("Associativity operators \"a -= b -= c\" not working
correctly!");
    }

    public static void associativityTest3(int a, int b, int c) {
        int t;
        if((t = xorWithAssignment(a, xorWithAssignment(b, c))) == (a ^= b ^= c))
            System.out.println("Associativity operators \"a ^= b ^= c\" "+ t +" is
work!");
        else
            System.out.println("Associativity operators \"a ^= b ^= c\" not working
correctly!");
    }

    public static void associativityTest4(boolean a, boolean b, boolean c) {
        boolean t;
        if((t = boolXor(boolXor(a, b), c)) == (a ^ b ^ c))
            System.out.println("Associativity operators \"a ^= b ^ c\" "+ t +" is work!");
        else
            System.out.println("Associativity operators \"a ^= b ^ c\" not working
correctly!");
```

```
    }

    public static void associativityTest5(boolean a, boolean b, boolean c) {
        boolean t;
        if((t = boolXorWithAssignment(a, boolXorWithAssignment(b, c))) == (a ^= b ^= c))
            System.out.println("Associativity operators \"a ^= b ^= c\" "+ t +" is
work!");
        else
            System.out.println("Associativity operators \"a ^= b ^= c\" not working
correctly!");
    }

    //-----//

    public static void addTest(int a, int b) {
        int t;
        if((t = add(a, b)) == (a + b))
            System.out.println("Method \"add\" "+ t +" is work!");
        else
            System.out.println("Method \"add\" not working correctly!");
    }

    public static void modTest(int a, int b) {
        int t;
        if((t = mod(a, b)) == (a % b))
            System.out.println("Method \"mod\" "+ t +" is work!");
        else
            System.out.println("Method \"mod\" not working correctly!");
    }

    public static void assignmentWithSubtractionTest(int a, int b) {
        int t;
        if((t = assignmentWithSubtraction(a,b)) == (a -= b))
            System.out.println("Method \"assignmentWithSubtraction\" "+ t +" is work!");
        else
            System.out.println("Method \"assignmentWithSubtraction\" "+ t +" is work!");
    }

    public static void orTest(int a, int b) {
        int t;
        if((t = or(a, b)) == (a | b))
            System.out.println("Method \"or\" "+ t +" is work!");
        else
            System.out.println("Method \"or\" not working correctly!");
    }

    public static void xorWithAssignmentTest(int a, int b) {
        int t;
        if((t = xorWithAssignment(a, b)) == (a ^= b))
            System.out.println("Method \"xorWithAssignment\" "+ t +" is work!");
        else
            System.out.println("Method \"xorWithAssignment\" not working correctly!");
    }

    public static void moreTest(int a, int b) {
        boolean t;
        if((t = more(a, b)) == (a > b))
            System.out.println("Method \"more\" "+ t +" is work!");
        else
            System.out.println("Method \"more\" not working correctly!");
    }

    public static void boolXorTest(boolean a, boolean b) {
        boolean t;
        if((t = boolXor(a, b)) == (a ^ b))
```

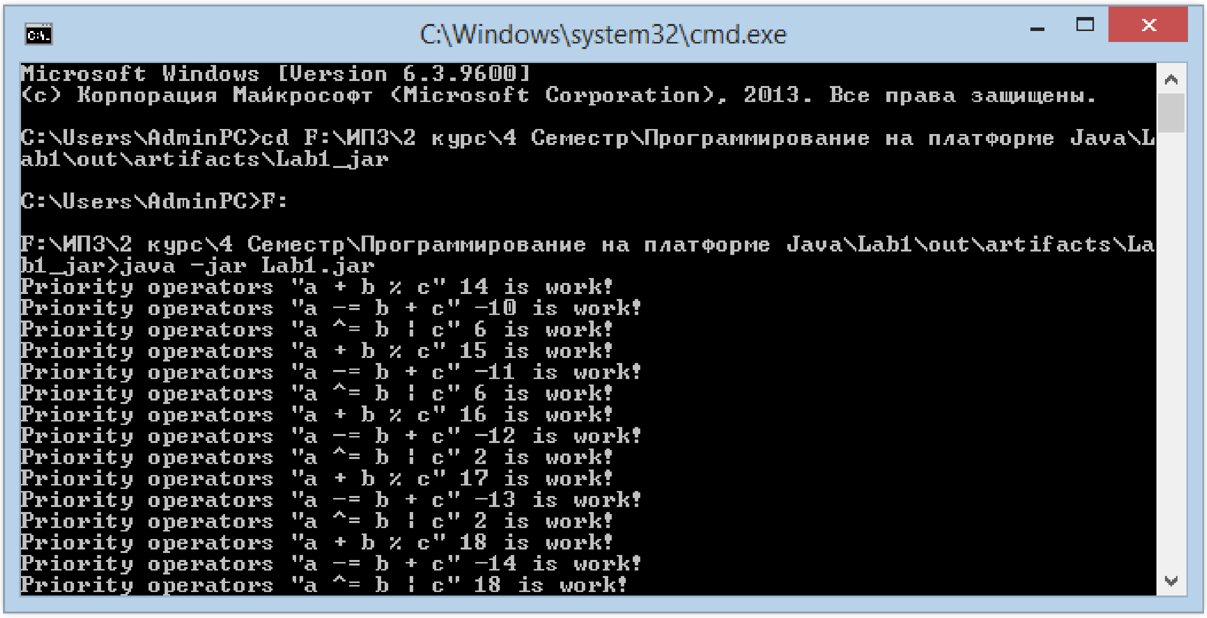
```
            System.out.println("Method \"boolXor\" "+ t +" is work!");
        else
            System.out.println("Method \"boolXor\" not working correctly!");
    }

    public static void boolNotTest(boolean a) {
        boolean t;
        if((t = boolNot(a)) == (!a))
            System.out.println("Method \"boolNot\" "+ t +" is work!");
        else
            System.out.println("Method \"boolNot\" not working correctly!");
    }

    public static void boolXorWithAssignmentTest(boolean a, boolean b) {
        boolean t;
        if((t = boolXorWithAssignment(a, b)) == (a ^= b))
            System.out.println("Method \"boolXorWithAssignment\" "+ t +" is work!");
        else
            System.out.println("Method \"boolXorWithAssignment\" not working correctly!");
    }

    public static void boolXorWithAssignmentTest2(boolean a, boolean b) {
        boolean t;
        if((t = boolXorWithAssignment(b, a)) == (b ^= a))
            System.out.println("Method \"boolXorWithAssignment\" "+ t +" is work!");
        else
            System.out.println("Method \"boolXorWithAssignment\" not working correctly!");
    }
}
```

Экранные формы



```
Microsoft Windows [Version 6.3.9600]
(c) Корпорация Майкрософт (Microsoft Corporation), 2013. Все права защищены.

C:\Users\AdminPC>cd F:\ИПЗ\2 курс\4 Семестр\Программирование на платформе Java\L
ab1\out\artifacts\Lab1_jar

C:\Users\AdminPC>F:

F:\ИПЗ\2 курс\4 Семестр\Программирование на платформе Java\Lab1\out\artifacts\La
b1_jar>java -jar Lab1.jar
Priority operators "a + b % c" 14 is work!
Priority operators "a -= b + c" -10 is work!
Priority operators "a ^= b | c" 6 is work!
Priority operators "a + b % c" 15 is work!
Priority operators "a -= b + c" -11 is work!
Priority operators "a ^= b | c" 6 is work!
Priority operators "a + b % c" 16 is work!
Priority operators "a -= b + c" -12 is work!
Priority operators "a ^= b | c" 2 is work!
Priority operators "a + b % c" 17 is work!
Priority operators "a -= b + c" -13 is work!
Priority operators "a ^= b | c" 2 is work!
Priority operators "a + b % c" 18 is work!
Priority operators "a -= b + c" -14 is work!
Priority operators "a ^= b | c" 18 is work!
```