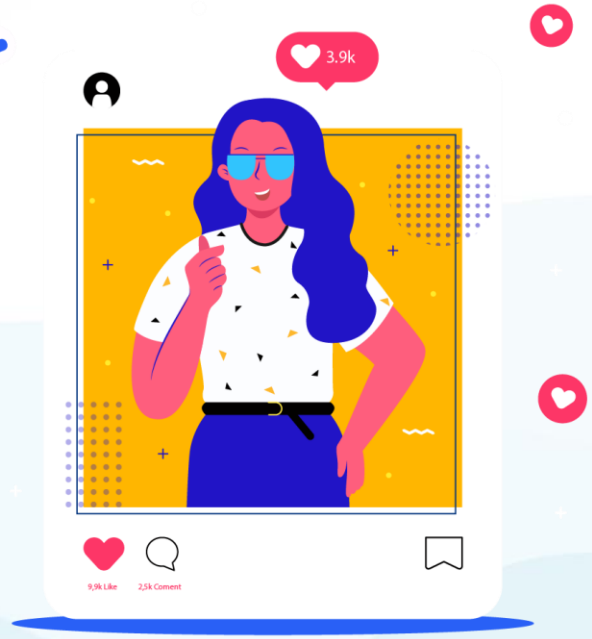
PROGRAM STUDI
SISTEM INFORMASI
FAKULTAS ILMU KOMPUTER
UNIVERSITAS DIAN NUSWANTORO

MATA KULIAH
PEMROGRAMAN BERORIENTASI OBYEK



OPERATOR

-penyusun-

Team penyusun matkul PBO

2021

Capaian Pembelajaran

Mahasiswa dapat memahami berbagai macam operator dan mampu menggunakannya pada bahasa pemrograman java.

Kemampuan Akhir yang Diharapkan

- Mahasiswa memiliki kemampuan menjelaskan tentang operator dan menyebutkan jenis operator yang dapat digunakan di program Java
- Mahasiswa memiliki kemampuan mempraktekkan penggunaan operator menggunakan bahasa pemrograman Java

Java Operators

Operator di Java adalah simbol yang digunakan untuk melakukan operasi.
Misalnya: +, -, *, / dll.

Jenis operator pada Java sebagai berikut :

- Unary Operator,
- Arithmetic Operator,
- Shift Operator,
- Relational Operator,
- Bitwise Operator,
- Logical Operator,
- Ternary Operator and
- Assignment Operator.

Java Operator Precedence

Operator Type	Category	Precedence
Unary	postfix	*expr++ expr--*
	prefix	*++expr --expr +expr -expr ~ !*
Arithmetic	multiplicative	* / %
	additive	+ -
Shift	shift	<< >> >>>
Relational	comparison	< > <= >= instanceof
	equality	== !=
Bitwise	bitwise AND	&
	bitwise exclusive OR	^
	bitwise inclusive OR	|
Logical	logical AND	&&
	logical OR	||
Ternary	ternary	? :
Assignment	assignment	= += -= *= /= %= &= ^= |= <<= >>= >>>=

Assignment Operator

Operator penugasan Java adalah salah satu operator yang paling umum.
Digunakan untuk menetapkan nilai di sebelah kanannya ke operand disebelah kirinya.

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
&=	x &= 3	x = x & 3
|=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Assignment Operator

```
public class Main {
    public static void main(String[] args) {
        int x = 5;
        x += 3;
        System.out.println(x);    // 8
    }
}
```

```
public class Main {
    public static void main(String[] args) {
        int x = 5;
        x &= 3;
        System.out.println(x);  // 1
    }
}
```

```
0000 0101
0000 0011
========== &
0000 0001
```

Assignment Operator

```
public class Main {
    public static void main(String[] args) {
        int x = 13;
        x >>= 1;
        System.out.println(x);  // 6
    }
}
```

0000 1101 ==> 0000 0110

```
public class Main {
    public static void main(String[] args) {
        int x = 9;
        x >>= 2;
        System.out.println(x);  // 2
    }
}
```

0000 1001 ==> 0000 0010

Ternary Operator

Operator Java Ternary digunakan sebagai salah satu pengganti pernyataan if-then-else dan banyak digunakan dalam pemrograman Java.

Sintak penulisan : `variable x = (expression) ? value if true : value if false`

Contoh :

```
public class Program01 {
    public static void main(String abcd[]) {
        int a, b;
        a = 10;
        b = (a == 1) ? 20: 30;
        System.out.println( "Value of b is : " +  b );

        b = (a == 10) ? 20: 30;
        System.out.println( "Value of b is : " + b );
    }
}
```

Ternary Operator

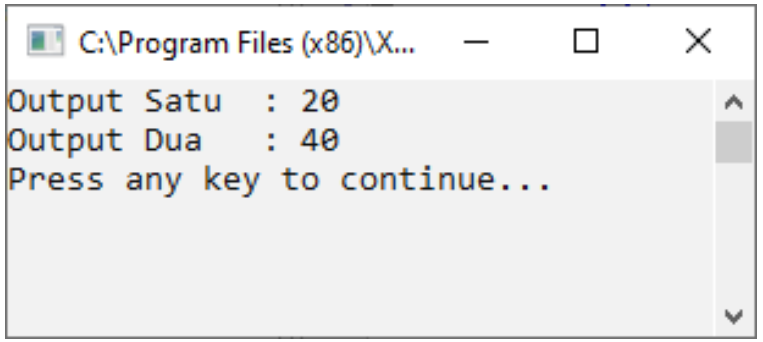
Apa output program berikut :

```
public class Program02 {
    public static void main(String abcd[]) {
        int a, b;
        a = 14;
        b = (a++ > 14) ? 10: 20;
        System.out.println( "Output Satu  : " +  b );

        b = (a <= 14) ? 30: 40;
        System.out.println( "Output Dua   : " + b );
    }
}
```

Ternary Operator

output program :

```
public class Program02 {
    public static void main(String abcd[]) {
        int a, b;
        a = 14;
        b = (a++ > 14) ? 10: 20;
        System.out.println( "Output Satu  : " +  b );

        b = (a <= 14) ? 30: 40;
        System.out.println( "Output Dua   : " + b );
    }
}
```



Logical Operator

Operator logika digunakan untuk menentukan logika antara variabel atau nilai.

Operator	Name	Description	Example
&&	Logical and	Returns true if both statements are true	x < 5 && x < 10
||	Logical or	Returns true if one of the statements is true	x < 5 || x < 4
!	Logical not	Reverse the result, returns false if the result is true	!(x < 5 && x < 10)

Contoh :

```
System.out.println (var_a > 3 && var_b < 10);
```

Logical Operator

Operator and (&&)

a	b	a&&b
1	1	1
1	0	0
0	1	0
0	0	0

Contoh :

```
public class PLogical01 {
    public static void main(String[] args) {
        int x = 5;
        System.out.println(x > 3 && x < 10); // true
    }
}
```

Logical Operator

Operator or (||)

a	b	a||b
1	1	1
1	0	1
0	1	1
0	0	0

Contoh :

```
public class PLogical02 {
    public static void main(String[] args) {
        int x = 5;
        System.out.println(x > 3 || x < 4); // true
    }
}
```

Logical Operator

Apa output program berikut :

```
public class PLogical04 {
    public static void main(String[] args) {
        int x = 9;
        int y = 3;
        System.out.println(x > 3 && x < 10);
        System.out.println(x > 3 && y > 10);
        System.out.println(x < 3 || y < 10);
        System.out.println(x < 3 || y > 10);
        System.out.println(x++ > 9 && y+1 > 4);
        System.out.println(x > 9 && y+1 > 4);
        System.out.println(x++ > 9 || y+1 == 4);
        System.out.println(x > 9 || y+1 == 4);
    }
}
```

Operator and (&&)

a	b	a&&b
1	1	1
1	0	0
0	1	0
0	0	0

Operator or (||)

a	b	a||b
1	1	1
1	0	1
0	1	1
0	0	0

Logical Operator

output program :

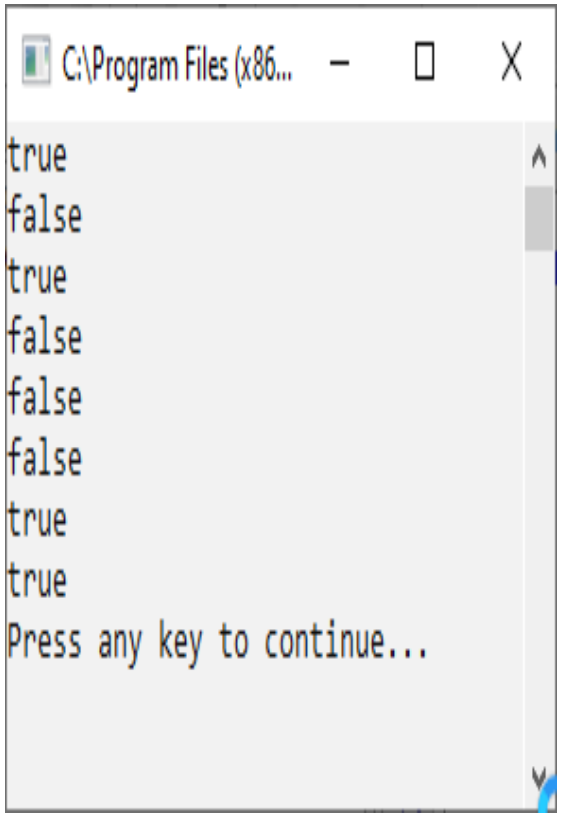
```
public class PLogical04 {
    public static void main(String[] args) {
        int x = 9;
        int y = 3;
        System.out.println(x > 3 && x < 10);
        System.out.println(x > 3 && y > 10);
        System.out.println(x < 3 || y < 10);
        System.out.println(x < 3 || y > 10);
        System.out.println(x++ > 9 && y+1 > 4);
        System.out.println(x > 9 && y+1 > 4);
        System.out.println(x++ > 9 || y+1 == 4);
        System.out.println(x > 9 || y+1 == 4);
    }
}
```

Operator and (&&)

a	b	a&&b
1	1	1
1	0	0
0	1	0
0	0	0

Operator or (||)

a	b	a||b
1	1	1
1	0	1
0	1	1
0	0	0



Bitwise Operator

Operator bitwise bekerja pada bit dan melakukan operasi bit demi bit.

Operator	Function
&	Bitwise AND
|	Bitwise OR
^	Bitwise XOR (Exclusive OR)

Contoh :

```
public class Main {
    public static void main(String[] args) {
        int x = 5;
        x = x ^ 3;
        System.out.println(x);    // 6
    }
}
```

Bitwise Operator

Contoh :

```
public class Main {
    public static void main(String[] args) {
        int x = 5;
        x = x ^ 3;
        System.out.println(x);    // 6
    }
}
```

```
5 = 0000 0101
3 = 0000 0011
===============
^   0000 0110     -> 6
```

```
a    = 0011 1100
b    = 0000 1101
----------------
a&b = 0000 1100
a|b = 0011 1101
a^b = 0011 0001
~a   = 1100 0011
```

Bitwise Operator

Apa output program berikut :

```
a    = 0011 1100
b    = 0000 1101
---------------
a&b = 0000 1100
a|b = 0011 1101
a^b = 0011 0001
~a   = 1100 0011
```

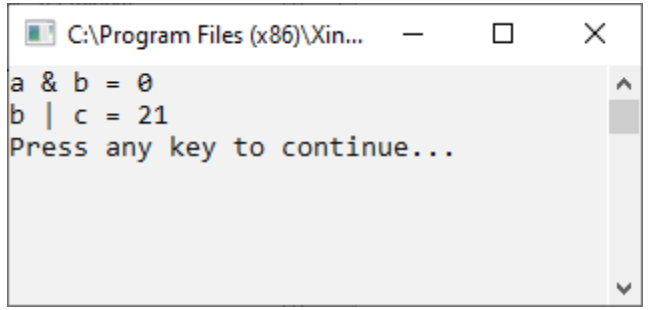
```
public class CobaAndOr {
    public static void main(String[] args) {
        int a = 17;
        int b = 8;
        int c = 5;

        System.out.println("a & b = " + ( a & b ));
        System.out.println("b | c = " + ( a | c ));
    }
}
```

Bitwise Operator

Apa output program berikut :

```
public class CobaAndOr {
    public static void main(String[] args) {
        int a = 17;
        int b = 8;
        int c = 5;

        System.out.println("a & b = " + ( a & b ));
        System.out.println("b | c = " + ( a | c ));
    }
}
```

```
a    = 0001 0001    17
b    = 0000 1000     8
c    = 0000 0101     5
---------------
a&b  = 0000 0000     0
a|c  = 0001 0101    21
```



Relational Operator

Ada operator relasional berikut yang didukung oleh bahasa Java.

Operator	Description	Example
==	equal to	(A == B) is not true.
!=	not equal to	(A != B) is true.
>	greater than	(A > B) is not true.
<	less than	(A < B) is true.
>=	greater than or equal to	(A >= B) is not true.
<=	less than or equal to	(A <= B) is true.

Contoh :

```
public class Main {
    public static void main(String[] abcd) {
        int x = 20;
        int y = 90;
        System.out.println(x >= y);   // false
    }
}
```

Relational Operator

Perhatikan program berikut :

```
public class Main01 {
    public static void main(String[] abcd) {
        int a = 20;
        int b = 90;
        System.out.println(a <= b);    // true
    }
}
```

Operator apa yg harus digunakan agar outputnya false :

```
public class Main02 {
    public static void main(String[] abcd) {
        int a = 20;
        int b = 90;
        System.out.println(a      b);    // false
    }
}
```

Shift Operator

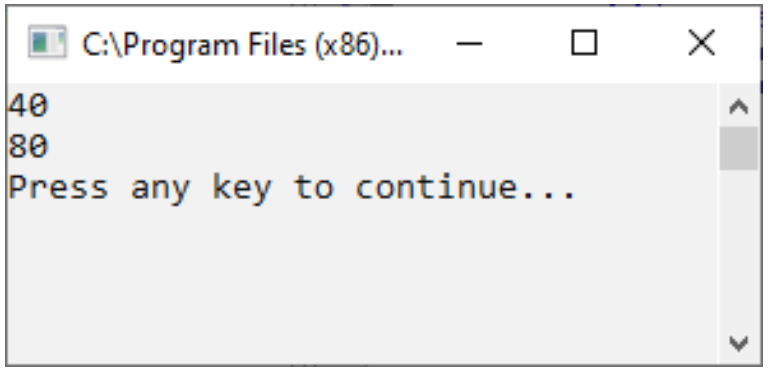
Left Shift Operator

Operator pergeseran kiri Java << digunakan untuk menggeser semua bit dalam nilai ke sisi kiri .

Contoh :

```
class LeftShift01{
    public static void main(String args[])
    {
        System.out.println(10<<2);   //10*2^2 = 10*4 = 40
        System.out.println(10<<3);   //10*2^3 = 10*8 = 80
    }
}
```

```
        10              40

    0000 1010 ==> 0010 1000
```



Shift Operator

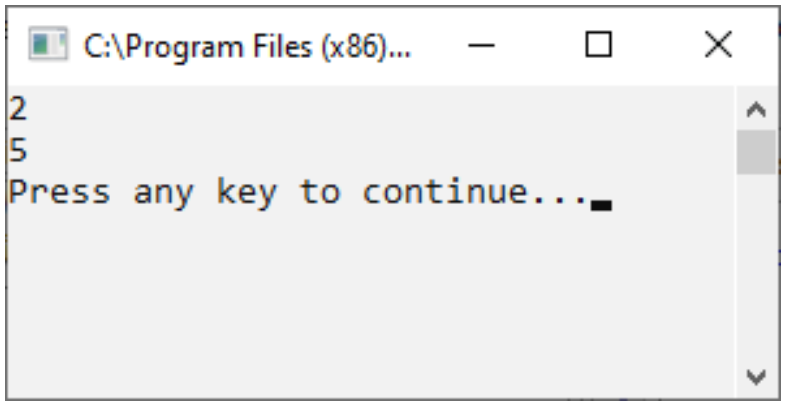
Right Shift Operator

Operator pergeseran kanan Java >> digunakan untuk memindahkan nilai operan kiri ke kanan dengan jumlah bit yang ditentukan oleh operan kanan.

Contoh :

```
class RightShift01{
    public static void main(String args[])
    {
        System.out.println(10>>2);     // 10/2^2 = 10/4 = 2
        System.out.println(20>>2);     // 20/2^2 = 20/4 = 5
    }
}
```

```
10                2

0000 1010 ==> 0000 0010
```



Arithmetic Operator

Operator aritmatika digunakan untuk melakukan operasi matematika umum.

Operator	Name	Description	Example
+	Addition	Adds together two values	x + y
-	Subtraction	Subtracts one value from another	x - y
*	Multiplication	Multiplies two values	x * y
/	Division	Divides one value by another	x / y
%	Modulus	Returns the division remainder	x % y
++	Increment	Increases the value of a variable by 1	++x
--	Decrement	Decreases the value of a variable by 1	--x

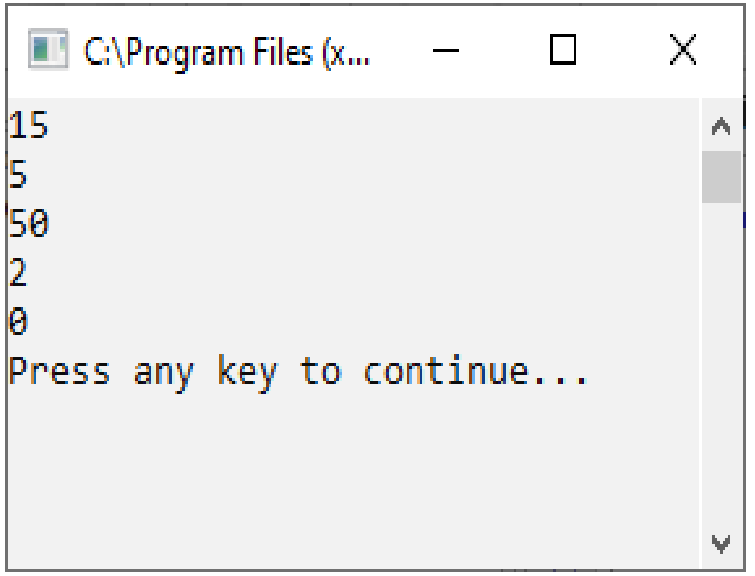
Contoh :

```
int x = 5;
int y = 2;
System.out.println(x % y);
```

Arithmetic Operator

Contoh :

```
class LatAritmatika
{
    public static void main(String absaja[])
    {
        int a = 10;
        int b = 5;
        System.out.println(a+b);     // 15
        System.out.println(a-b);     // 5
        System.out.println(a*b);     // 50
        System.out.println(a/b);     // 2
        System.out.println(a%b);     // 0
    }
}
```



Unary Operator

Operator unary Java hanya membutuhkan satu operand. Operator unary digunakan untuk melakukan berbagai operasi yaitu: increment , decrement nilai, serta membalikkan nilai boolean.

Contoh :

```
class LatUnary
{
    public static void main(String absaja[])
    {
        int x=10;
        System.out.println( x++ );   //  10 (11)
        System.out.println( ++x );   //  12
        System.out.println( x-- );   //  12 (11)
        System.out.println( --x );   //  10
    }
}
```

Unary Operator

Contoh :

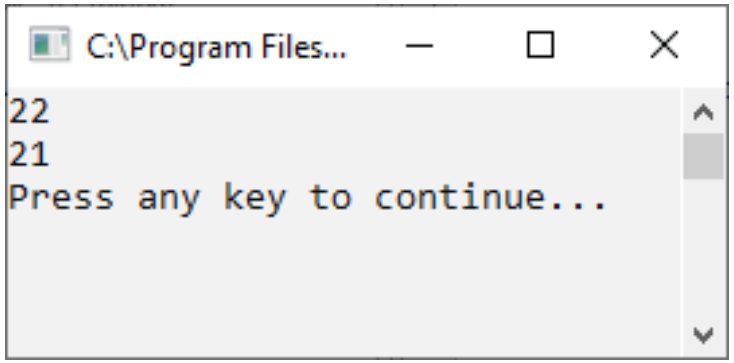
```
class LatUnary02
{
    public static void main(String absaja[])
    {
        int a = 10;
        int b = 10;
        System.out.println(a++ + ++a);
        System.out.println(b++ + b++);
    }
}
```

Apa outputnya ?

Unary Operator

Contoh :

```
class LatUnary02a
{
    public static void main(String absaja[])
    {
        int a = 10;
        int b = 10;
        System.out.println(a++ + ++a);    //10 + 12 = 22
        System.out.println(b++ + b++);    //10 + 11 = 21
    }
}
```

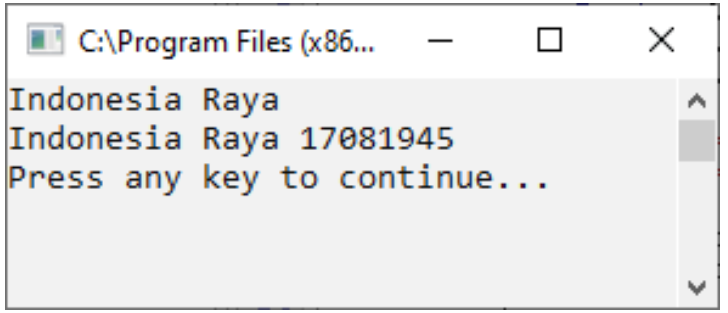


Menggabungkan Angka dengan String

Dalam Java angka dan string atau string dengan setringdapat digabungkan menggunakan operator +

Contoh :

```
public class LatString01
{
    public static void main(String absaja[])
    {
        String hasil1, hasil2;
        String kata1 = "Indonesia ";
        String kata2 = "Raya ";
        int angka1 = 17081945;

        hasil1 = kata1 + kata2;
        hasil2 = kata1 + kata2 + angka1;

        System.out.println(hasil1);
        System.out.println(hasil2);
    }
}
```



RANGKUMAN

Berbagai macam operator dalam pemrograman java perlu dipahami dengan baik dan digunakan sesuai dengan kebutuan.

Operator dalam implementasinya untuk penyusunan berbagai perhitungan harus memperhatikan derajat operator, sehingga diharapkan dapat terhindar dari kesalahan hitung

SUMBER PUSTAKA

- https://www.w3schools.com/java/java_type_casting.asp
- https://www.javatpoint.com/operators-in-java
- https://www.w3schools.com/java/java_operators.asp
- https://www.tutorialspoint.com/java/java_basic_operators.htm

Sumber gambar:
www.freepik.com

THANKS

ANY QUESTIONS?