Java Fundamental

Pertemuan 2

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Objectives :

- Java Intro
- Basic Java Syntax
- Control Flow
- Arrays

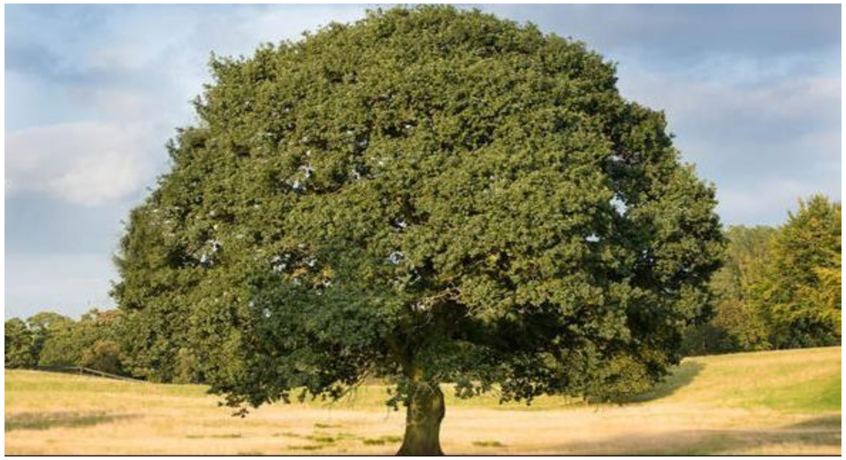
Java Intro

Java Intro

- James Gosling, Mike Sheridan, and Patrick Naughton initiated the Java language project in June 1991
- The language was initially called *Oak* after an oak tree that stood outside Gosling's office. It went by the name *Green* later, and was later renamed *Java*, from a list of random words
- Gosling aimed to implement a virtual machine and a language that had a familiar C/C++ style of notation
- Sun Microsystems released the first public implementation as Java 1.0 in 1995
- On May 8, 2007, Sun finished the process, making all of Java's core code available under GNU Public License

Contd..

- James Gosling



- Oak tree

Contd..

- Java has some interesting features:
  - automatic type checking,
  - automatic garbage collection,
  - simplifies pointers; no directly accessible pointer to memory,
  - simplified network access,
  - multi-threading!

Java Advantages

- Portable - Write Once, Run Anywhere
- Security has been well thought through
- Robust memory management
- Designed for network programming
- Multi-threaded (multiple simultaneous tasks)
- Dynamic & extensible (loads of libraries)
  - Classes stored in separate files
  - Loaded only when needed

Basic Syntax

Primitive Data Type & Variables

- Java is strongly typed language.
- boolean, char, byte, short, int, long, float, double etc.
- These basic (or primitive) types are the only types that are not objects (due to performance issues).
- This means that you don't use the new operator to create a primitive variable.
- Declaring primitive variables:

```
float initVal;
int retVal, index = 2;
double gamma = 1.2, brightness
boolean valueOk = false;
```

Initialization

- If no value is assigned prior to use, then the compiler will give an error
- Java sets primitive variables to zero or false in the case of a boolean variable
- All object references are initially set to null
- An array of anything is an object
    - Set to null on declaration
    - Elements to zero false or null on creation

Assignment

- All Java assignments are right associative

```
int a = 1, b = 2, c = 5
a = b = c
System.out.print("a= " + a + "b= " + b + "c= " + c)
```

- What is the value of a, b & c
- Done right to left: `a = (b = c);`

Declarations

```
int index = 1.2;                 // compiler error
boolean retOk = 1;               // compiler error
double fiveFourths = 5 / 4;      // no error!
float ratio = 5.8f;              // correct
double fiveFourths = 5.0 / 4.0;  // correct
```

- 1.2f is a float value accurate to 7 decimal places.
- 1.2 is a double value accurate to 15 decimal places.

Constant Variable

- Untuk membuat variable yang bersifat konstan (tetap), keyword yang digunakan adalah final.
- Keyword final mengindikasikan variable hanya boleh dideklarasikan 1kali dan tidak dapat diubah.
- Umumnya variable ditulis dengan UPPERCASE.

```
final double PI = 3.14     //nilainya tetap
```

Mathematical Operator

- `* / % + -` are the mathematical operators
- `* / %` have a higher precedence than `+` or `-`

```
double myVal = a + b % d - c * d / b;
```

- Is the same as:

```
double myVal = (a + (b % d)) -
                   ((c * d) / b);
```

Statement & Blocks

- A simple statement is a command terminated by a semi-colon:

  ```
  name = “Fred”;
  ```

- A block is a compound statement enclosed in curly brackets:

  ```
  {
          name1 = “Fred”; name2 = “Bill”;
  }
  ```

- Blocks may contain other blocks

Type Casting

- Type casting pada java dilakukan untuk mengkonversi suatu variable dengan tipe data yang berbeda dari tipe data saat deklarasi.
- Contoh :

```
double x = 9.997;
int nx = (int) x;
```

Control Flow

Flow of Control

- Java executes one statement after the other in the order they are written
- Many Java statements are flow control statements:

Alternation:	if, if else, switch
Looping:	for, while, do while
Escapes:	break, continue, return

If – Conditional Statement

- The if statement evaluates an expression and if that evaluation is true then the specified action is taken

```
if ( x < 10 ) x = 10;
```

- If the value of x is less than 10, make x equal to 10
- It could have been written:

```
if ( x < 10 )
x = 10;
```

- Or, alternatively:

```
if ( x < 10 ) { x = 10; }
```

Relational Operators

==	Equal (careful)
!=	Not equal
>=	Greater than or equal
<=	Less than or equal
>	Greater than
<	Less than

If. . . else

- The if …else statement evaluates an expression and performs one action if that evaluation is true or a different action if it is false.

```
if (x != oldx) {
    System.out.print(“x was changed”);
 }
 else {
    System.out.print(“x is unchanged”);
 }
```

Nested if ….else

```
if ( myVal >100 ) {
   if ( remainderOn == true)
      { myVal = mVal % 100;
   }
   else {
      myVal = myVal / 100.0;
   }
}
else
{
   System.out.print(“myVal is in range”);
}
```

Else if

- Useful for choosing between alternatives:

```
if ( n == 1) {
   // execute code block #1
}
else if ( j == 2 ) {
   // execute code block #2
}
else {
   // if all previous tests have failed, execute code block #3
}
```

A Warning..

WRONG!

```
if( i == j )
        if ( j == k )
            System.out.print(
              "i equals k");
      else
          System.out.print
            ( "i is not equal    to j");
```

CORRECT!

```
if( i == j ) {
   if ( j == k )
   System.out.print(
        "i equals k");
}
else
   System.out.print("i is
   not equal to j"); //
   Correct!
```

The switch statement..

```
switch ( n )
  { case 1:
     // execute code block #1
     break;
  case 2:
     // execute code block #2
     break;
  default:
     // if all previous tests fail then
    // execute code block #4
     break;
}
```

The for loop

- Loop n times

```
for ( i =0; i <n; n++ ) {
   // this code body will execute n times
   // ifrom  0 to n-1
}
```

- Nested for:

```
for ( j =0; j <10; j++ )
   { for ( i =0; i <20;
   i++ ){
      // this code body will execute 200 times
   }
}
```

While loops

```
while(response == 1)
  { System.out.print( "ID =" +
  userID[n]);
  n++;
  response = readInt( "Enter ");
}
```

- What is the minimum number of times the loop is executed?
- What is the maximum number of times?

do {…} while loops

```
do {
   System.out.print( “ID =” + userID[n] );
   n++;
   response = readInt( “Enter ” );
} while (response == 1);
```

- What is the minimum number of times the loop is executed?
- What is the maximum number of times?

Break

- A break statement causes an exit from the innermost containing while, do, for or switch statement.

```
for ( int i = 0; i < maxID, i++ )
  { if ( userID[i] == targetID )
  {
     index = i;
     break;
  }
} // program jumps here after break
```

Continue

- Can only be used with while, do or for.
- The continue statement causes the innermost loop to start the next iteration immediately

```
for ( int i = 0; i < maxID; i++ )
  { if ( userID[i] != -1)
  continue;
  System.out.print( “UserID ” + i + “ :” +
     userID);
}
```

Array

Array

- An array is a list of similar things
- An array has a fixed:
  - name
  - type
  - length
- These must be declared when the array is created.
- Arrays sizes cannot be changed during the execution of the code

Contd..

myArray =

3	**6**	**3**	**1**	**6**	**3**	**4**	**1**
0	1	2	3	4	5	6	7

myArray has room for 8 elements

- the elements are accessed by their index
- in Java, array indices start at 0

Declaring Arrays

int myArray[];

declares *myArray* to be an array of integers

myArray = new int[8];

sets up 8 integer-sized spaces in memory, labelled *myArray[0]* to *myArray[7]*

int myArray[] = new int[8];

combines the two statements in one line

Assigning Values

- refer to the array elements by index to store values in them.

```
myArray[0] = 3;
myArray[1] = 6;
myArray[2] = 3;
```

- can create and initialise in one step:

```
int myArray[] = {3, 6, 3, 1, 6, 3, 4, 1};
```

Iterating Through Array

- for loops are useful when dealing with arrays:

```
for (int i = 0; i < myArray.length; i++)
  { myArray[i] = getsomevalue();
}
```

Arrays of Objects

- So far we have looked at an array of primitive types.
  - integers
  - could also use doubles, floats, characters…
- Often want to have an array of objects
  - Students, Books, Loans …..
- Need to follow 3 steps.

Declaring Array Object

1. Declare the array

```
private Student studentList[];
```

- this declares studentList

2 .Create the array

```
studentList = new Student[10];
```

- this sets up 10 spaces in memory that can hold references to Student objects

3. Create Student objects and add them to the array:

```
studentList[0] = new Student("Cathy",
"Computing");
```

Question