

(یہ) کیا (عقل کی بات ہے کہ) تم لوگوں کو نیکی کرنے کو کہتے ہو اور اپنے تئیں فراموش کئے دیتے ہو، حالانکہ تم کتاب (خدا) بھی پڑھتے ہو۔ کیا تم سمجھتے نہیں؟ گے - البقرة آیت ۴۴

Age is an issue of mind over matter. If you don't mind, it doesn't matter. Mark Twain

## Lecture 16

### Introduction to Arrays

Well last week was exam week. Normally students don't enjoy exams; whereas; despite of the pressure and tough routine, it is really a very different experience to appear in every other exam. Almost all exams have something to learn, though it matters whether or not you are ready for learning. Another important aspect of exam is to test yourself, what you have learned so far, how much you are able to understand and solve. So, if you have not taken it as experience yet you can if you give some time to analyze last week. What happened and particularly what you did? Was there anything different from previous exams and particularly have you learned anything new from these exams. If there is anything try to record it by writing somewhere. Now days one way is to right a small email to yourself with title "Midterm Fall 2012 Semester I MIT" and in points write anything useful in future.

Well in last lecture before exam we have not studied anything further rather revised lecture 1-14. Now it's time to start learning once again. Based on mid-term experience of OOP different students may have different opinions for future:

- I must put extra effort to learn subject more comprehensively to get maximum grades and to get firm control over problem solving. [Excellent approach after all without motivation it is hilarious to work hard]
- I must give due time to subject to get reasonable grades and to develop reasonable programming skills after all its matter of time otherwise I have abilities to do it. [Once again nice approach and it's not too late]
- I must try my level best to cover previous concepts as well to go along with coming lectures to get through understand of subject as well as to secure grades [Once again marvelous approach, after all material is available all is intention followed by hard work]
- There may be other possible positive approaches; however; it's better to discuss with teacher and to take advise seriously, otherwise, world is open for fun. Why to make your life boring by attending 3 hour lectures per week, just enjoy, there is enough time. You may cover this subject next year or may be next to next year. After all parents afford wheat else required.

Hope this is enough for today for those who have kept some space to enter something positive into their minds. With pray that May Allah give us understanding and opportunities to implement, we start today's lecture.

We are going to start discussion on Arrays. Essentially arrays have enough room to revise all topics we have studied previously plus it give programming a power to solve many problems which were too hard or too difficult to implement. So once again hope you enjoy new topic.

#### Arrays

Often we need to handle a list of related values like height of players, weight of workers, marks of students, salary of employees, addresses etc. Using variables in such cases are highly impractical because of two reasons. One if you have fixed number of elements in the list and list is lengthy your code will have too much length, which creates implementation, updating, error finding like problems. Secondly if user have to choose size at run-time without arrays many problems are not

even possible. Array is a sequence of value of the same/ similar type. Similar has some meanings here which you may able to understand in next semester. Array is a collection with one name, where access of each element needs array name + index/ subscript. So access array A of size 5 we will write A[0], A[1], ..., A[4]. Shortly you will see some examples. There are 3 possible ways of declaration of arrays:

1. Declaration in single line using size

```
int x[]=new int[10];
int size=5;
double d[]=new double[size];
```

2. Declaration in multiple lines using size

```
int x[];
...
x=new int[10];
...
...
...
x=new int[30]; //a brand new array of size 30 is available after this line
```

This way is used when normally we declare array variable (mostly called reference) earlier and at later stage we declare actual array or it is also possible that after some statements we may declare a new array with same name (when previous one is not required) and use it subsequently in same program, where previous values will be lost.

3. Declaration in single line using values

This type of declaration is only possible when array values are fixed and known at the time of development:

```
int dayOfMonths[]={31, 28, 31,...,31};
String days[]{"Monday", "Tuesday",..., "Sunday"};
```

This type is only possible in single line.

Well whatever way you use to declare array. To use array index/ subscript is required. Writing array name to put or get values in arrays is syntax error. You must handle all elements individually by writing array name and index operator having some integer value like 0, 1, 2 etc. Array size 10 means array has 10 elements; whereas; to access first element we will write 0 as index/ subscript and to access last (10<sup>th</sup>) element 9 as index is used. Accessing elements by using index below 0 (negative) or above or equal to size is run-time error, in java it is second famous exception [Top most famous exception is **NullPointerException**] **IndexOutOfBoundsException**.

We may declare any time off array including primitive types like int, double, long, float, char, boolean, short etc and other types like String, Scanner, Student, Account, Book etc. The thing you have remember for the time being is that you have to match types; one which is used in declared and type after new keyword like:

```
int ...=new int[..];
double ...=new double[..];
String ...=new String[..];
Student ...=new Student[..];
Teacher ...=new Teacher[..];
Paper ...=new Paper[..];
Account ...=new Account[..];
```

Lastly we will write some programs using arrays.

### Program

A complete program using array is to store 5 values and print them:

```
class ArrayExample1{
    public static void main(String []args){
        int x[]=new int[5],i;
        x[0]=23; x[1]=49; x[2]=-26; x[3]=13; x[4]=43;
        System.out.println("Printing Array Values:");
        for (i=0;i<x.length;i++)
            System.out.print(x[i]+" ");
        System.out.println();
    }
}
```

Another complete program using array of type double, initialization randomly and finding average:

```
class ArrayExample2{
    public static void main(String []args){
        double d[]=new double[10], i, sum=0;
        for (i=0;i<d.length;i++){
            d[i]=Math.random();
            sum=sum+d[i];
        }
        System.out.println("Average:"+(sum/d.length));
    }
}
```