Multiple Decisions

• What if I want to make these same decisions for the whole year?
  If it is sunny today
    then I’ll go to the beach
  if it is windy at the beach
    then I’ll fly a kite
  else if it is not windy at the beach
    then I’ll walk on the shore
  Else if it is raining today
    then I’ll stay inside and read a book
  Else if it is snowing
    then I’ll go to the mountains to ski
• Repeat the process for 365 days

How do we do this?

• Repetition: for loops
  – Semantics
    • Repeat for a specific # of iterations w/ starting point, ending point, and an increment
  – Syntax
    for(int x=1; x <= 365; x++) {
      <statement>
      <statement>
      ...
    }
The for Loop

Starting point: Initialization

for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}

The for Loop

Ending point: Continuation Test

for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}

Test is True: Execution Block

for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}

• What do you notice about order?
The for Loop

```java
for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}  
• Same as x = x+1
• What about x = x + 2? += (p. 84 more details)
```

The for Loop

```java
for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}  
• What do you notice about order?
```

The for Loop

```java
for(int x=1; x <= 365; x++) {
    <statement>
    <statement>
    ...
}  
• Test is False: Execution after loop
```
The for Loop Examples

```java
for(int x=-100; x <= 100; x++)
    System.out.println("hello world");
for(int x=2+2; x <= 17*3; x++)
    System.out.println("hello world");
for(int x=0; x <= 100; x++)
    System.out.println("hello world");
for(int x=0; x < 100; x++)
    System.out.println("hello world");
for(int x=-100; x <= -1; x++)
    System.out.println("hello world");
```

• Why is it better to use curly braces?

The for Loop Pattern

```java
for(int <variable> = n; <variable> <= p; <variable>++) {
    <statement>
    ...
}
for(int <variable> = n; <variable> >= p; <variable>--) {
    <statement>
    ...
}
```
Nested for Loops

```java
for(int x = 0; x < 10; x++) {
    for(int y = 0; y < 10; y++) {
        System.out.println("hello world");
    }
}
```

Using `<variable>` inside the loop

```java
for(int x = 0; x < 10; x++) {
    System.out.print("The value of x is: ");
    System.out.println(x);
}
```

- Can we use x outside the loop?
- What if we declared x outside the loop?

Scope

- Part of program in which a declaration is valid
- Local variable
  - Declared inside a method only accessible inside method
- Localizing variables
  - Declaring variable in innermost scope
Illegal access in methods

```java
public class ScopeEx {
    public static void main (String[] args) {
        int x=2, y=3;
        computeSum();
        sum = x+y;  //error: sum hasn't been declared
    }
    public static void computeSum() {
        int sum = x+y;  //error: x and y outside scope
    }
}
```

Illegal access outside loops

```java
for(int x = 0; x < 10; x++) {
    int y = 10;
    System.out.print("The value of x * y is: ");
    System.out.println(x * y);
    System.out.print("The value of y is: ");
    System.out.println(y);  //error: y is outside scope
}
```

• How do we fix this?

Variables with same name

```java
for(int x = 0; x < 10; x++) {
    System.out.print("The value of x is: ");
    System.out.println(x);
}
for(int x = 0; x < 10; x++) {
    System.out.print("The value of x is: ");
    System.out.println(x);
}
```
Variables with same name
for(int x = 0; x < 10; x++) {
    for(int x = 0; x < 10; x++) {
        System.out.print("The value of x is: ");
        System.out.println(x);
    }
}

VS.
int x;
for(x = 0; x < 10; x++) {
    for(x = 0; x < 10; x++) {
        System.out.print("The value of x is: ");
        System.out.println(x);
    }
}

Infinite Loops
int x;
for(x = 0; x < 10; x++) {
    for(x = 0; x < 5; x++) {
        System.out.print("The value of x is: ");
        System.out.println(x);
    }
}

Infinite Loops
int x, y;
for(x = 0; x < 10; x++) {
    for(y = 0; y < 5; x++) {
        System.out.print("The value of x is: ");
        System.out.println(x);
    }
}
Infinite Loops

```java
int x, y;
for(x = 0; x < 10; x++) {
    for(y = 0; x < 5; y++) {
        System.out.print("The value of x is: ");
        System.out.println(x);
    }
}
```

Class Constants

```java
public class ScopeEx {
    public static final int x=2;
    public static final int y=3;
    public static void main (String[] args) {
        computeSum();
    }
    public static void computeSum() {
        int sum = x+y;
    }
}
```
Illegal use of Class Constants

```java
public class ScopeEx {
    public static final int x=2;
    public static final int y=3;
    public static final int sum=0;
    public static void main (String[] args) {
        computeSum();
    }
    public static void computeSum() {
        sum = x+y; //error: final value and not variable
    }
}
```