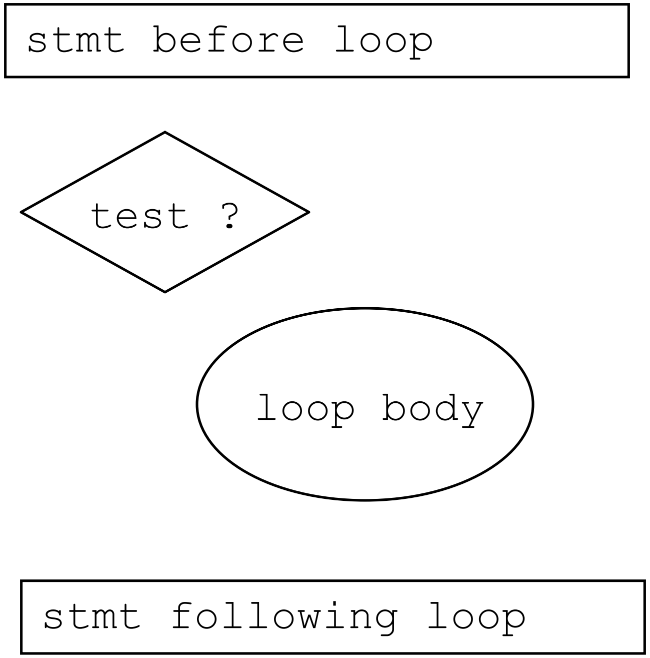
Loops/Iteration

- **Used to repeat an action**
- **Must have a STOP condition**
- **Three flavors - for, while, do/while**

Anatomy of a while loop

- 1 check the test
- 2 if the test is true
  - exec the body
  - when the body has finished
    - go to step 1
- if the test is false
  - exit the loop



stmt before loop

test ?

loop body

stmt following loop

```
int n = ?;  // try n as 6
while (n >= 0)
{
   n -= 2;
   System.out.println( n );
}
System.out.println( “final n is “ + n  );
```

The test is always a “keep going” condition.
To determine the termination condition, negate the test.
I.e. the loop will keep going as long as n >= 0
     the loop will terminate when n becomes negative (n < 0)

while Loops

- The test is checked at the very beginning and then again each time after the after the entire loop body has been executed
- The test is NOT checked in the middle of the loop body
- This is true for all the loops (for, while, and do/while), not just the while loop
- A while is just an if statement that keeps going back to the test and quits looping at first failure of test

```
x = ?;   // try x as 45
while (x < 50)
{
   x++;
   System.out.println( x );
   x++;
   System.out.println( x );
}
```

Practice
What’s the output?

```
int d = 90;
while (d < 80)
{
   ++d;
}
System.out.println( “d is ” + d );
```

```
int x = 90;
while (x < 100)
{
   x += 5;
   if (x>95)
         x-=25;
}
System.out.println(“final value for x is ” + x );
```

```
int z = 85;
while (z < 90)
{
   z -= 5;
}
System.out.println(“final value for z is ” + z );
```

Summing (even) numbers with a while loop

Example of an indeterminate loop - the user’s input will determine how many times the loop executes

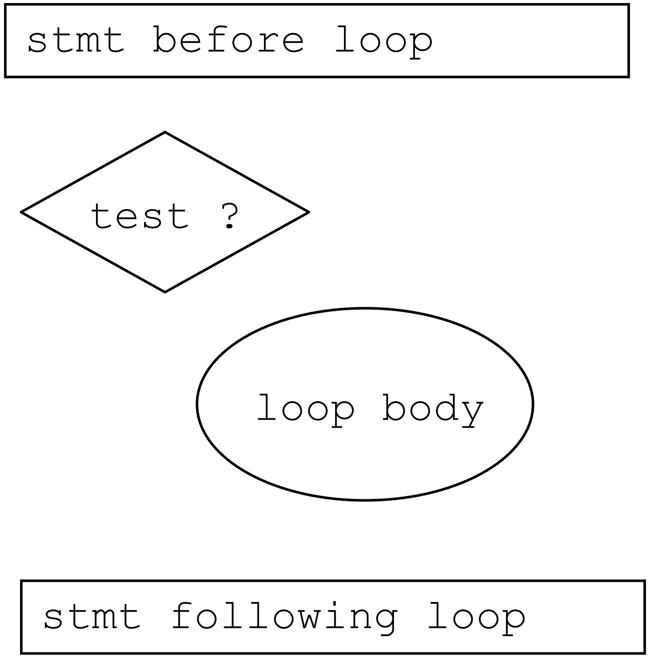
```
// assume kbd declared (save space)
int sum = 0, evensum = 0, number;
System.out.print(“ First number please “);
number = kbd.nextInt() );
while (number > 0)
{
   sum += number;
   if (number % 2 == 0)
        evensum += number;
   System.out.print(“number please “);
   number = kbd.nextInt() );
}
System.out.println(“sum is “ + sum );
System.out.println(“sum of even #’s is “ + evensum );
```

Error checking with a **do** loop

do loop is a variant of the while that waits till the bottom to make the test. There are some very good uses for the **do** form of the while

```
final int MAX = 10,  MIN = 5;
int number;
do
{
   System.out.print(“Enter # between “ +
   “5 and 10 inclusive: “);
   number = kbd.nextInt();
   if (number < MIN || number > MAX)
      System.out.println(“:=( Try again”);
} while (number < MIN || number > MAX);

System.out.print(“The user entered “ +
     number );
```



stmt before loop

test ?

loop body

stmt following loop