Iteration

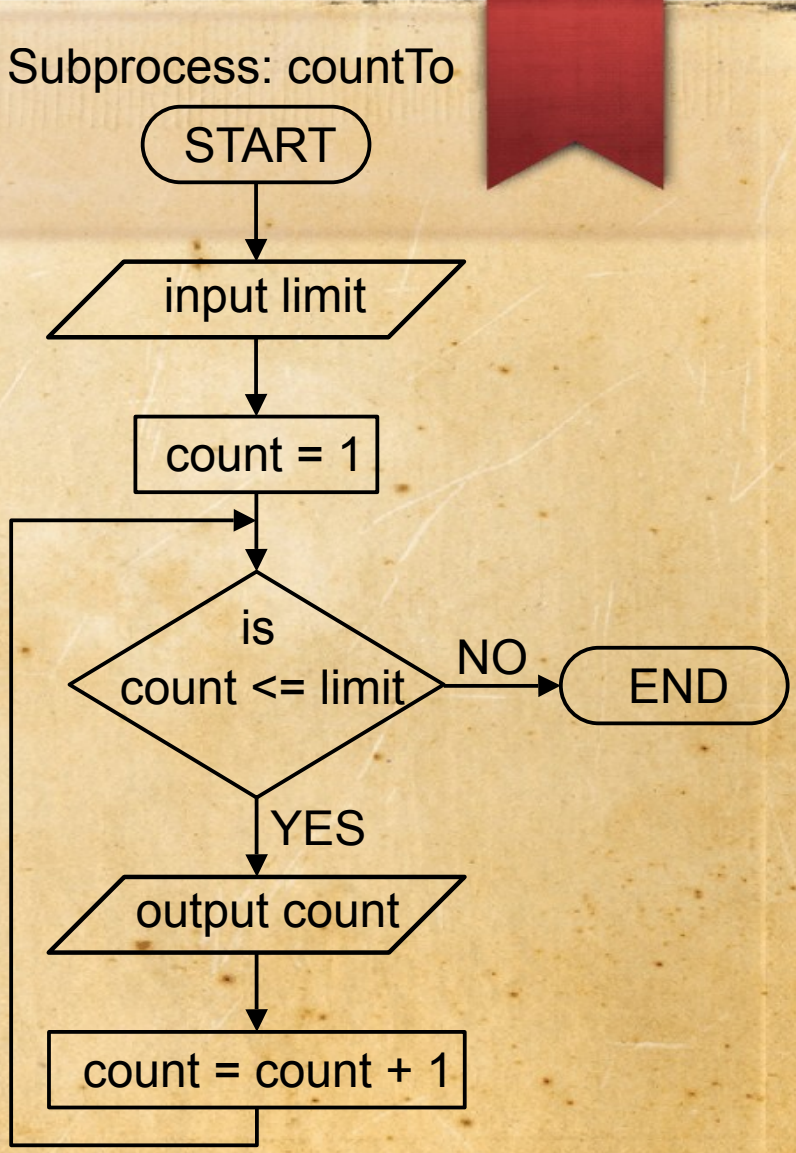
The `while` and `for` loops

Lecture Contents

- The `while` loop
- The `for` loop
- Practice

`while` loop

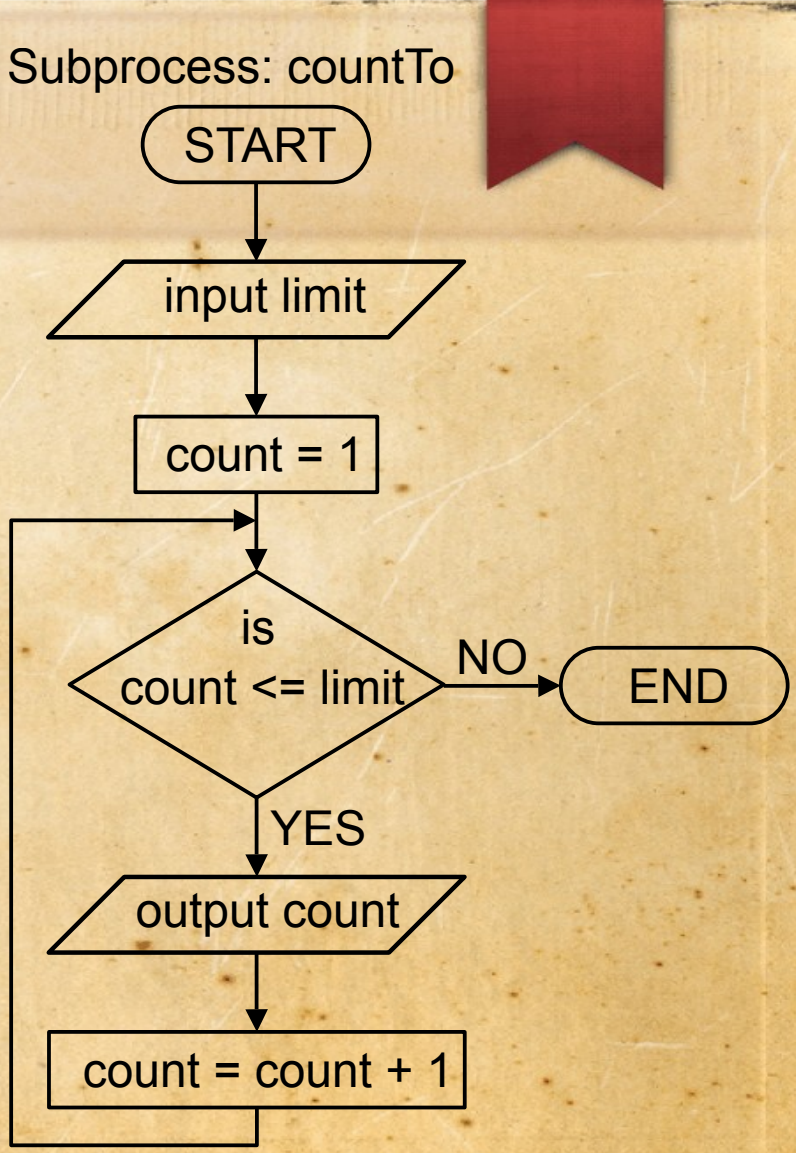
- Iteration is the process of repeating a set of instructions or actions.
- In programming, iteration repeats a block of code until a condition is met.
- Consider the algorithm represented by this flowchart.
  - What is the result of following this algorithm?



`while` loop

- The algorithm represented in the flowchart can be converted into the following Pearson pseudocode:

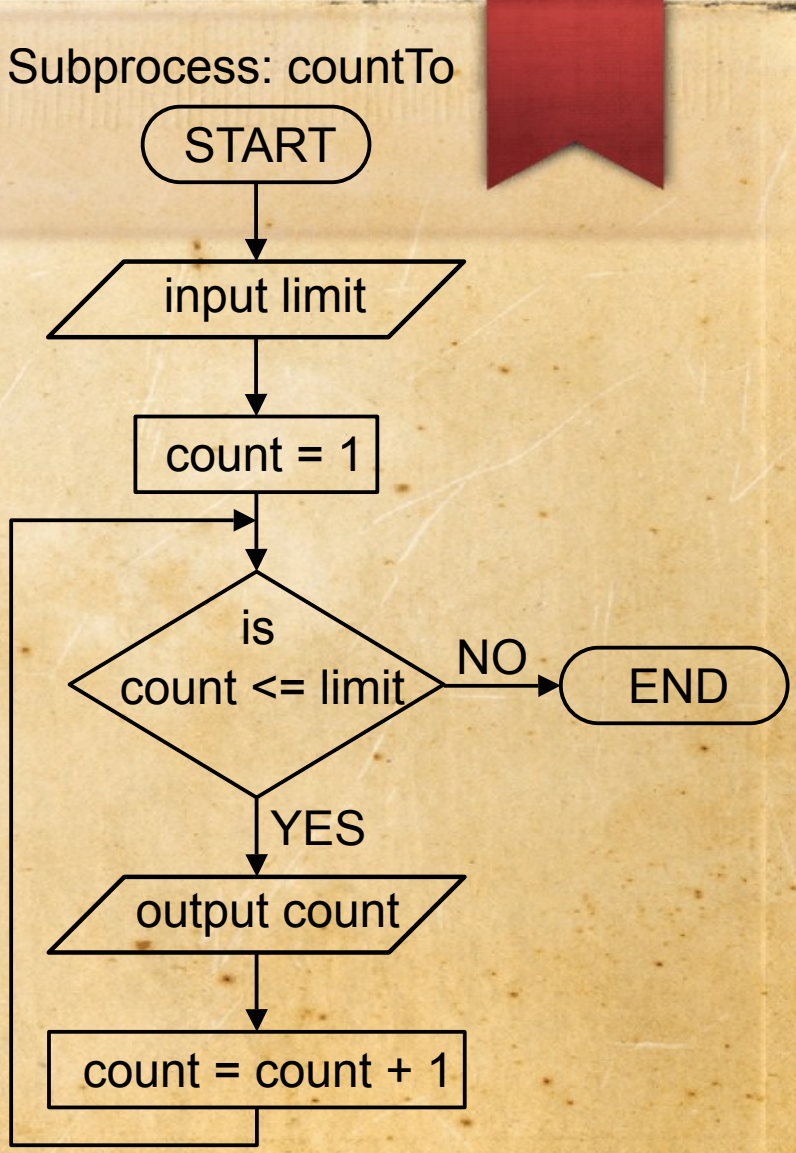
```
PROCEDURE countTo(limit)
BEGIN PROCEDURE
   count = 1
   WHILE count <= limit DO
      SEND count TO DISPLAY
      SET count to count + 1
   END WHILE
END PROCEDURE
```



`while` loop

- The algorithm represented in the flowchart can be converted into the following Java code:

```
public static void countTo(int limit) {
   int count = 1;
   while(count <= limit) {
      System.out.println(count);
      count += 1;
   }
}
```



`while` loop

- Adding a main process and executing the Java code gives us the following output:

```
public static void main(String[] args) {
   count(5);
}

public static void countTo(int limit) {
   int count = 1;
   while(count <= limit) {
      System.out.println(count);
      count += 1;
   }
}
```

```
1
2
3
4
5
```

The `for` Statement

```
public static void countTo(int max) {
   for(int i=1; i<=max; i++) {
      System.out.print(i + " ");
   }
   System.out.println();
}
```

```
int i = 1;
while(i<=max) {
   System.out.print(i + " ");
   i++;
}
```

The `for` Statement

```
public static void main(String[] args) {
   countTo(10);
}
public static void countTo(int max) {
   for(int i=1; i<=max; i++) {
      System.out.print(i + " ");
   }
   System.out.println();
}
```

```
1 2 3 4 5 6 7 8 9 10
```

The `for` Statement

- For Pearson Pseudocode, there are variations of the `for` loop

```
FOR index FROM 1 TO 10 DO
   SEND index to DISPLAY
END FOR
```

```
1 2 3 4 5 6 7 8 9 10
```

```
FOR index FROM 2 TO 10 STEP 2 DO
   SEND index to DISPLAY
END FOR
```

```
2 4 6 8 10
```

```
REPEAT 10 TIMES
   SEND "*" to DISPLAY
END REPEAT
```

```
**********
```

The `for` Statement

```
for(int i=1; i<=10; i++) {
    // Do something 10 times
}
```

```
int i = 1;
while(i<=10) {
    // Do something 10 times
    i++;
}
```

Practice

- Write a method
  - That repeatedly prints a character a variable number of times

```
public static void main(String[] args) {
   printCharRepeatedly('a',5);
}
public static void printCharRepeatedly(char c, int numTimes) {
   //TODO: Write the code for this method.
}
```

```
aaaaa
```

Practice

- Write a method
  - That repeatedly prints a character in a grid of size x,y

```
public static void main(String[] args) {
   printCharGrid('b',10,4);
}
public static void printCharGrid(char c, int x, int y) {
    //TODO: Write the code for this method.
}
```

```
bbbbbbbbbb
bbbbbbbbbb
bbbbbbbbbb
bbbbbbbbbb
```

Practice

- Write a method
  - That repeatedly prints a character a variable number of times

    `public static void printCharRepeatedly(char c, int numTimes) {}`
  - That repeatedly prints a character in a grid of size x,y

    `public static void printCharGrid(char c, int x, int y) {}`

```
int i=1;
while(i<=max) {
   System.out.print(i + " ");
   i++;
}
System.out.println();
```

```
for(int i=1; i<=max; i++) {
   System.out.print(i + " ");
}
System.out.println();
```

Iteration

The `while` and `for` loops