






Flowcharts

“group practice” lecture

ph/cs 265

Flowchart basics

- Flowchart=graphical representation of your computation algorithm
- Flowchart represents **single function/method**
- Flowchart elements:
 - Start/finish 
 - Local variable declaration  int a, double b, etc
 - Action (computation/assignment/print/etc)  Print "a=",a
 - Conditional statement  a>0?
 - Loop (a special case of conditional statement)
 - Global variables  Int gi

Hello, world and linear equation solving

Function name

main

Start

Print "Hello, world"

End

$$5x + 10 = 0$$

$$x = -10/5$$

main

Start

Double x

$$x = -10/5$$

Print "x="+x

End

$$ax + b = 0$$

$$x = -b/a$$

linearSolve

Double a,b

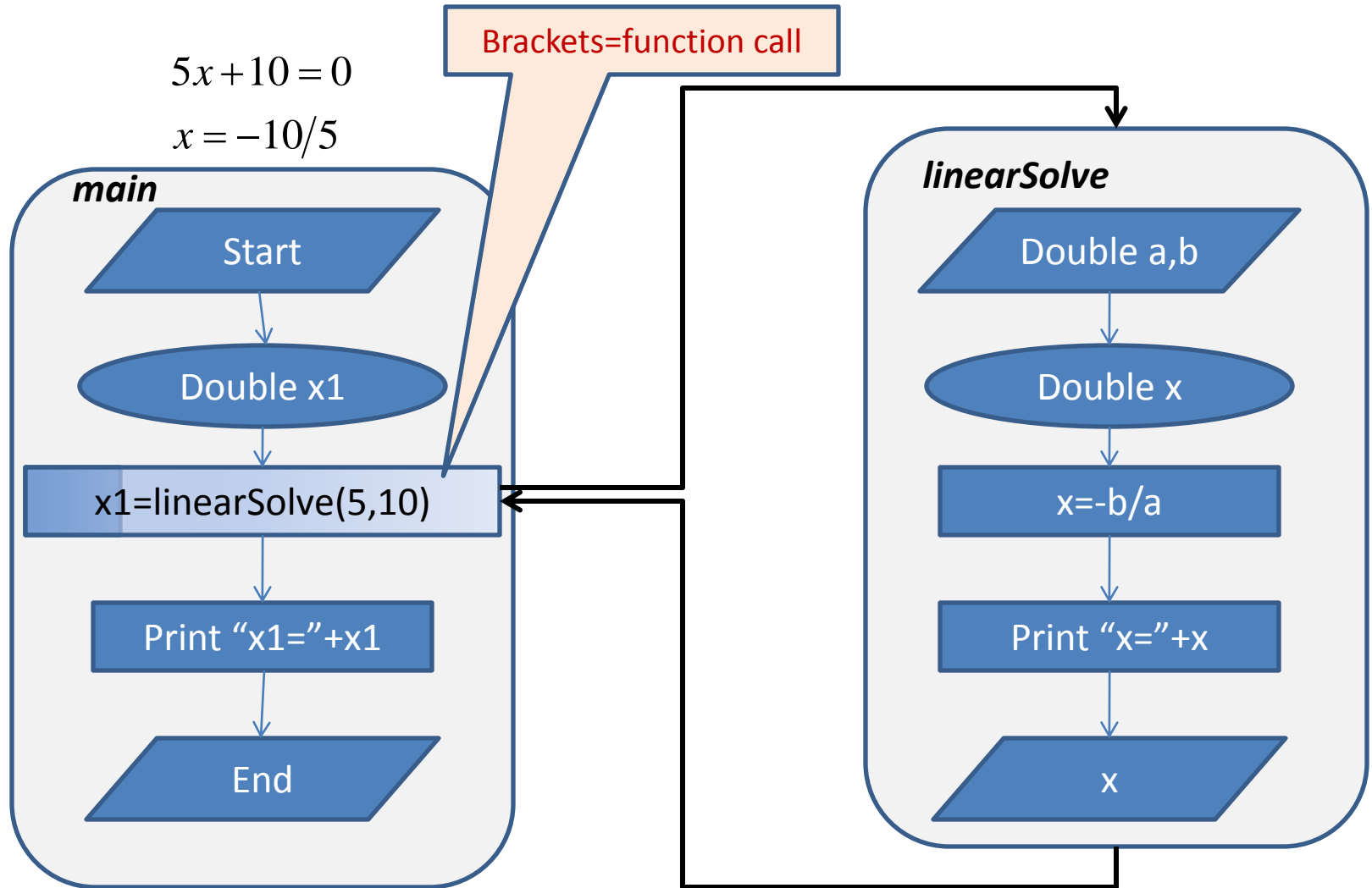
Double x

$$x = -b/a$$

Print "x="+x

x

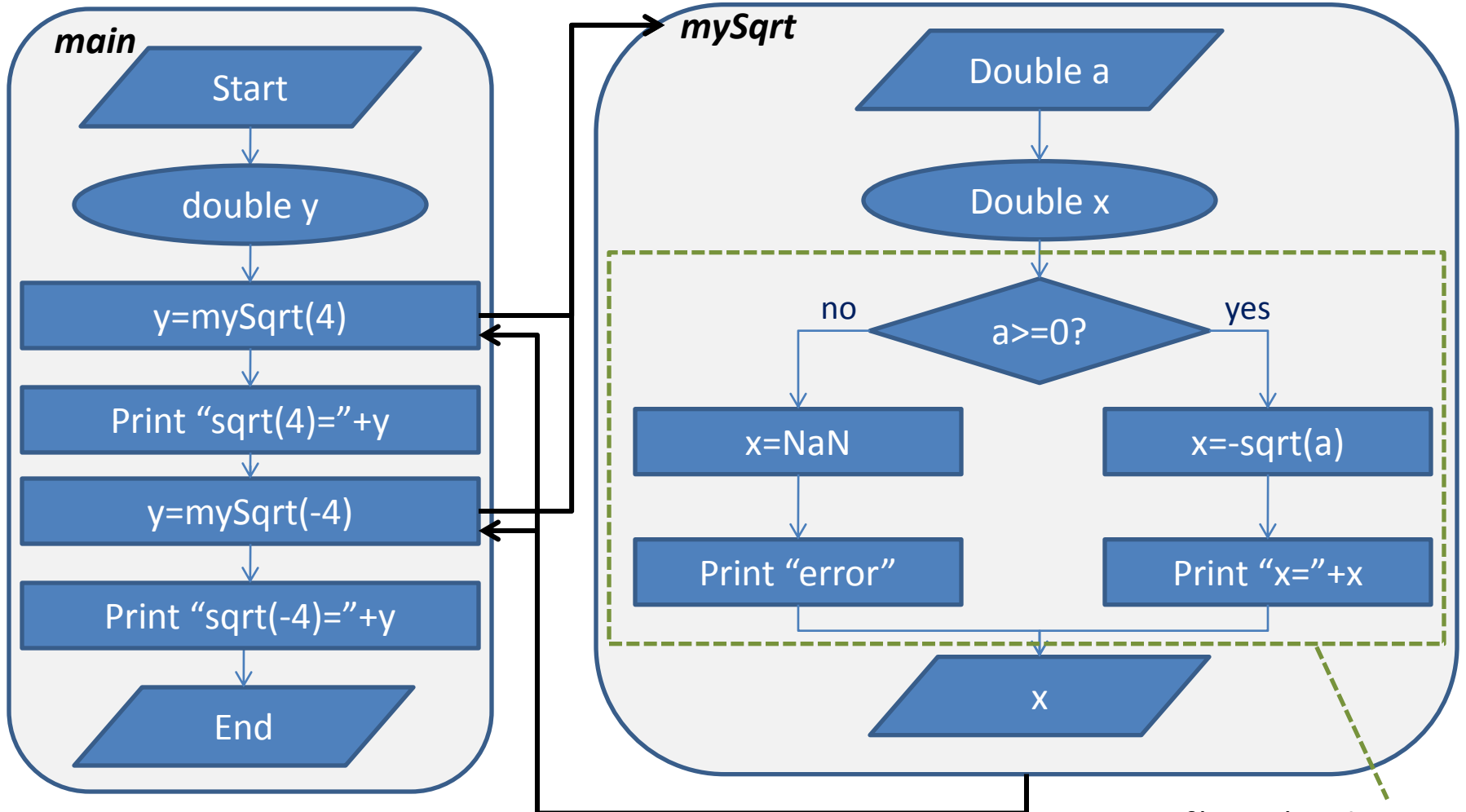
Linear equation solving (functions)



Conditional statements

Calculate the square root of a given number and print it

$$x = \sqrt{a}$$



If(a>=0) – then – else

Loops and function calls

Calculate the factorial of an integer number, format this calculation as a function,
Print factorial of 3

factorial

Int n

Int j, f

f=1

j=1

j<=n?

no

yes

f=f*j

j=j+1

for(j=1,j<=n,j++)...
or
j=1; while (j<=n)...

f

main

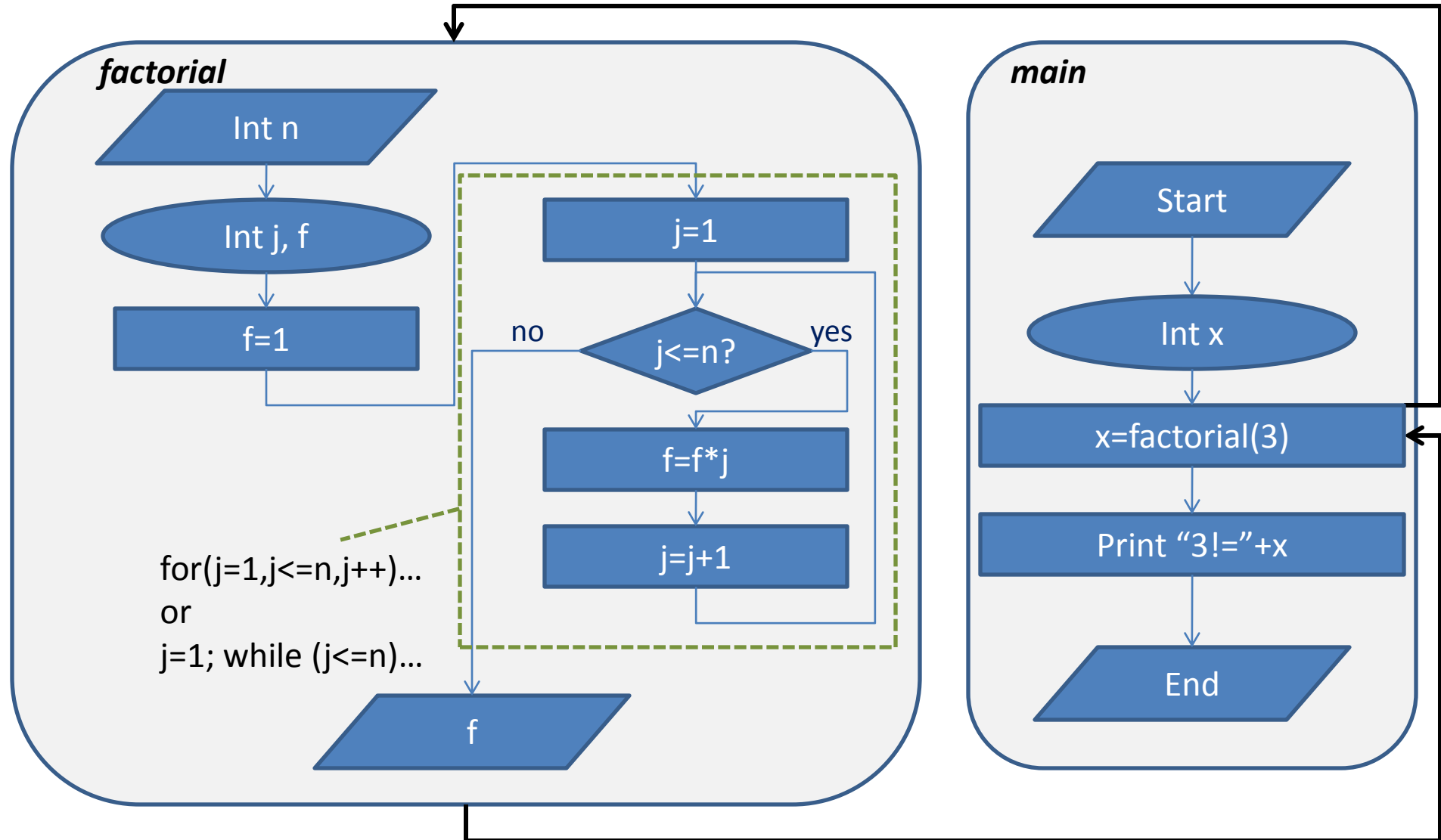
Start

Int x

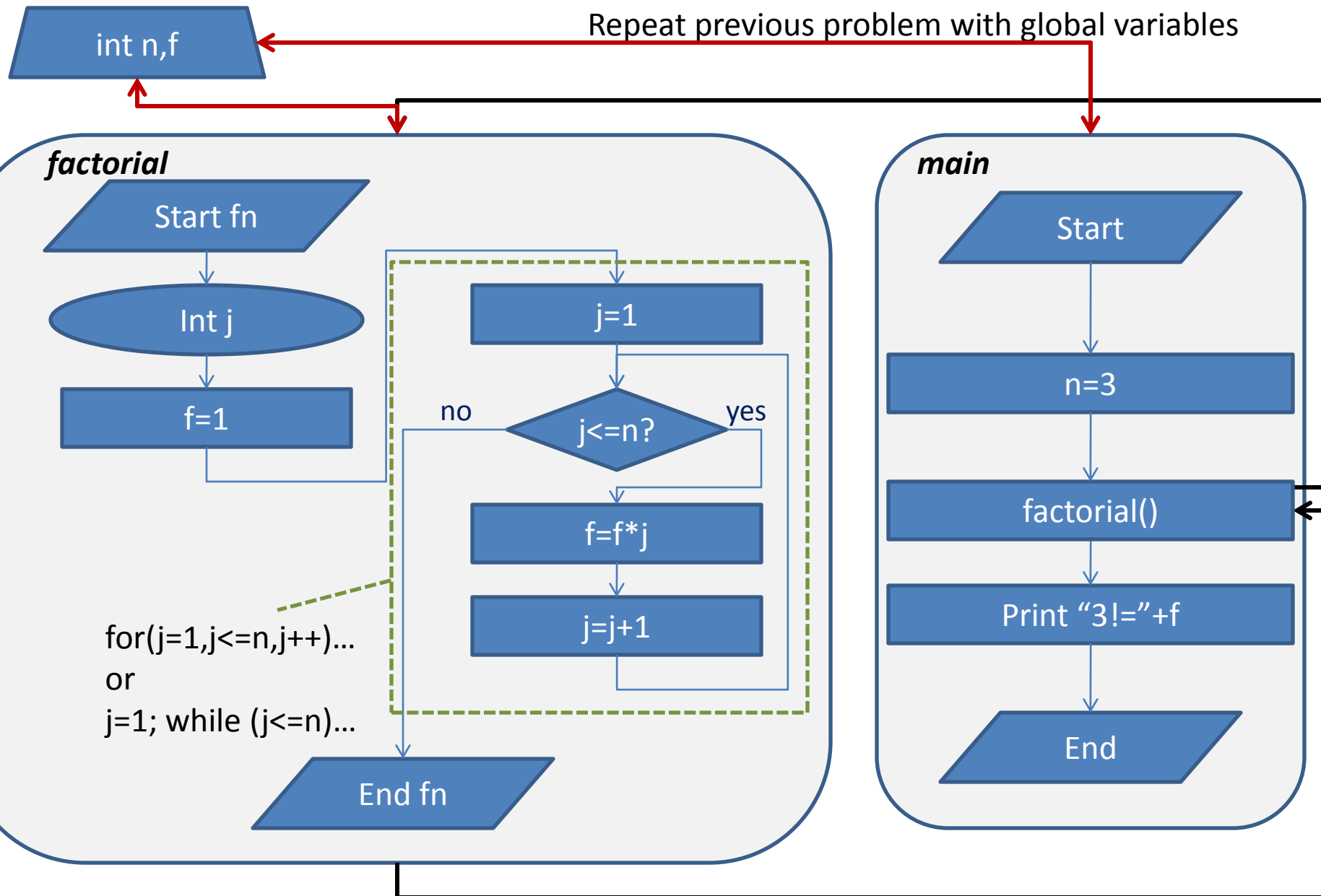
x=factorial(3)

Print "3!="+x

End



Global variables function calls



Practice

- 1:**
 - Write a flowchart for a function *sqSolve* that solves quadratic equation: ax^2+bx+c and prints answers on the screen (it does not have to return a value)
 - Consider cases when the equation has two roots, one root, or no (real) roots
 - Write a flowchart incorporating a main function, calling *sqSolve* to solve $x^2-2x+1=0$
 - Implement your flowcharts in Java
 - Repeat the problem incorporating global variables
- 2:** Calculate $\sum_{i=1}^{20} \frac{1.5}{i}$
- 3:** Calculate $\frac{1}{2} - \frac{1}{4} + \frac{1}{6} - \frac{1}{8} + \dots - \frac{1}{100}$
- 4:** Make another look at numerical integration. Note that the integral of a function is reduced to a sum. Write down this sum (assume trapezoid rule). Make a flowchart for calculation of an integral of a function given by *function f(x)* which accepts *double* value and returns *double* value
- 5:** Make up your own computational problem with solution requiring *function call*, *for* loop, and *if* statement. Develop a flowchart and write a Java program.
- 6:** Repeat **5** with global variable approach