INTRODUCTION TO COMPUTER SCIENCE

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Fall 2013

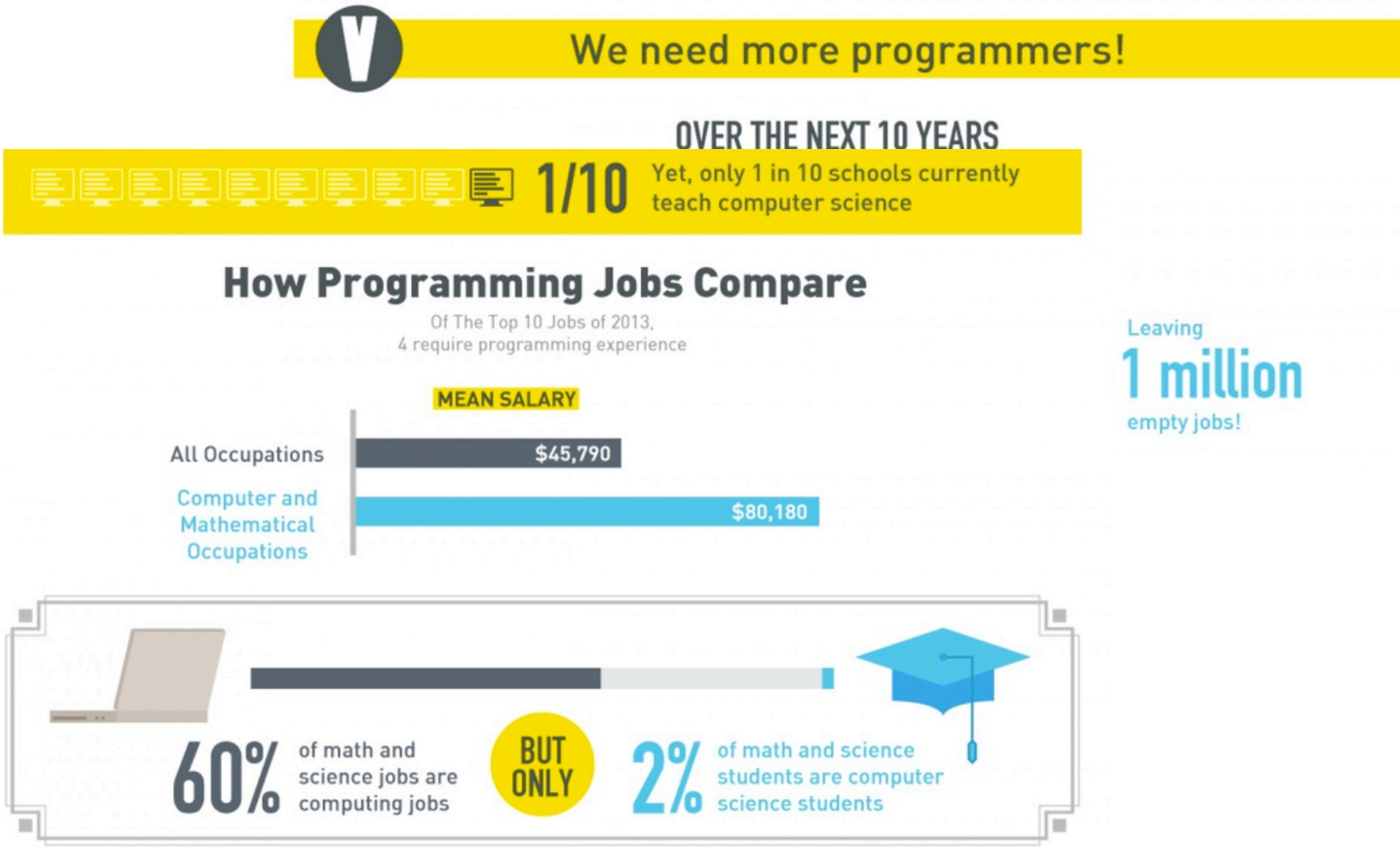
Ch.6: Programming Languages

- Traditional Programming Concepts
- Procedural Units

Programming

"Learning to write programs stretches your mind, and helps you think better, creates a way of thinking about things that I think is helpful in all domains."
-Bill Gates

Programming



Traditional Programming

Procedural Units

- A program consists of a collection of statements
  - **Declarative statements** define customized terminology that is used later in the program, such as the names used to reference data items;
  - **imperative statements** describe steps in the underlying algorithms;
  - **comments**

Variables and Data Types

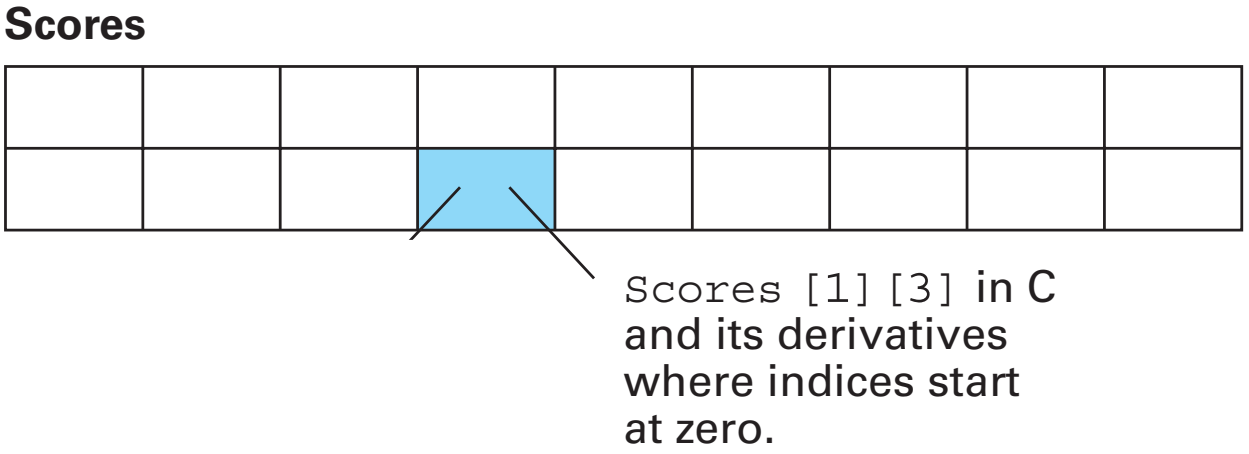
- High-level programming languages allow locations in main memory to be referenced by names called: **variable**
- the type of data that will be stored at the memory: **data type** e.g. integer, float, character, Boolean
- Examples:

```
int Height, Width;

int WeightLimit = 100;

char Letter, Digit;
```

Array

- A block of elements of the same type such as a one-dimensional list, a two-dimensional table with rows and columns, or tables with higher dimensions.
- **Indices**
- Example:

```
int Scores[2][9];
```



Structure

- A block of data in which different elements can have different types.

```
struct {char  Name[25];
        int   Age;
        float SkillRating;}
       Employee;
```

- a programmer can use the structure name (Employee) to refer to the entire aggregate
- or can reference individual **fields** within the aggregate by means of the structure name followed by a period and the field name (such as Employee.Age).

- Constants
  - A fixed, predetermined value
  - Example:

```
const int AirportAlt = 645;
```

- Assignment Statements
  - The most basic imperative statement is the **assignment statement**
  - **Example:**

```
Z = X + Y;
```

  - Rules of **operator precedence**

```
2 * 4 + 6 / 2
```

  - parentheses

```
2 * (4 + 6) / 2
```

- Overloading
  - multiple use of an operation symbol
  - Ex.

```
"abra" + "cadabra"
```

  - is *abracadabra.*

- Control Statements

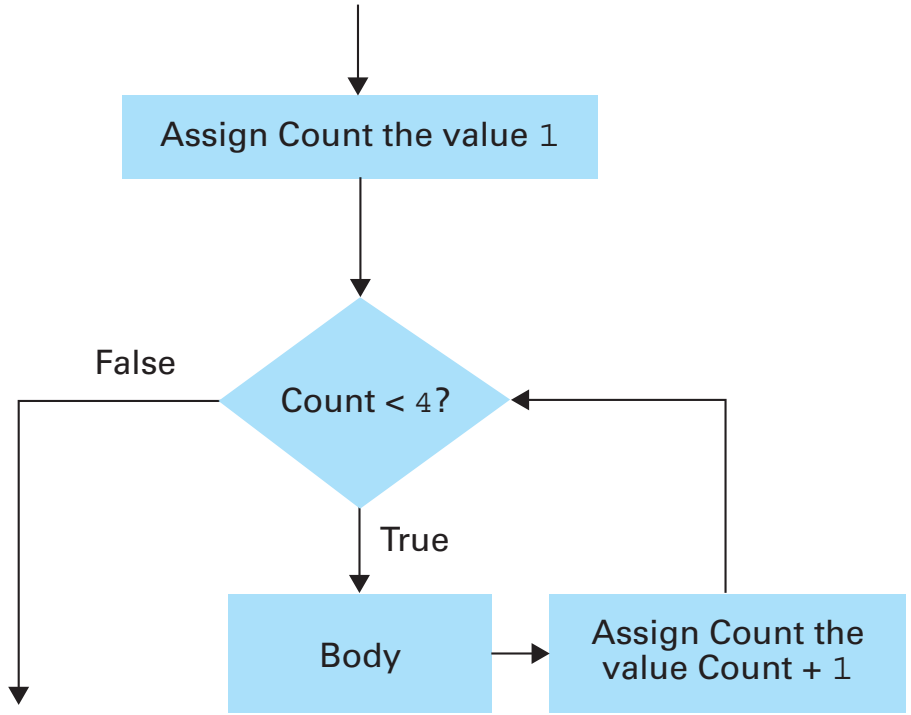
```
if (condition) statementA
  else statementB;
```

```
switch (variable) {
  case 'A': statementA; break;
  case 'B': statementB; break;
  case 'C': statementC; break;
  default: statementD}
```

Traditional Programming

Procedural Units

- Control Statements




```
for (int Count = 1; Count < 4; Count++)
    body ;
```

```
while (condition)
    {loop body}
```

Traditional Programming

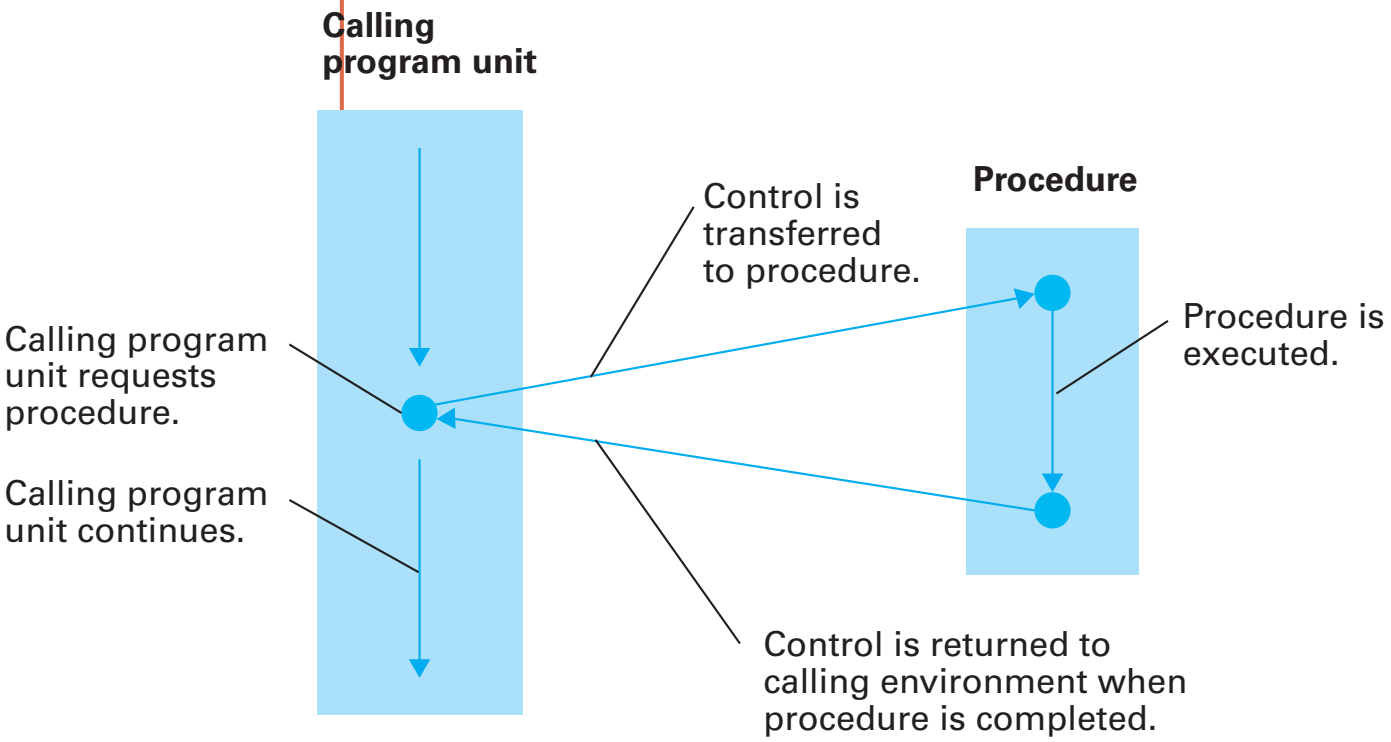
Procedural Units

- Comments
  - explanatory statements
  - for internal documentation,
  -

```
/* This is a comment. */


// This is a comment.
```

Procedural Units

- Procedure
  - a set of instructions for performing a task that can be used as an abstract tool by other program units.

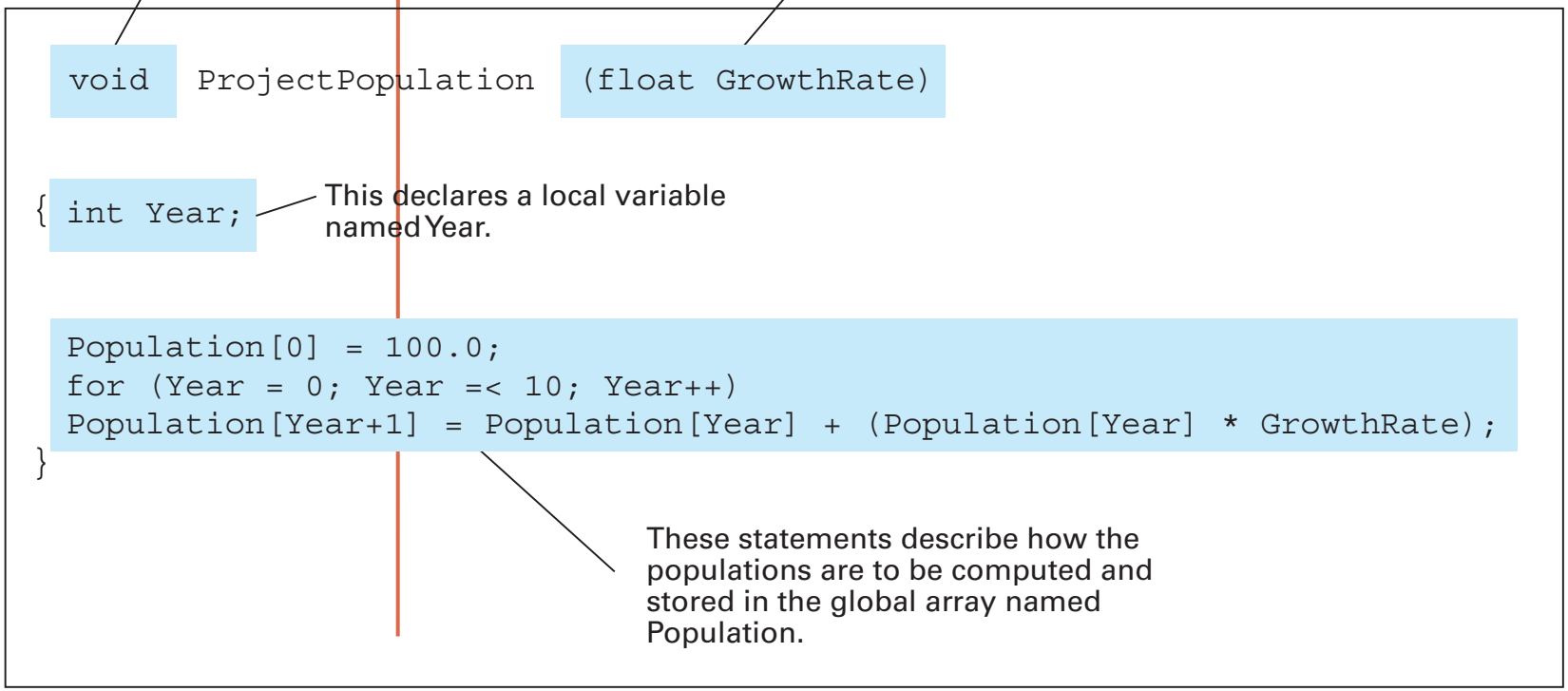


Procedural Units

- Procedure
  - **procedure's header:**
    - identifies, among other things, the name of the procedure.
  - Following this header are the statements that define the procedure's details.
  - a variable declared within a procedure is a **local variable,**
  - The portion of a program in which a variable can be referenced is called the **scope** of the variable
  - **global variables**

Parameters

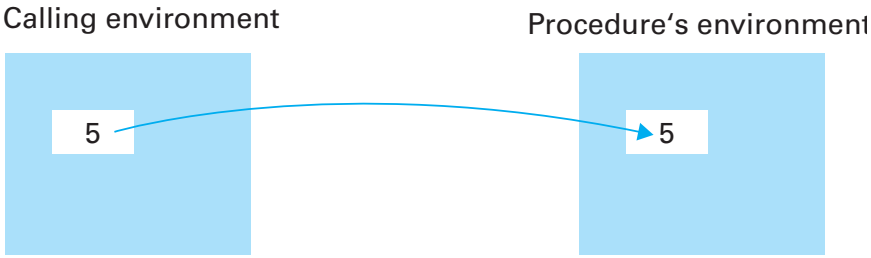
Procedural Units



Parameters passed by value vs. reference

Executing the procedure Demo and passing parameters by value

a. When the procedure is called, a copy of the data is given to the procedure

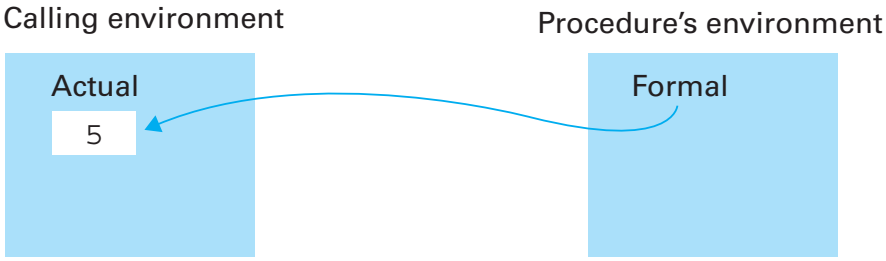


b. and the procedure manipulates its copy.

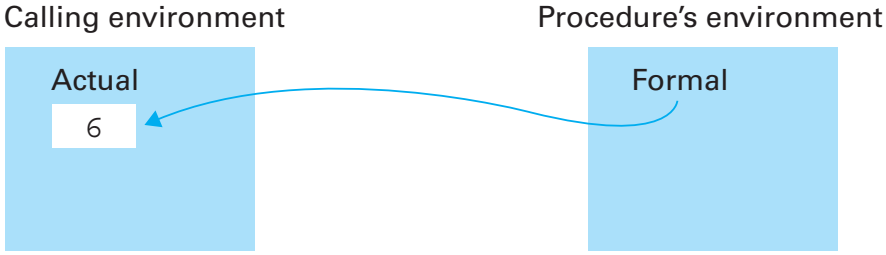
c. Thus, when the procedure has terminated, the calling environment has not been changed.

Executing the procedure Demo and passing parameters by reference

a. When the procedure is called, the formal parameter becomes a reference to the actual parameter.



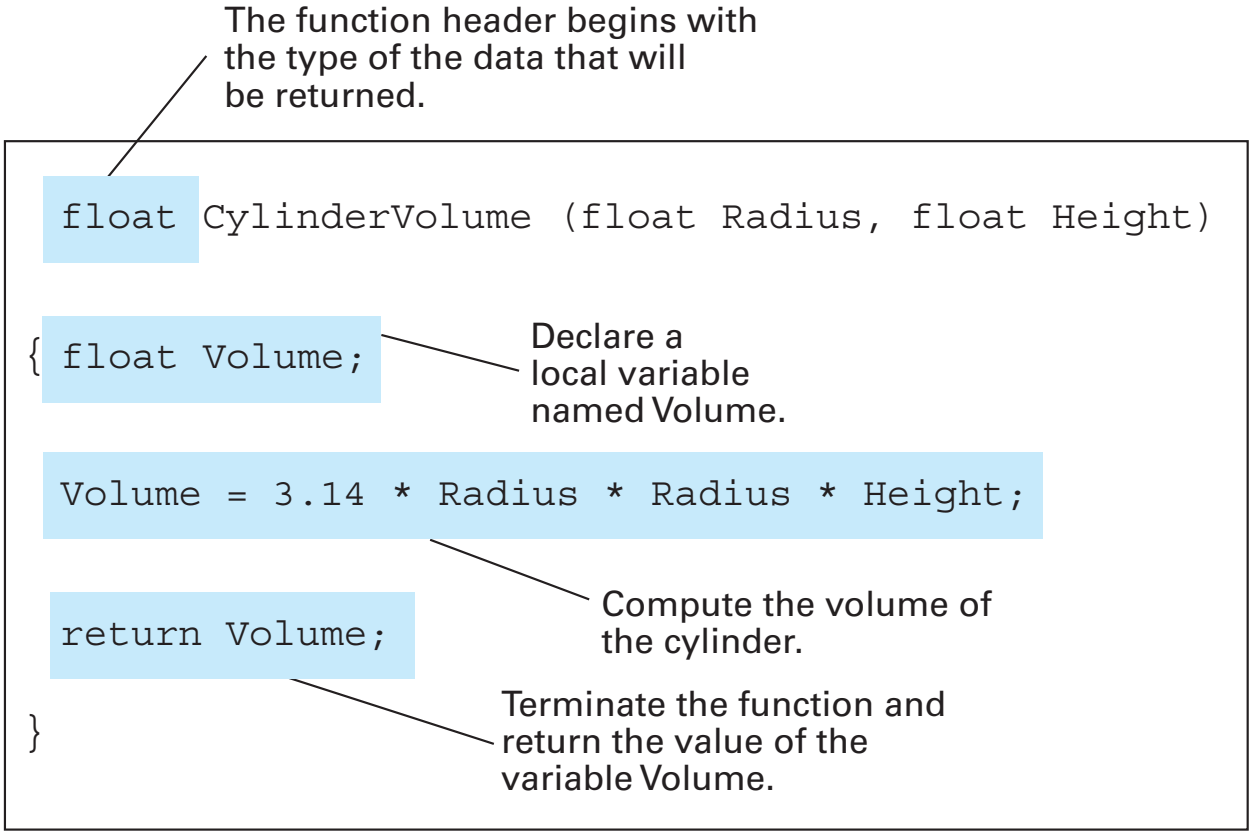
b. Thus, changes directed by the procedure are made to the actual parameter



c. and are, therefore, preserved after the procedure has terminated.

Function

- The term **function** refers to a program unit similar to a procedure except that a value is transferred back to the calling program unit as “the value of the function.”



Assignment

- 10 programming problems to be solved at the Lab.

Notes about the exam

- Lab
  - Computer-based
- Oral
  - Discussion question
- Final
  - MCQ + problems + programming, (NO articles questions)
- Book
  - Ch.1 except 1.7
  - Ch.2
  - Ch. 3 except 3.1
  - Ch. 4
  - Ch. 6 (6.2 and 6.3)

Notes to You

- How to start reading a book?
  - Read the contents
  - Skim each chapter
  - Prepare a side list with your translated words
  - Learn the meanings of the scientific expressions

Have you noticed that Appendix F is Answers to the chapters questions?

I think we underrate students if we assume that we have to explain everything in class. We should be helping them learn to learn on their own.

Students' feedback

- Comments about the book
  - Writing style, arrangement, examples, problems
- Comments about the lecture
  - Timing, coverage, explanation, respond to questions
- Comments about the slides
  - Clarity, animations, videos,
- Comments about the assignments
  - Variety, coverage, amount, time allowance
- Comments about the Lab
  - Computers, software, discipline,

Thank y all n c u nxt year