SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

CMPT 120: Introduction to Computing Science and Programming 1

Algorithms, Flowcharts and Pseudocodes

One-Stop Access To Course Information

- Course website: One-stop access to all course information.

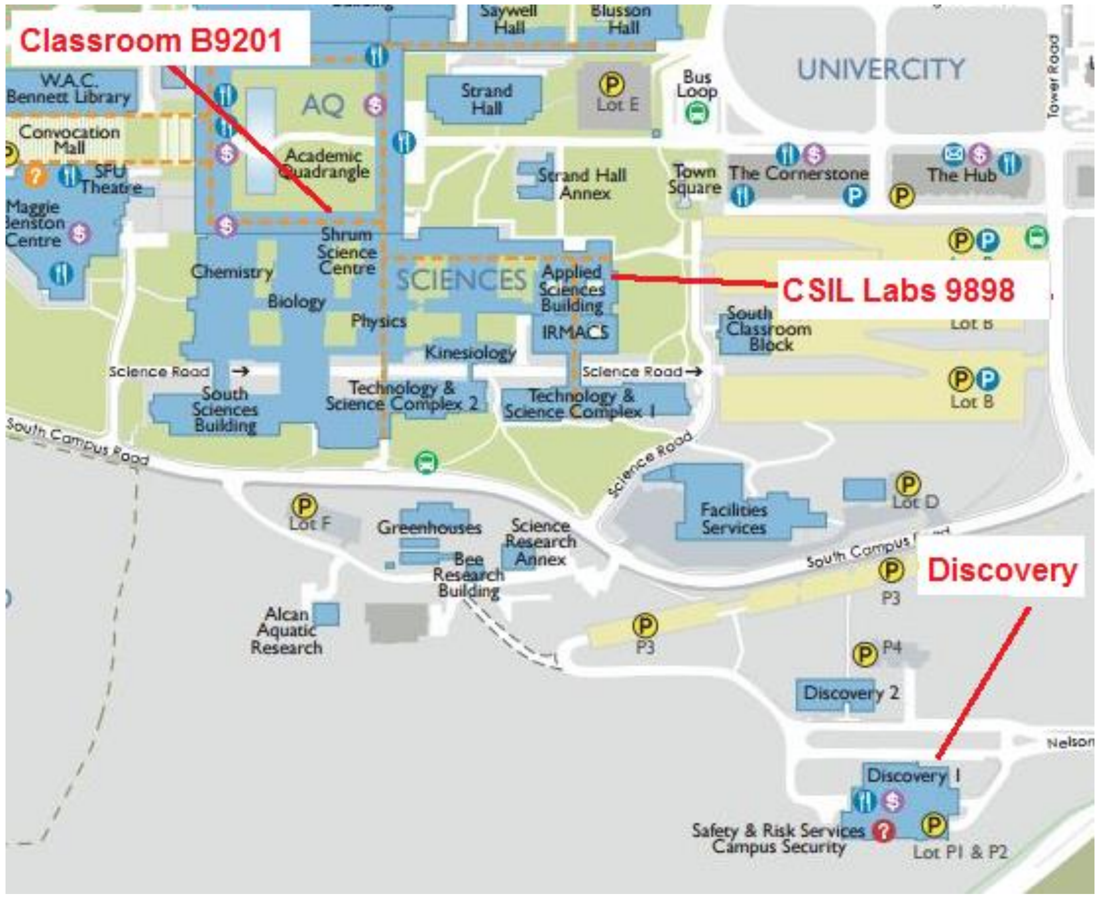
  http://www2.cs.sfu.ca/CourseCentral/120/liaqata/WebSite/index.html

- Course Outline	- Learning Outcomes	- Grading Scheme
- Exam Schedule	- Office Hours	- Lab/Tutorial Info
- Python Info	- Textbook links	- Assignments
- CourSys/Canvas link	- and more…	

- Canvas: Discussions forum - https://canvas.sfu.ca/courses/39187
- CourSys: Assignments submission, grades - www.coursys.sfu.ca

Some Reminders

- **Get familiar with the course Website.**
  - **http://www2.cs.sfu.ca/CourseCentral/120/liaqata/WebSite/index.html**
  - **Minor updates may occur during first week.**
- **Get fob to access LABS (start next week!)**
  - **If you don't have it already, get a new fob from Discovery Park 1 .**



Additional Resources / Online References

- Online references are **as important as the texts**. (Links on course website.)
- These resources are **very important to your success**.
  - They aren't meant to be read from beginning to end like the readings in the textbook.
- You should **use them to get an overall picture of the topic** and as references as you do the assignments.

How to Learn in This Course?

A **Attend** Lectures & Labs

R **Read** / review Textbook/Slides/Notes

R **Reflect** and ask Questions

O **Organize** – your learning activities on weekly basis,

and finally…

W **Write** Code, Write Code, and Write Code.

Course Topics

1. General introduction
2. Algorithms, flow charts and pseudocode
3. Procedural programming in Python
4. Data types and control structures
5. Fundamental algorithms
6. Binary encodings
7. Basics of computability and complexity
8. Basics of Recursion
9. Subject to time availability:
   - Basics of Data File management

Today's Topics

1. Continue with Algorithms, Flowcharts
2. Pseudocodes

Today’s Topics

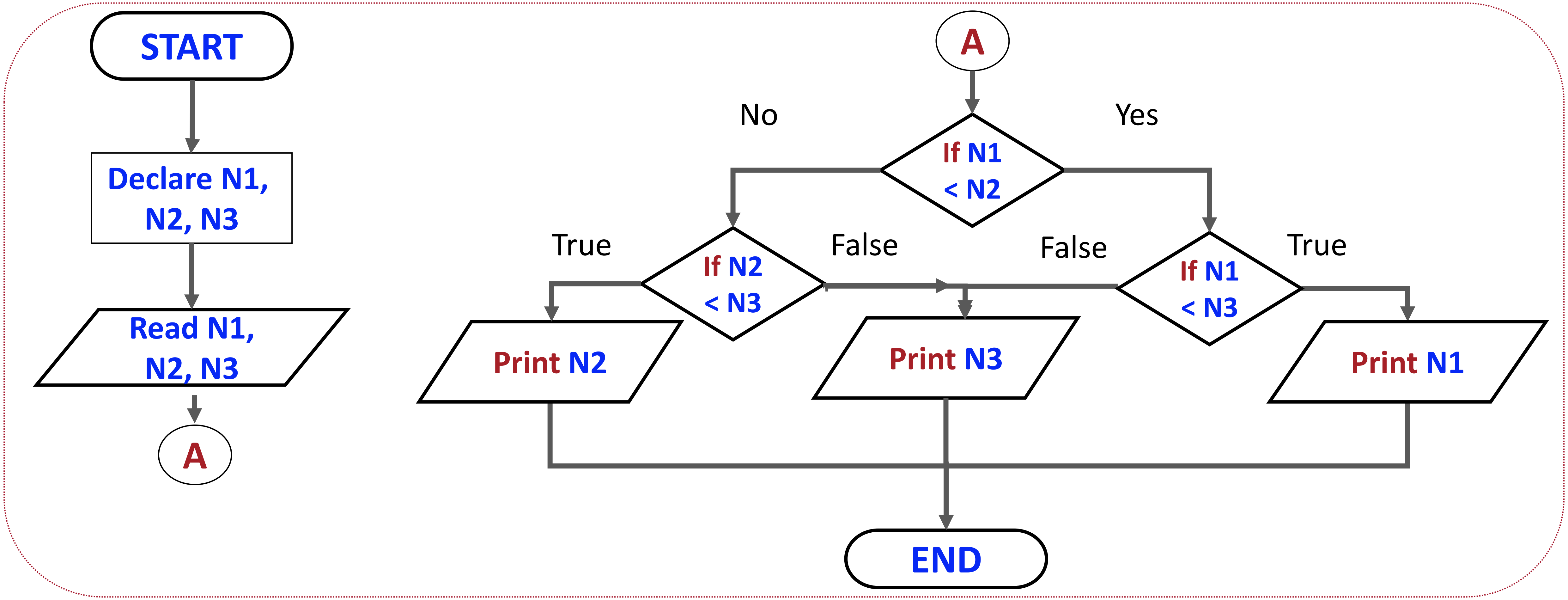
1

Continue with Algorithms, Flowcharts

Algorithm: Find the Smallest of Three Numbers

```
Step 1:  Start
Step 2:      Declare variables n1, n2, and n3.
Step 3:      Read variables n1, n2, and n3.
Step 4:      If n1 < n2 then:
Step 5:          If   n1 < n3 then print n1 else print n3.
Step 6:      else
Step 7:          If n2 < n3 then print n2 else print n3.
Step 8:  End
```

Flowchart: Smaller of Three Numbers (Solution)



Today’s Topics

2

Pseudocodes

Pseudocodes

- You can think of **Pseudocodes same** as **Algorithms**: a sequence of steps to solve a problem, except:
  - Steps in algorithm may be **less detailed**, a pseudocode **describe** those steps.
  - Steps in an algorithm look **more like an English** (natural) language instructions, whereas, steps in a pseudocode may look **more like a code**.
- For example:
  - A step in algorithm may be written like this: **Convert feet into inches.**
  - An equivalent pseudocode may be written as: **Set inches to feet * 12**
- **What's common:** We can transform the instruction written as algorithms, flowcharts or pseudocode into a programming language code.

Pseudocodes - 2

- But, the algorithms we write in the natural language may be not easy to transform into code – especially for large and complex problems.
- It would generally be more helpful to be "**short**" and "**specific**", i.e., "**describe**" our algorithms in a way that's easy to transform into code.
- So, pseudocode **a way to describe** the steps in an algorithm using some short and simple English (natural) language terms. (**Pseudo** is "**almost**".)
- It describes an algorithm in specific enough detail to be easily implemented in any language.
- Actually, some of the algorithms we wrote in the previous two classes equally qualify as pseudocodes.

Pseudocodes: Features

- We typically use short phrases or keywords to describe steps in a pseudocode.
- For example:
- **READ, WRITE, SET, IF, ELSE, ENDIF, WHILE, ENDWHILE, REPEAT, UNTIL**
- Pseudocodes omit language specific syntax.
- It enables the programmers to concentrate on writing the coding.

Algorithm/Pseudocode: Smaller of Three Numbers

1: **Start**

2: Declare variables n1, n2, and n3

3: Read variables n1, n2, and n3

4: If n1 is smaller than n2 and n3, then n1 smaller.

5: If n2 is smaller than n1 and n3, then n2 smaller.

6: If n3 is smaller than n1 and n2, then n3 smaller.

7: **End**

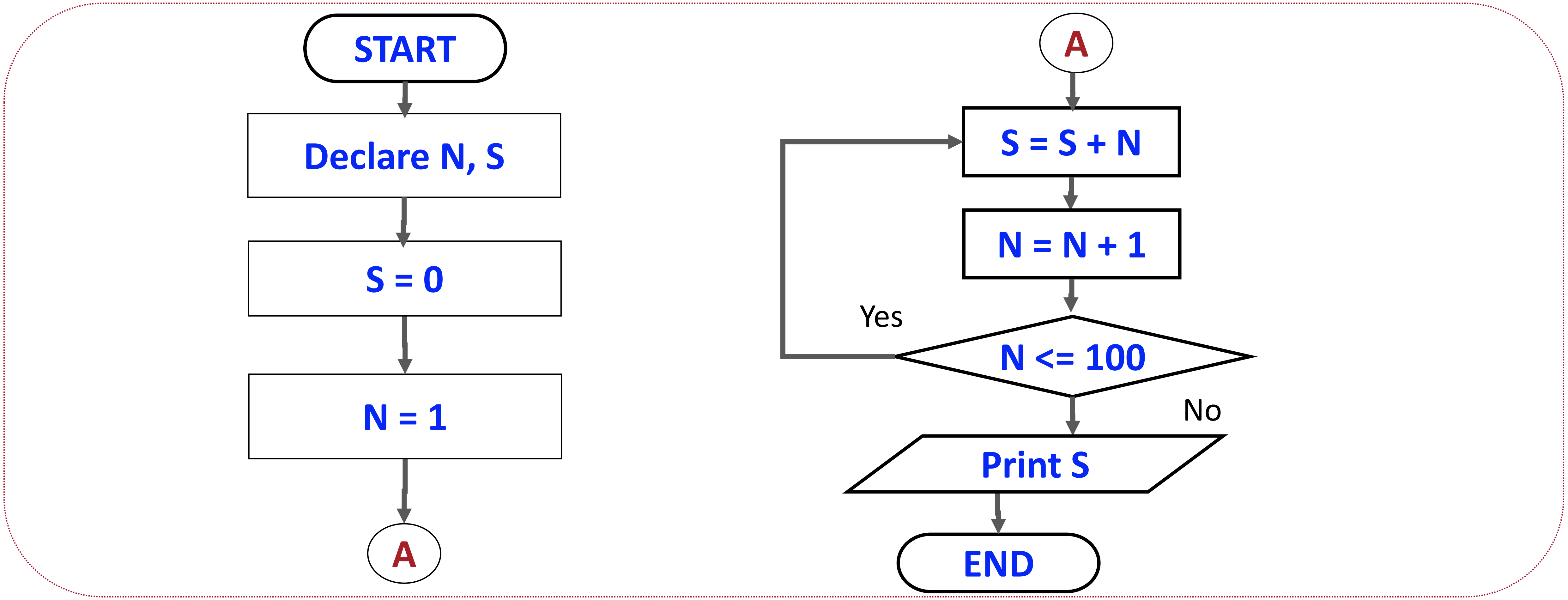
```
Read n1, n2, n3.
If n1 < n2:
    If n1 < n3, Write n1.
    Else Write n3
If n2 < n1:
    If n2 < n3, Write n2.
    Else  Write n3.
```

Pseudocode: Find Sum of First 100 Natural Numbers

```
Step 1: Start
Step 2:   Declare N and S.
Step 3:   Set initial value of S to 0.
Step 4:   Set initial value of N to 1.
Step 5:   Add the value of N to S, giving S.
Step 6:   Get the next number by add 1 to N.
Step 7:   Repeat steps 5 to 6 until N is equal 100
Step 8:   Display S.
Step 9:  End
```

```
Set S to 0
Set N to 1
Repeat until N <=100:
    Set S=S+N
    Set N=N+1
Write S
```

Flowchart: Find Sum of First 100 Natural Numbers

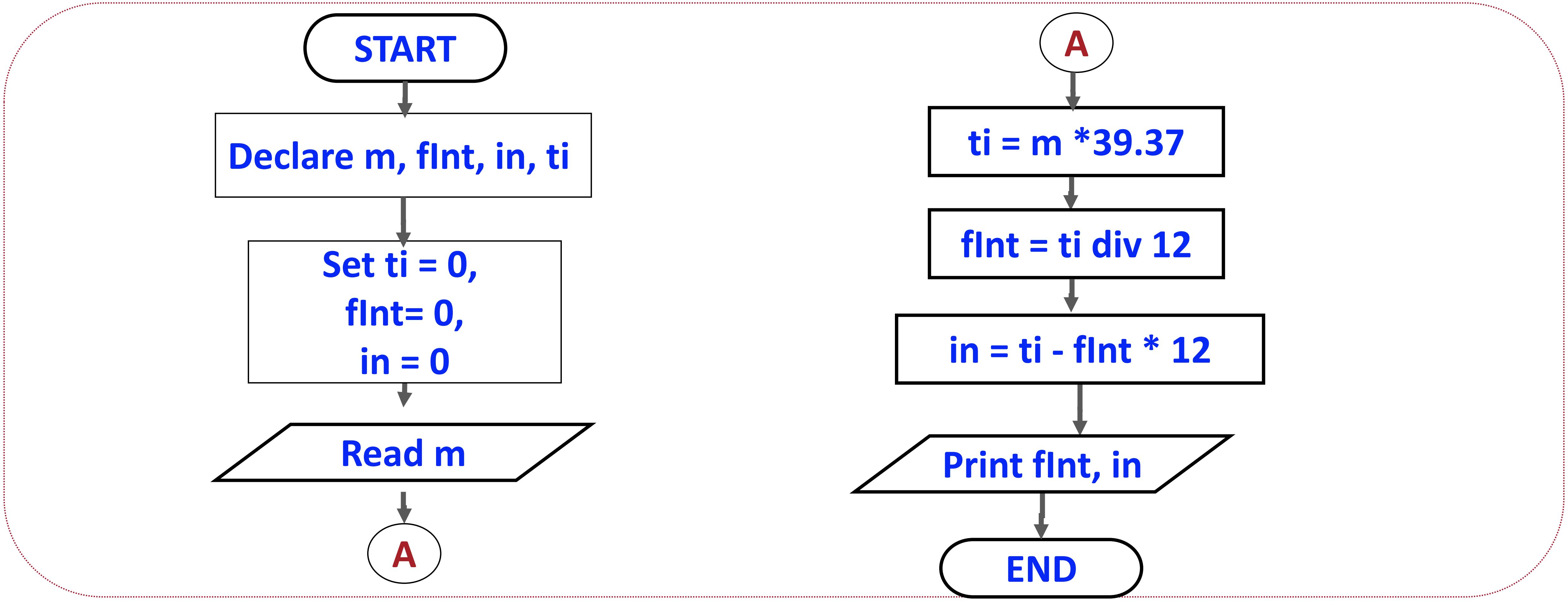


Algorithm: Convert Height In Meters To Feet and Inches

1: Start
2: Declare meter, feet, total inches and inches variables.
3: Initialize feet, total inches and inches variables to 0.
4: Get the height in meters from the user.
5: Convert meters into total inches and store it.
5: Convert total inches into feet and store it.
6: Find remainder of total inches / 12 and store in inches.
7: Display the value in feet variable.
8: Display the value in the inches variable.
9: End

```
Read meters
Set totInch to 39.37 × metres
Set feet to totInch/12 (floor)
Set inches to totInch – 12*feet
Write feet, inches
```

Flowchart: Convert Height In Meters To Feet and Inches



Why Pseudocodes?

Writing code to solve a problem would have two parts:

1. Identifying what to : Writing Pseudocode (Algorithm)
2. Knowing how to do : Writing Python code

- So, write an algorithm, express it in pseudocode before you start coding.
- Especially as you're **starting to program**, you **don't want to be worrying** about **what you're trying to say** and **how to say** it **at the same time**.

Questions?