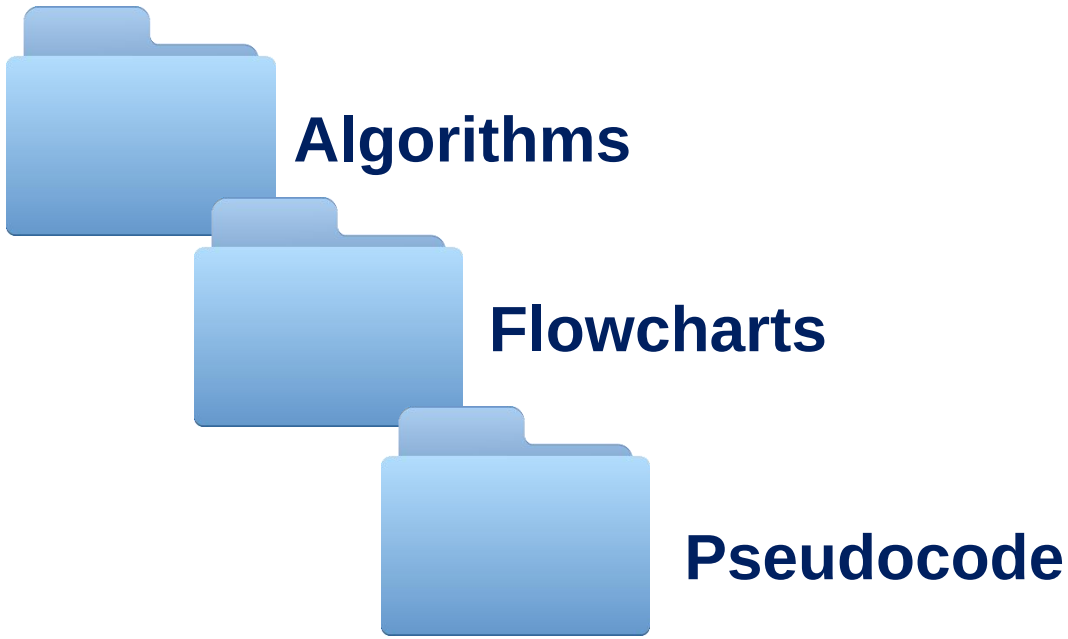
Basic Program Structure
Part A: Flowchart and Pseudo-code

Lesson Objectives

At the end of this lesson, you should be able to:

- Define what an algorithm is
- Express an algorithm using
  - Flowcharts
  - Pseudo-code
- Formulate a simple problem
- Express the solution(s) of a problem in such a way that a computer—human or machine—can effectively carry out

Topic Outline



Scenario 1: Finding the Nearer Coffee Shop

Algorithms

Algorithms are basically sequential (step-by-step).

Scenario 1: Finding the Nearer Coffee Shop

Calculate the distances to locations

Find the nearer location

Algorithms (Cont'd)

- When you formulate a method/ procedure for solving a problem, it has to be computable.
- Such a procedure is called **Algorithm**.

Scenario 1: Finding the Nearer Coffee Shop

Find the distance to location 1

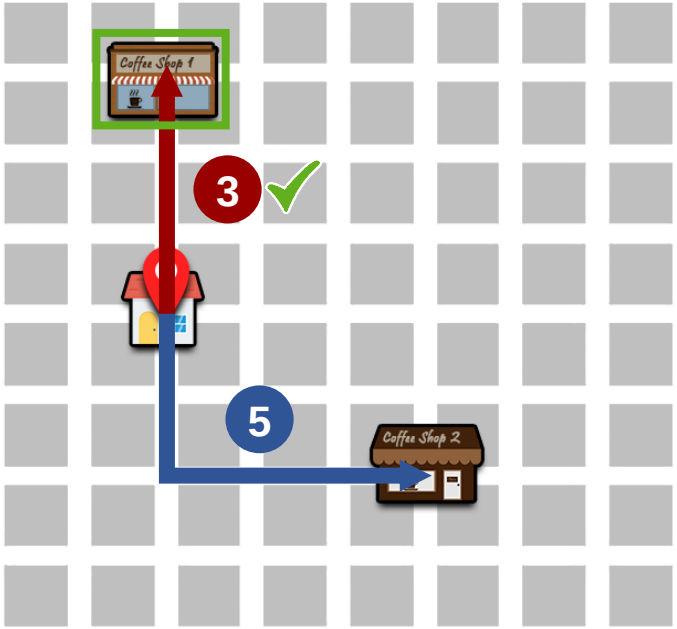
Calculate the distances to locations

Find the distance to location 2

Compare the two distances

Find the nearer location

Select the nearer one based on comparison result



Algorithms (Cont'd)

How to construct an Algorithm?

General Notes:

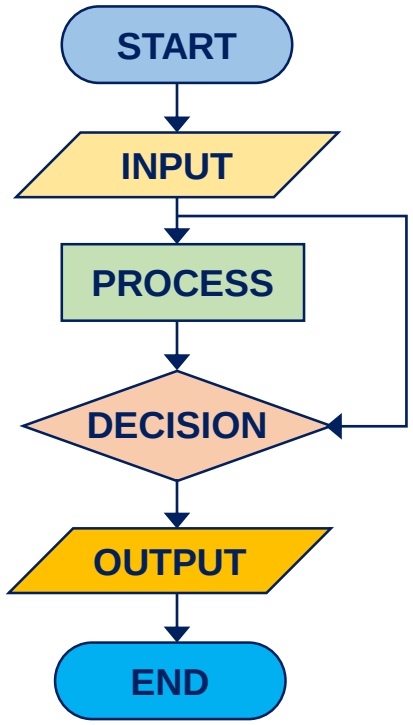
- No strict rules
- Uses informal language – combination of English and keywords

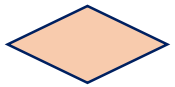
Common Keywords	Other Keywords
`IF, ELSE, WHILE`	`READ, PRINT, INITIALIZE, COMPUTE, ADD, SUBTRACT`

- Usually starts an operation sentence with a verb (description should be concise and precise)

Flowcharts

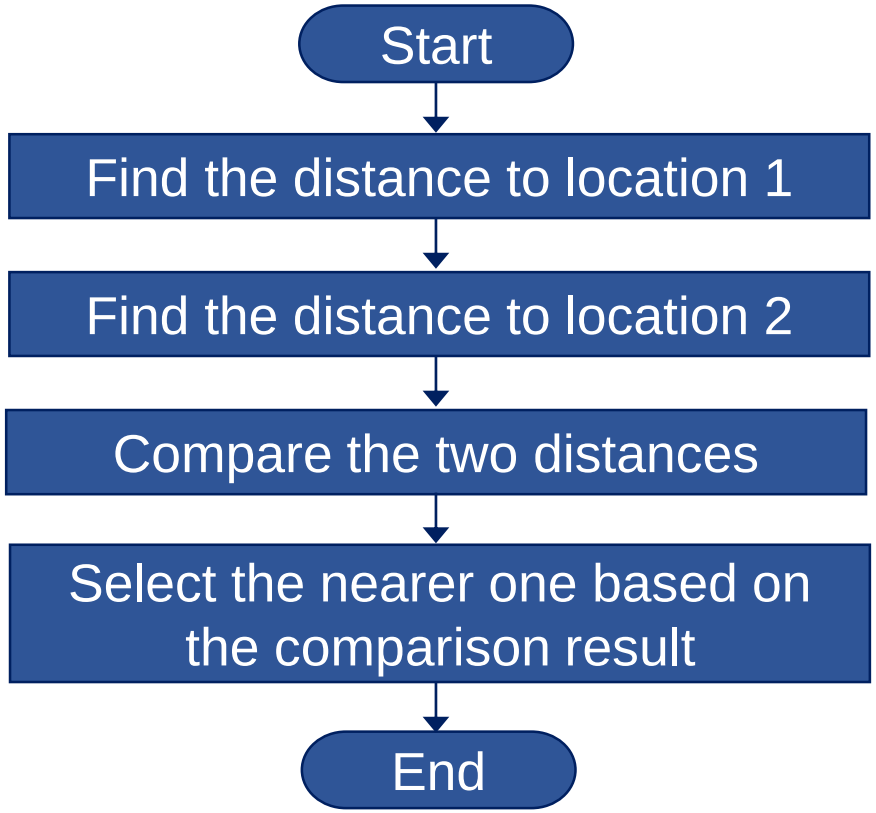
Flowchart: a representation of an algorithm using diagram for effective visualization



Name	Symbol	Use in Flowchart
Oval		Denotes the beginning or end of a program
Flow line		Denotes the direction of logic flow in a program
Parallelogram		Denotes either an input operation (e.g., INPUT or an output operation (e.g. PRINT)
Rectangle		Denotes a process to be carried our (e.g. an addition)
Diamond		Denotes a decision or branch to be made; the program should continue along one of two routes

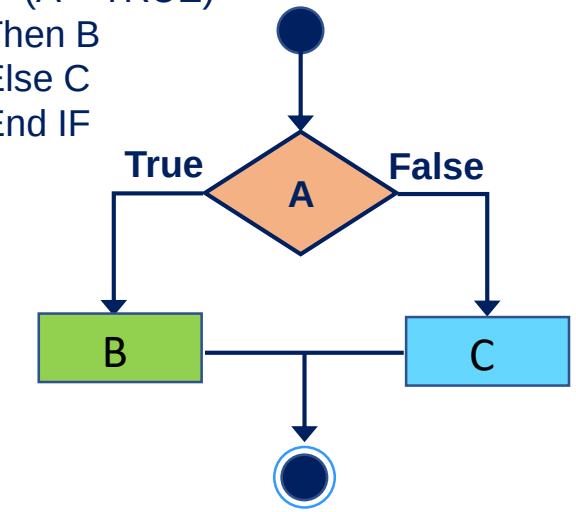
Flowcharts (Cont'd)

Scenario 1: Flowchart 1



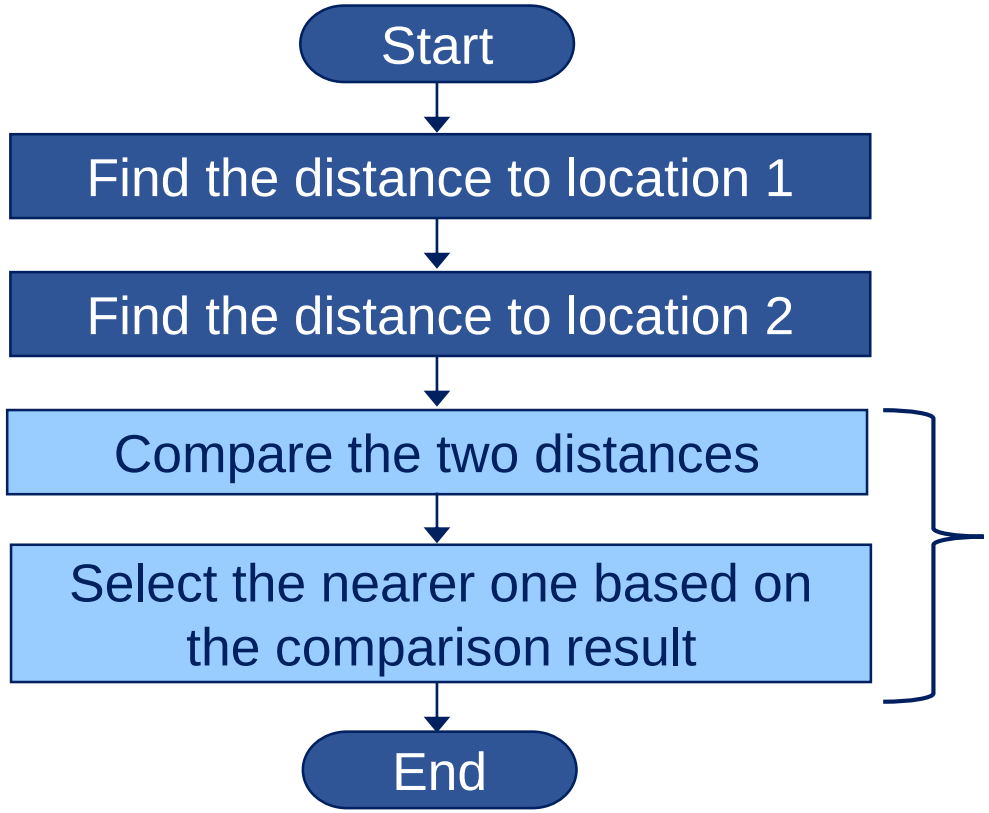
May include **Branching** (making selection)

IF (A = TRUE)
Then B
Else C
End IF

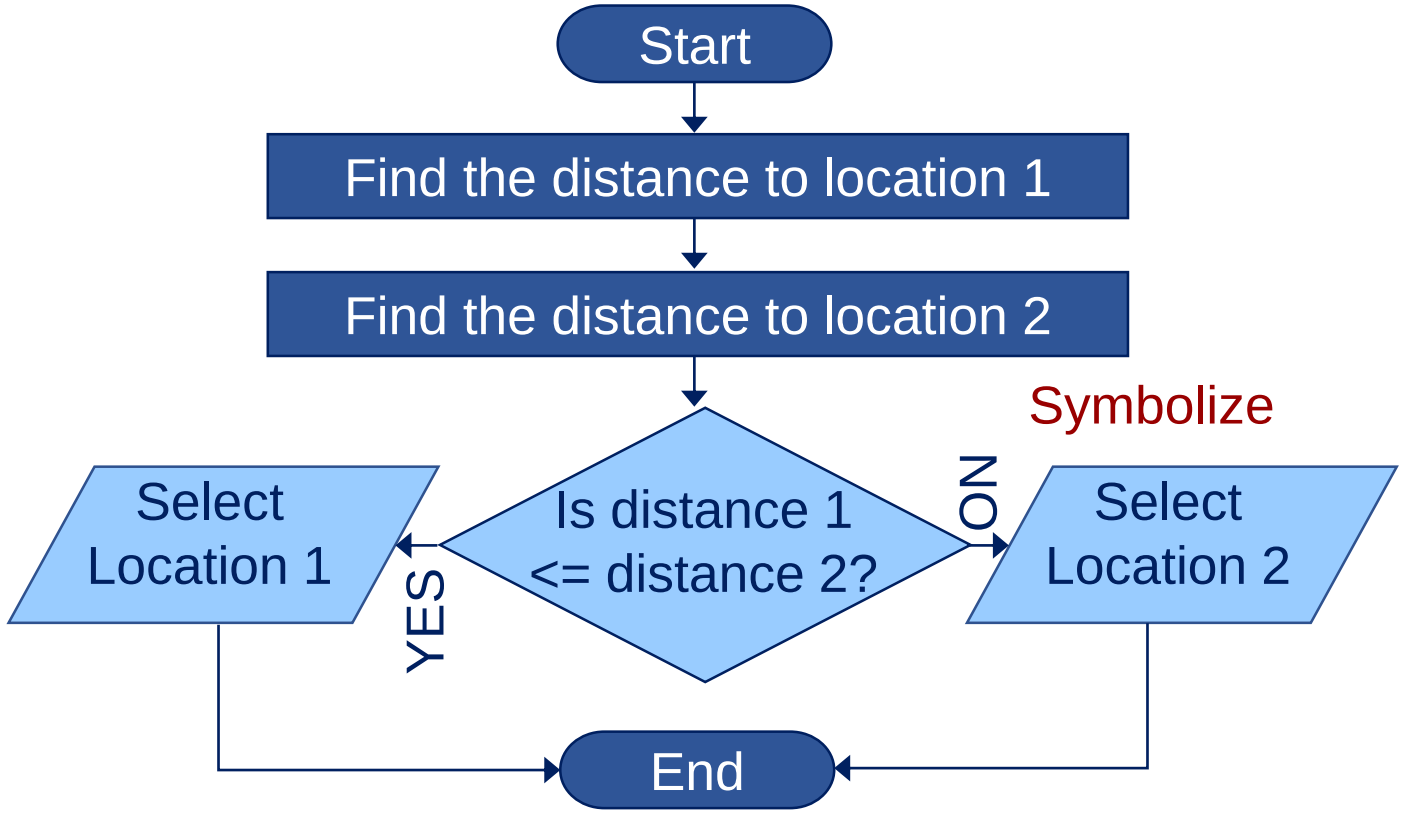


Flowcharts (Cont'd)

Scenario 1: Flowchart 1

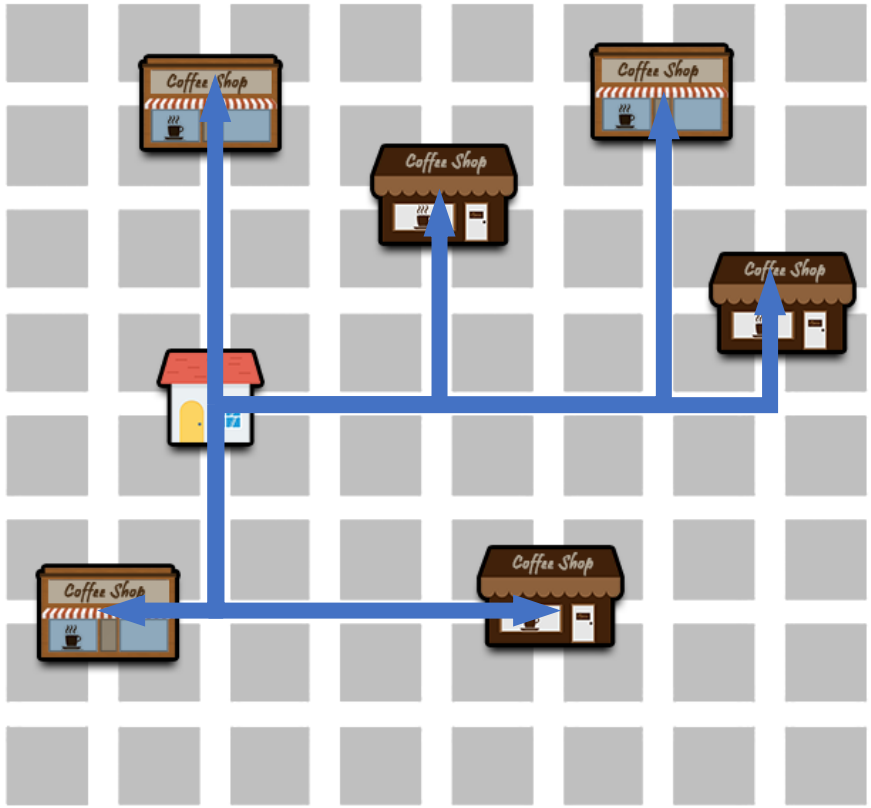


Flowchart 2



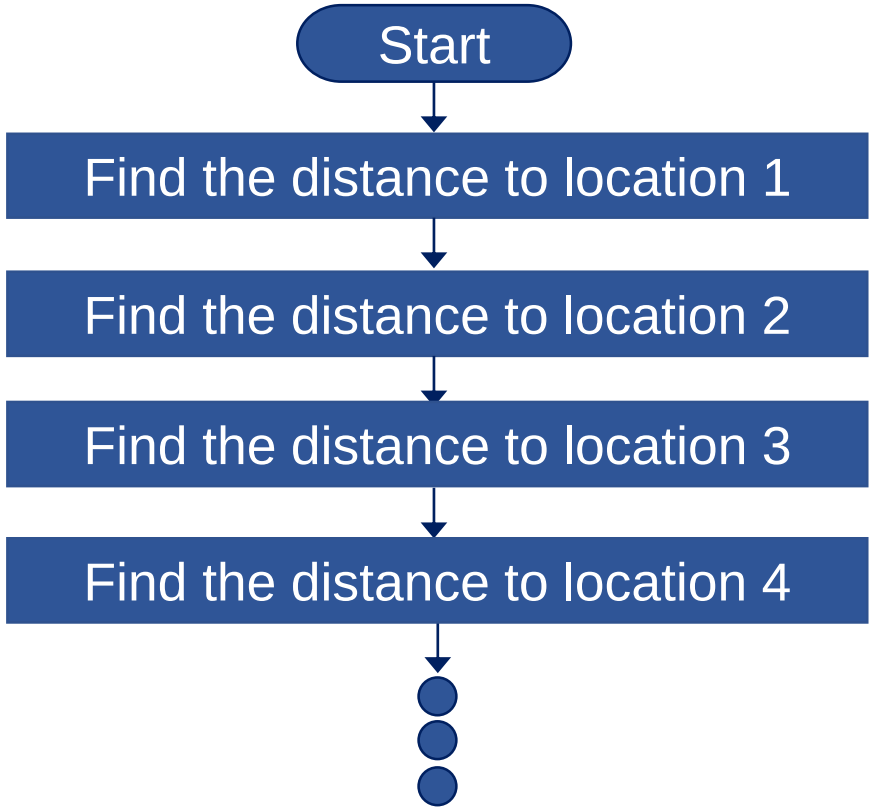
Flowcharts (Cont'd)

What if there were many coffee shops?

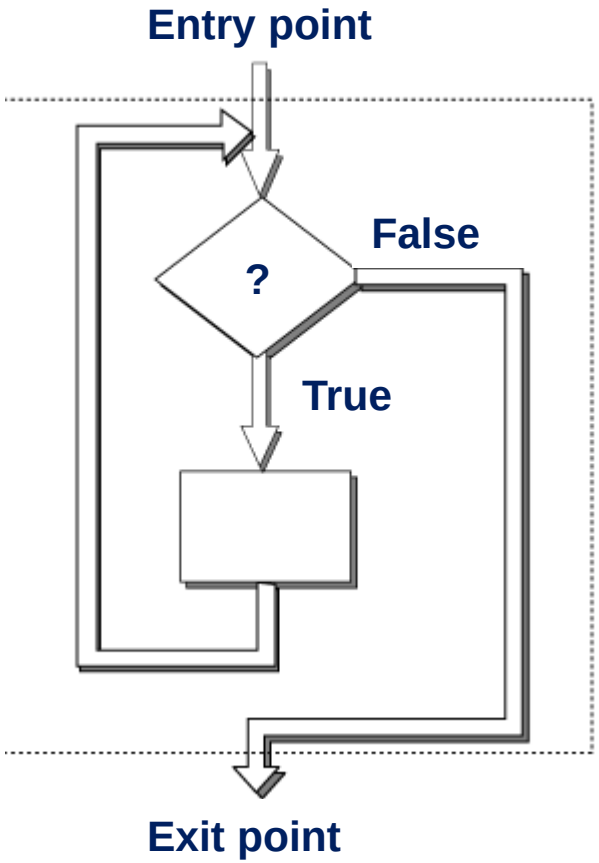


Flowcharts (Cont'd)

What if there were many coffee shops?

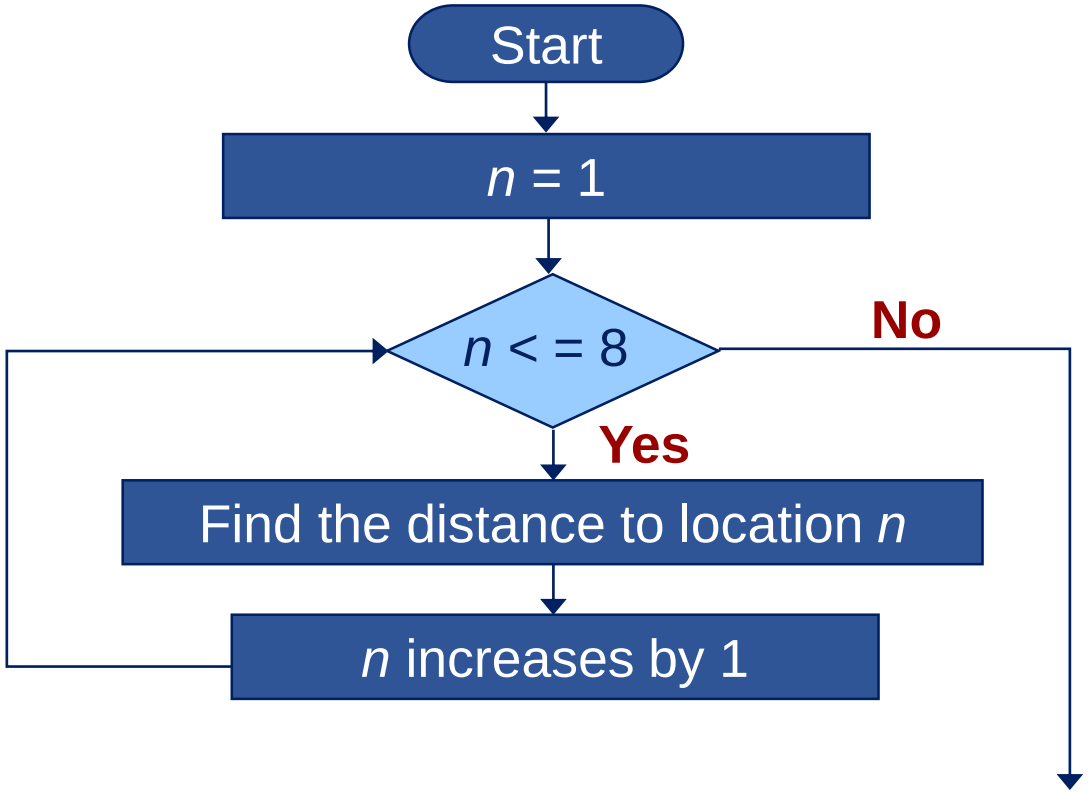


May include Looping (repeating certain operations)



Flowcharts (Cont'd)

May include Looping (repeating certain operations)



Find nearest location Data Structure (Ch. 4); Function (Ch. 5 & 6); Algorithm (Ch.7)

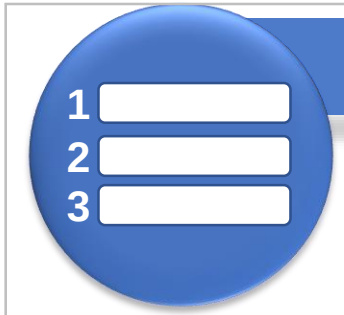
More on this later..

Pseudocode

Pseudocode: pronounced as /ˈ**s(j)uːdəʊˌkəʊd**/ 

- IDEA: directly uses informal English to describe an algorithm step by step with one step per line
- Uses the structural conventions of a normal programming language
  - but is intended for human reading rather than machine reading

Pseudocode (Cont'd)

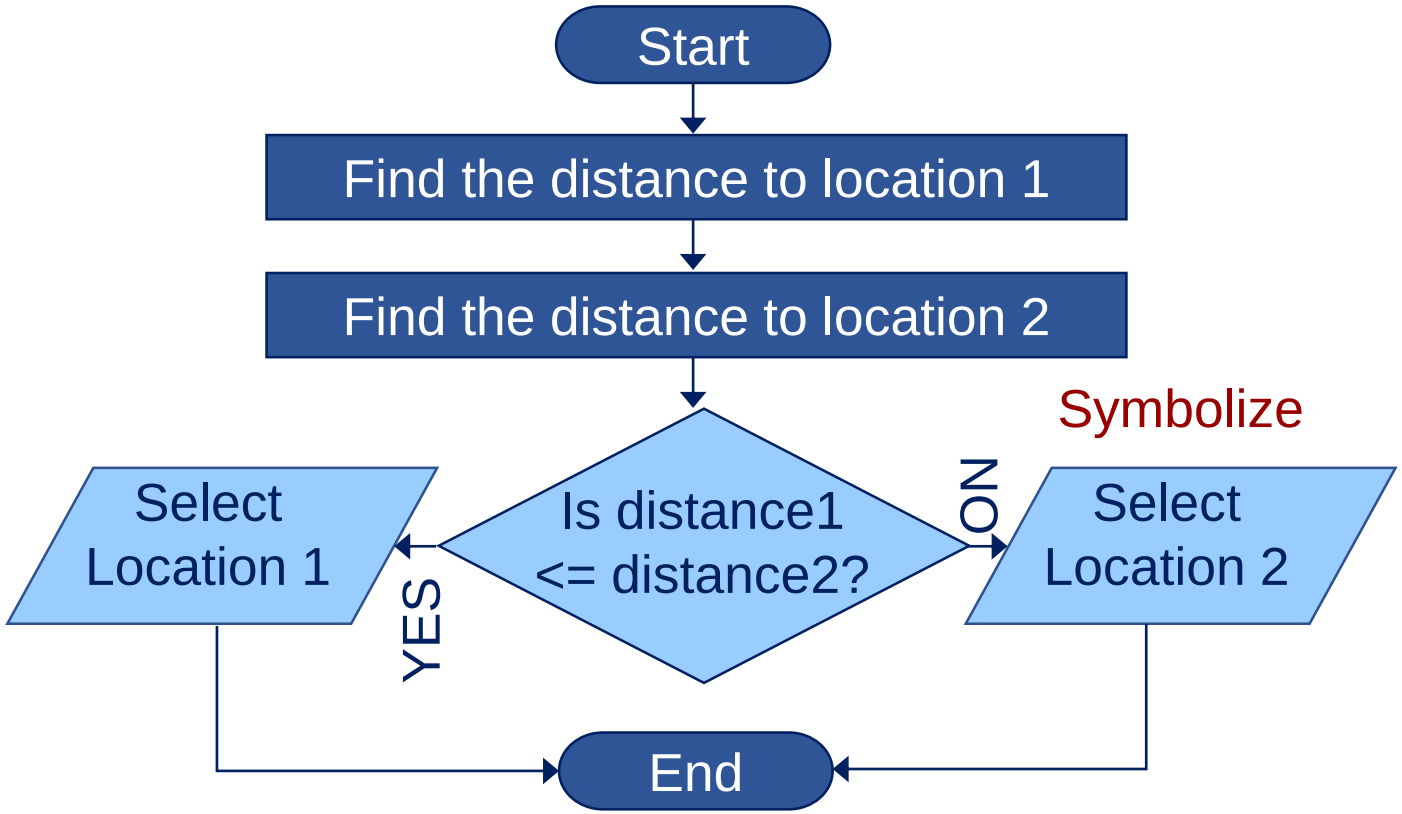


Guidelines

- *Write one statement per line only*
- *Capitalize the keywords*
- *Indent to show hierarchy*
- *End multi-line structures*
- *Keep statements programming-language independent*

Flowchart vs Pseudocode

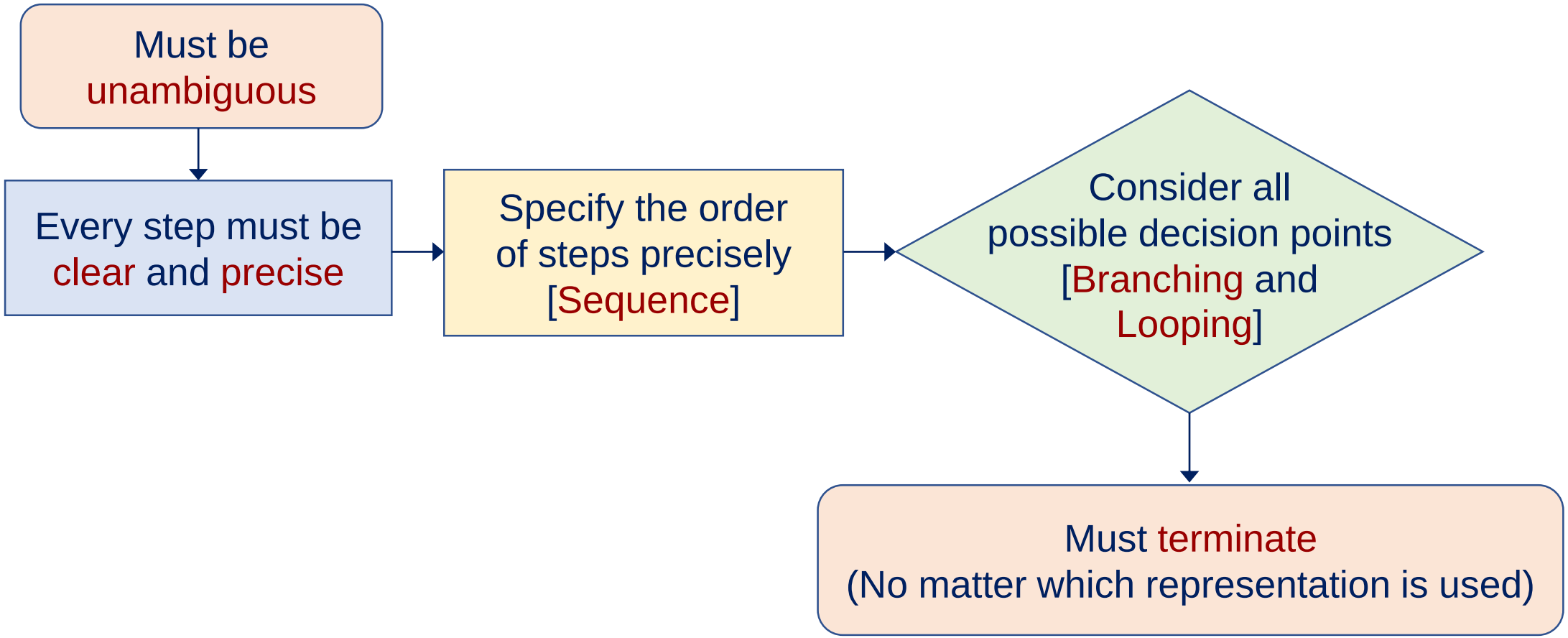
Flowchart



Pseudocode

```
FIND the distance to location 1
FIND the distance to location 2
IF distance1 < = distance2
   SELECT Location 1
ELSE
   SELECT Location 2
END IF
```

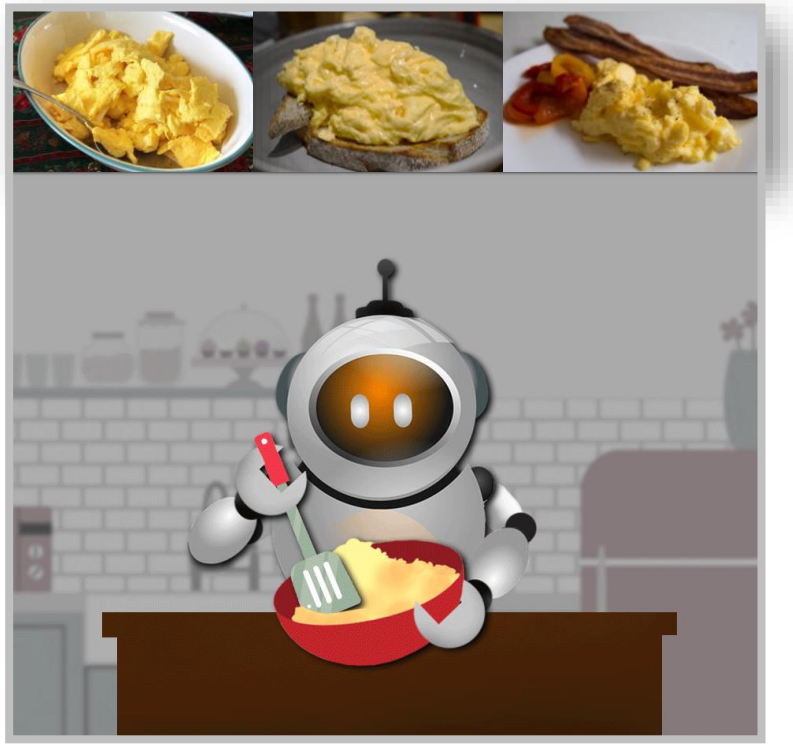
Summary: Expressing an Algorithm



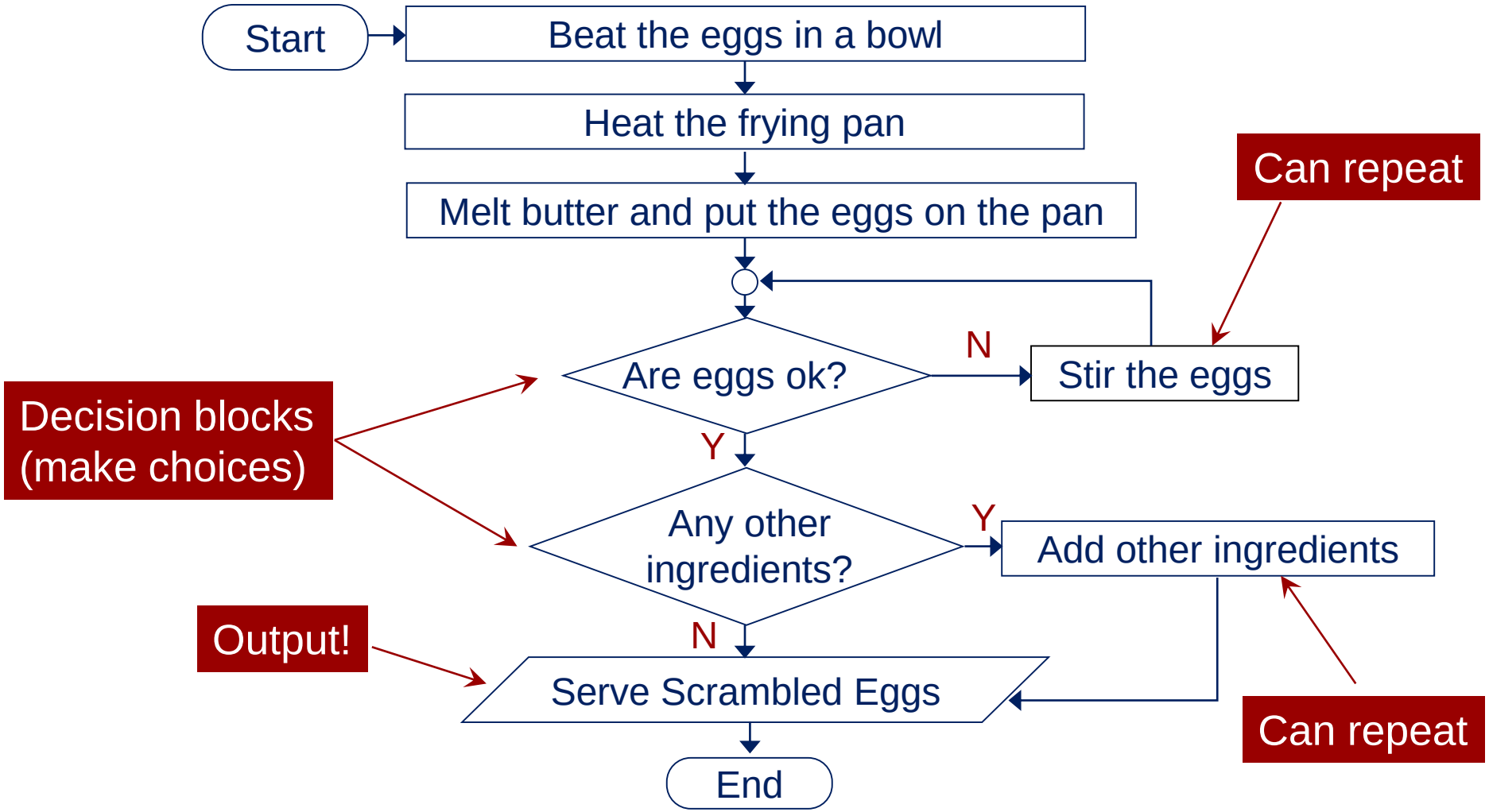
Scenario 2

Making Scrambled Eggs

1. Beat the eggs for 20 to 35 seconds in a bowl
2. Heat a frying pan over a medium-low heat
3. Melt some butter in the frying pan
4. Cook eggs on the pan and stir eggs while cooking
5. Add other ingredients
6. Serve the scrambled eggs



Scenario 2 (Making Scrambled Eggs): Flowchart



Scenario 2 (Making Scrambled Eggs): Pseudocode

```
BEAT the eggs for 20 to 35 seconds in a bowl
HEAT a frying pan over a medium-low heat
MELT some butter in the frying pan and PUT eggs on pan
WHILE eggs not okay
   STIR eggs while cooking
END WHILE
IF any ingredients
   Add other ingredients
END IF
SERVE the scrambled eggs
```

Quick Check

Is an algorithm readable by computers?

Quick Check: Answer

Is an algorithm readable by computers?

Answer **No**

References for Images

Placeholder

Knowledge Check Questions