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COLLEGE OF ENGINEERING
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- PALAI -
AUTONOMOUS

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

ALGORITHMIC THINKING WITH PYTHON

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15 October 2024

Module 2

Module 2

- ALGORITHM AND PSEUDOCODE REPRESENTATION:- Meaning and Definition of Pseudocode, Reasons for using pseudocode, The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and repetition (for, while, repeat-until loops), Sample problems

- FLOWCHARTS :- Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector.

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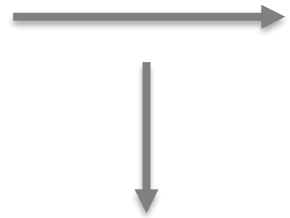
Flowchart

Flowchart

- Flowcharts use standardized symbols to visually represent various aspects of an algorithm or a process.
- Terminator : A terminator symbol is used to represent the beginning and end of an algorithm

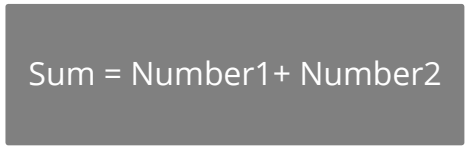
- Connector Lines: Connector lines are used to connect symbols in the flowchart.
  - The direction of the arrow indicates the next step.



Flowchart

- Process: A process symbol : represents an activity. It represents a particular step of an algorithm.
  - The symbol contains text which describes the step.

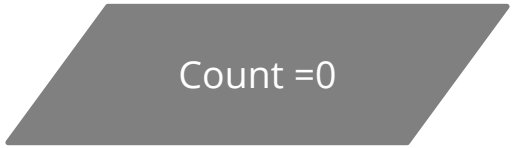
Process



Example

- Data: A data symbol represents data used in the algorithm. It is also used to represent the input and output
  - The symbol contains text which describes the step.
  - Multiple inputs can be read or multiple data can be initialised in the same symbol

Examples



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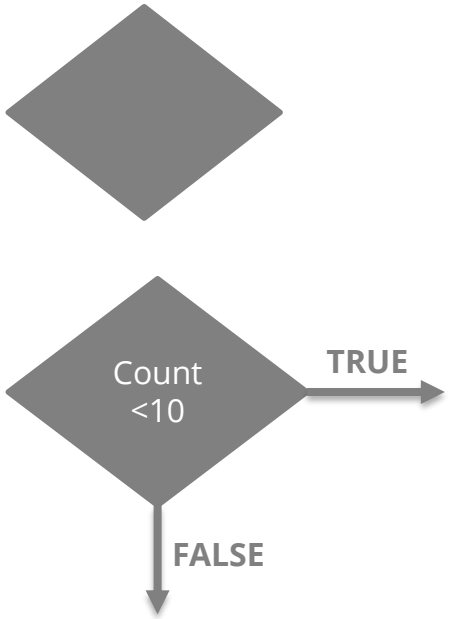
Flowchart

- Decision: A symbol used to branch into different steps based on condition
  - Based on whether the condition succeeds or fails, connector lines connect to different points in the flowchart.

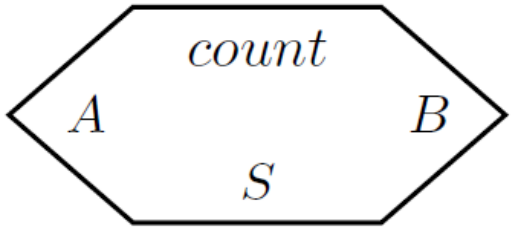


- On page and Off Page References: Symbols used when the entire flowchart cannot fit on the same page fully.

Flowchart

- Rectangle with vertical side-lines denotes a module. A module is a collection of statements written to achieve a task. It is known by the name function in the programming domain.

- Hexagon denotes a **for** loop. The symbol shown here is the representation of the loop: **for** *count* = *A* **to** *B* **by** *S*.



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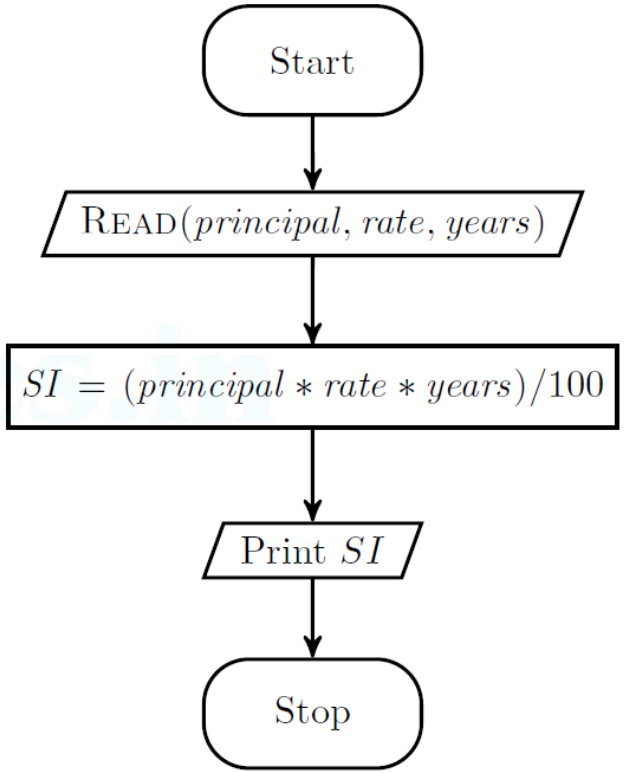
Flowchart

- **Problem 2.1** To find simple interest.

SIMPLEINTEREST

1 Start
2 READ($principal, rate, years$)
3 $SI = (principal * rate * years)/100$
4 PRINT(SI)
5 Stop.



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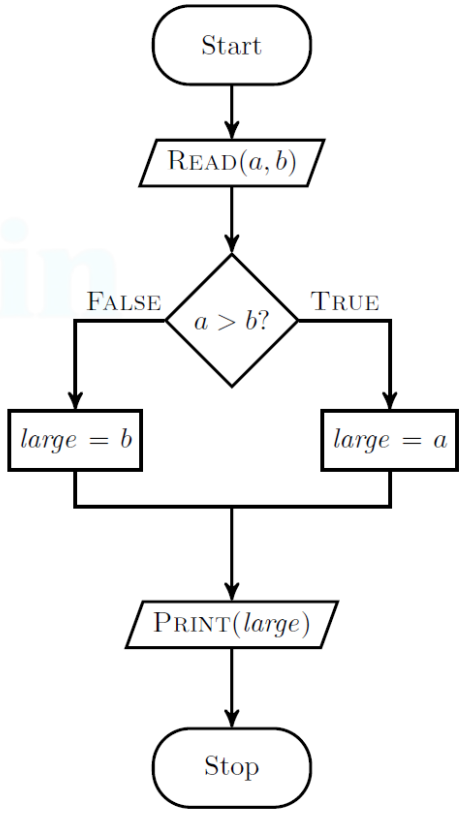
Flowchart

- **Problem 2.2 To determine the larger of two numbers.**

```
LargerTwo
1  Start
2  Read(a, b)
3  if (a > b)
4        large = a
5  else
6        large = b
7  endif
8  Print(large)
9  Stop.
```

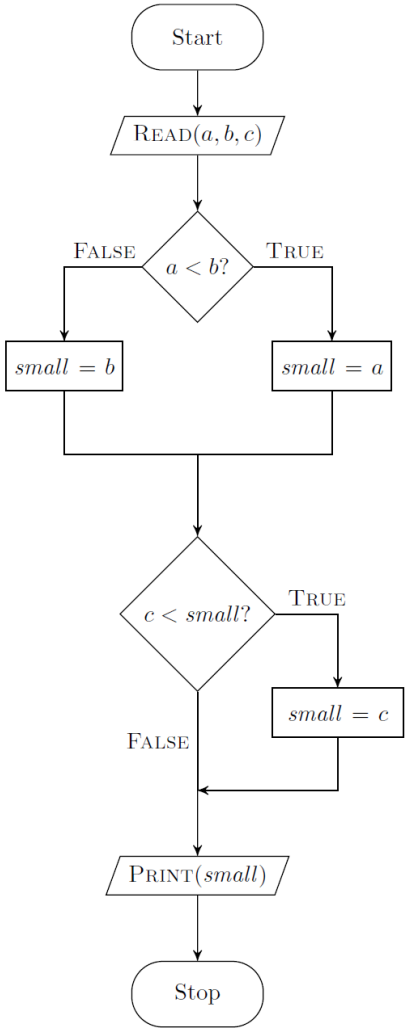


Flowchart

- **To determine the smallest of three numbers.**

SMALLESTTHREE

```
1   Start
2   READ(a, b, c)
3   if (a < b)
4         small = a
5   else
6         small = b
7   endif
8   if (c < small)
9         small = c
10  endif
11  PRINT(small)
12  Stop.
```

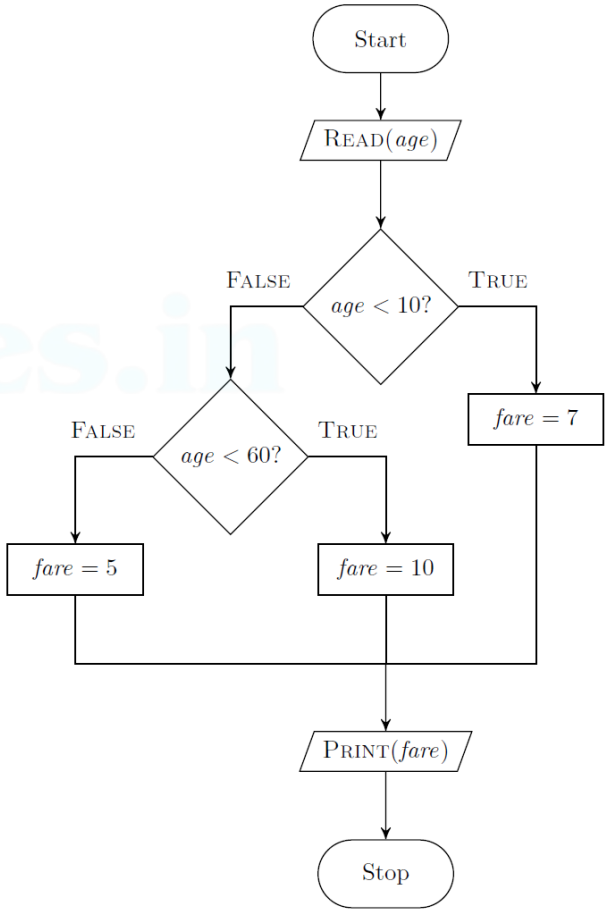


Flowchart

- **To determine the entry-ticket fare in a zoo based on age as follows:**

Age	Fare
< 10	7
$>= 10$ and < 60	10
$>= 60$	5

```
TicketFare
1   Start
2   Read(age)
3   if (age < 10)
4       fare = 7
5   else if (age < 60)
6       fare = 10
7   else
8       fare = 5
9   endif
10  Print(fare)
11  Stop
```

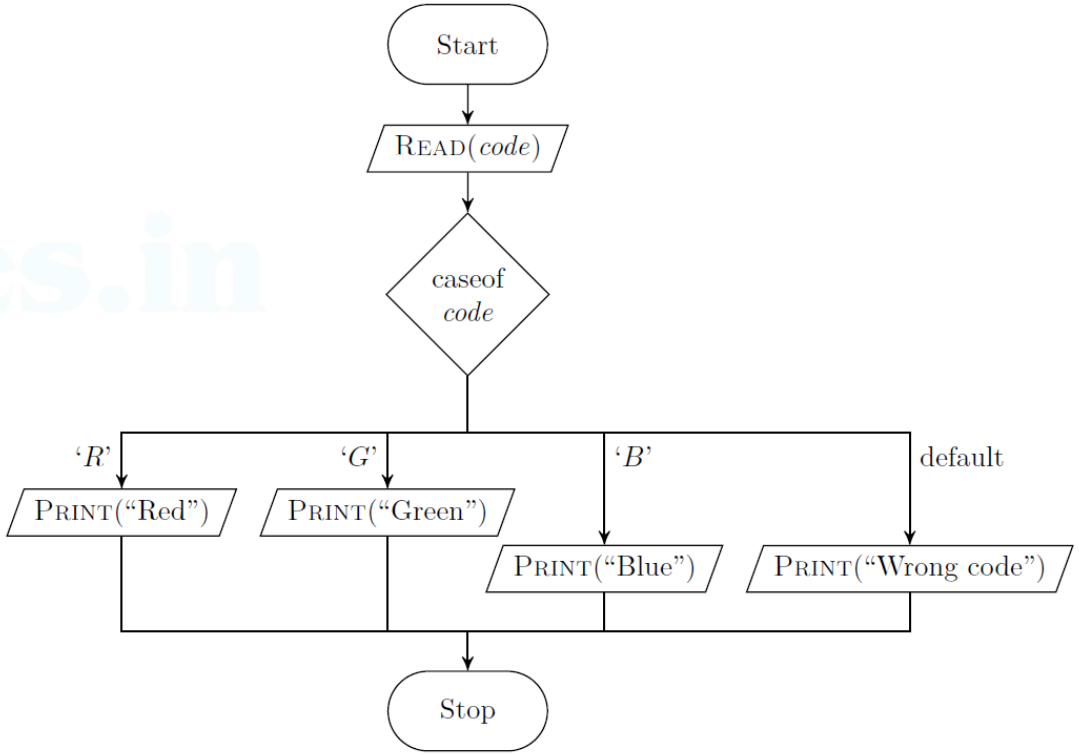


Flowchart

- **To print the colour based on a code value as follows:**

Grade	Message
R	Red
G	Green
B	Blue
Any other value	Wrong code

```
PRINTCOLOUR
1  Start
2  READ(code)
3  caseof (code)
4       case 'R':
5            PRINT("Red")
6            break
7       case 'G':
8            PRINT("Green")
9            break
10      case 'B':
11           PRINT("Blue")
12           break
13      default  :
14           PRINT("Wrong code")
15 endcase
16 Stop
```

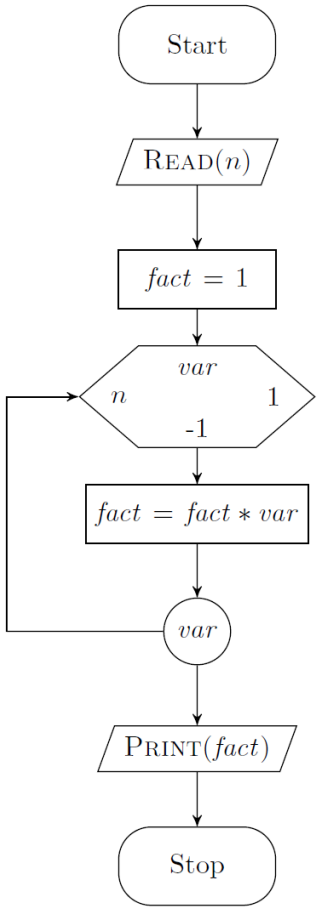


Flowchart

To find the factorial of a number

Solution: The factorial of a number n is defined as $n! = n \times n-1 \times \cdots \cdots \times 2 \times 1$.

```
FACTORIAL
1  Start
2  READ(n)
3  fact = 1
4  for var = n downto 1
5        fact = fact * var
6  endfor
7  PRINT(fact)
8  Stop
```



Flowchart

To find the factorial of a number

Solution: The factorial of a number n is defined as $n! = n \times n-1 \times \cdot \cdot \cdot \cdot \cdot \times 2 \times 1$.

FACTORIAL

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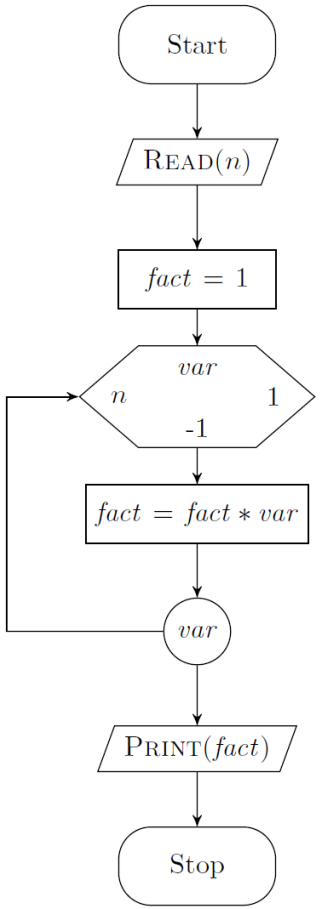
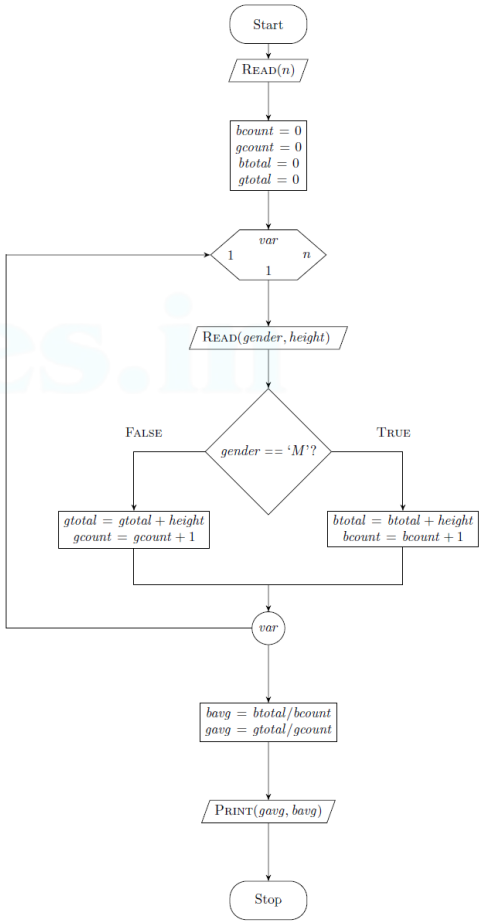


Flowchart

- **To find the average height of boys and average height of girls in a class of n students.**

```
AVERAGEHEIGHT
1  Start
2  READ(n)
3  btotal = 0
4  bcount = 0
5  gtotal = 0
6  gcount = 0
7  for var = 1 to n
8        READ(gender, height)
9        if (gender == 'M')
10             btotal = btotal + height
11             bcount = bcount + 1
12       else
13             gtotal = gtotal + height
14             gcount = gcount + 1
15       endif
16 endfor
17 bavg = btotal/bcount
18 gavg = gtotal/gcount
19 PRINT(bavg, gavg)
20 Stop
```



References

- https://www.scaler.com/topics/how-to-write-pseudo-code/
- Algorithmic Thinking with Python – Ajeesh Ramanujan, Narasimhan T

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Thank You

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