G.C.E. O/L Grade 11 ICT · Lesson 1

1.2 Algorithms: Sequence, Selection and Iteration

Syllabus 10.2. An **algorithm** is a list of clear steps, in the correct order, that solves a problem. Every algorithm – from making tea to running a bank – is built from just **three control structures**: **sequence**, **selection** and **iteration**. Learn these three and you can plan any program.

1. What is an algorithm?

An algorithm is a **step-by-step plan**. It is not yet a program – it is written in simple words, pseudocode or a flowchart. A good algorithm has: a clear **start and end**, steps that are **clear** (no guessing), steps in the **correct order**, and it **finishes** after a limited number of steps.

> 💡 Everyday algorithm – making a cup of tea: 1 Boil water. 2 Put a tea bag in the cup. 3 Pour the hot water. 4 If you like sugar, add sugar. 5 Stir. Step 4 is a **selection**. If you stir “until the sugar dissolves”, that is an **iteration**.

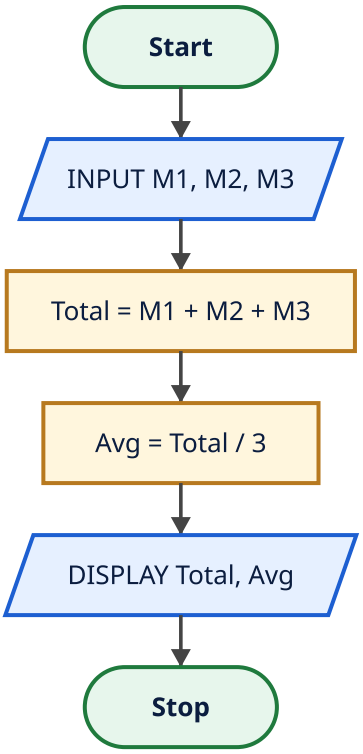
2. Sequence

In a **sequence**, the steps run **one after another**, from top to bottom, each step exactly once. Example: input three marks, find the total, find the average, display them.

Pseudocode

```
BEGIN
  INPUT M1, M2, M3
  Total = M1 + M2 + M3
  Avg = Total / 3
  DISPLAY Total, Avg
END
```

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Flowchart – Sequence: total and average of three marks

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Sequence: total and average of three marks

Pascal

```
program Average3;
var
  m1, m2, m3, total: integer;
  avg: real;
begin
  write('Enter mark 1: ');
  readln(m1);
  write('Enter mark 2: ');
  readln(m2);
  write('Enter mark 3: ');
  readln(m3);
  total := m1 + m2 + m3;
  avg := total / 3;
  writeln('Total = ', total);
  writeln('Average = ', avg:0:2);
end.
```

Python

```
m1 = int(input("Enter mark 1: "))
m2 = int(input("Enter mark 2: "))
m3 = int(input("Enter mark 3: "))
total = m1 + m2 + m3
avg = total / 3
print("Total =", total)
print(f"Average = {avg:.2f}")
```

Sample run

```
Enter mark 1: 75
Enter mark 2: 68
Enter mark 3: 72
Total = 215
Average = 71.67
```

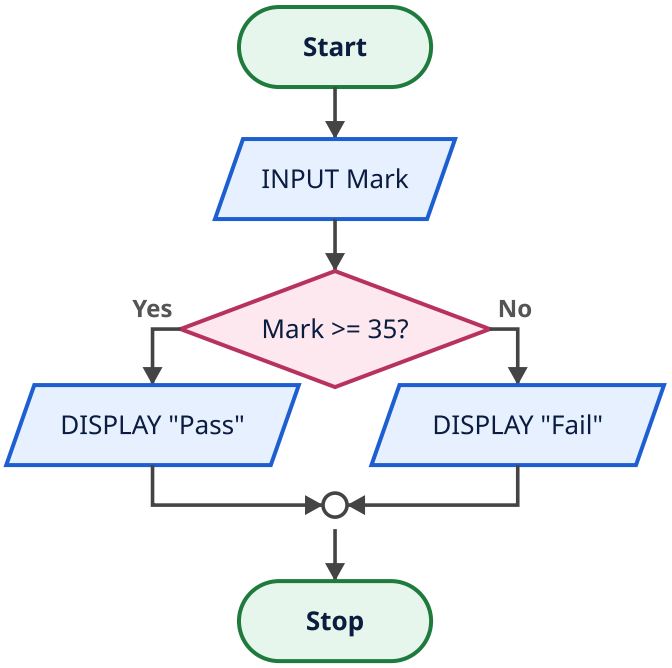
3. Selection

In **selection**, the computer checks a **condition** (a question with a Yes/No answer) and **chooses** which steps to run. Example: if the mark is 35 or more, display “Pass”, otherwise display “Fail”. Selection is also called a **decision**.

Pseudocode

```
BEGIN
  INPUT Mark
  IF Mark >= 35 THEN
    DISPLAY "Pass"
  ELSE
    DISPLAY "Fail"
  ENDIF
END
```

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Flowchart – Selection: Pass or Fail

Selection: Pass or Fail

Pascal

```
program PassFail;
var
  mark: integer;
begin
  write('Enter mark: ');
  readln(mark);
  if mark >= 35 then
    writeln('Pass')
  else
    writeln('Fail');
end.
```

Python

```
mark = int(input("Enter mark: "))
if mark >= 35:
    print("Pass")
else:
    print("Fail")
```

Sample run 1

```
Enter mark: 52
Pass
```

Sample run 2

```
Enter mark: 28
Fail
```

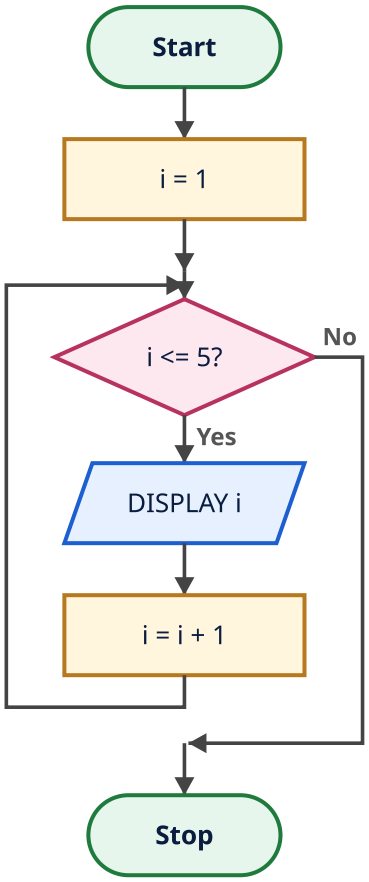
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4. Iteration

In **iteration** (also called **repetition** or a **loop**), some steps are **repeated** again and again while a condition is true, or a fixed number of times. Example: display the numbers 1 to 5. Without a loop we would need five DISPLAY steps; with a loop we need only one.

Pseudocode

```
BEGIN
  FOR i = 1 TO 5
    DISPLAY i
  ENDFOR
END
```



Flowchart – Iteration: display 1 to 5

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Iteration: display 1 to 5

Pascal

```
program Count5;
var
  i: integer;
begin
  for i := 1 to 5 do
    writeln(i);
end.
```

Python

```
for i in range(1, 6):
    print(i)
```

Sample run

```
1
2
3
4
5
```

5. The three structures side by side

Structure	What happens	Pseudocode words	Daily-life example
Sequence	Steps run in order, once each	INPUT, assign, DISPLAY	Wake up, wash, eat breakfast
Selection	A condition chooses a path	IF … THEN … ELSE … ENDIF	If it rains, take an umbrella
Iteration	Steps repeat	FOR, WHILE, REPEAT … UNTIL	Run 4 rounds of the school ground

NEW 2026 2026 – **Scratch and block coding.** In Scratch (scratch.mit.edu) you build programs by snapping blocks together. The same three structures are there: blocks stacked one under another are a **sequence**, the "if … then … else" block is **selection**, and "repeat 10" or "repeat until" is **iteration**. Scratch is a great way to practise algorithms before typing Pascal or Python.

Key Words

Algorithm – A clear, ordered list of steps that solves a problem.

Control structure – A way of controlling the order in which steps run.

Sequence – Steps run one after another, each once.

Selection – Choosing which steps to run using a condition.

Iteration – Repeating a group of steps.

Loop – Another name for iteration.

Condition – A question whose answer is True (Yes) or False (No).

Decision – Another name for selection.

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Finite – An algorithm must end after a limited number of steps.

Average – Total divided by the number of values.

Scratch – A free block-based programming tool.

Block coding – Programming by joining blocks instead of typing code.

Sample Q&A

1. What is an algorithm?

> **Answer:** A clear list of steps, in the correct order, that solves a problem and ends.

2. Name the three control structures.

> **Answer:** Sequence, selection and iteration.

3. Which structure is used to decide Pass or Fail?

> **Answer:** Selection.

4. Which structure is used to display 1 to 100?

> **Answer:** Iteration (a loop).

5. For marks 75, 68 and 72, what are the total and average?

> **Answer:** Total = 215, average = 71.67.

6. Give two qualities of a good algorithm.

> **Answer:** Clear steps; correct order; a clear start and end; it finishes (any two).

MCQ

1. A clear, ordered list of steps that solves a problem is a/an…

A. operating system
B. algorithm
C. compiler
D. database

2. Steps that run one after another, each once, form a…

A. iteration
B. selection
C. loop
D. sequence

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3. “If it rains, take an umbrella” is an example of…

A. selection
B. iteration
C. sequence
D. an array

4. “Run 4 rounds of the ground” is an example of…

A. sequence only
B. iteration
C. a constant
D. selection

5. Which is NOT one of the three control structures?

A. Compilation
B. Sequence
C. Selection
D. Iteration

6. A condition always has an answer of…

A. a name
B. a whole number
C. True or False
D. a picture

7. The total of the marks 75, 68 and 72 is…

A. 215
B. 205
C. 71.67
D. 225

8. For a mark of 28, the Pass/Fail program displays…

A. 28
B. Pass
C. Nothing
D. Fail

9. Another name for iteration is…

A. constant
B. loop
C. decision
D. output

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10. Another name for selection is…

A. decision
B. loop
C. variable
D. sequence

11. An algorithm must end after a limited number of steps. This means it is…

A. infinite
B. hidden
C. finite
D. random

12. The count5 program displays how many numbers?

A. 4
B. 1
C. 5
D. 6

13. In Scratch, the “repeat 10” block is…

A. an output device
B. iteration
C. a variable
D. selection

14. In Scratch, the “if … then … else” block is…

A. an array
B. sequence
C. iteration
D. selection

15. Which of these is written BEFORE the program, to plan it?

A. The output
B. The compiler
C. An algorithm
D. The error message

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Structured Questions

1. (i) Define an algorithm. (1 mark)
(ii) Name the three control structures and give one daily-life example of each. (6 marks) *(7 marks)*

> (i) A clear, ordered, finite list of steps that solves a problem. (ii) Sequence – get ready for school step by step; selection – if it rains take an umbrella; iteration – run 4 rounds (1 name + 1 example each).

2. Write an algorithm in simple steps to find the area of a rectangle. Which control structure does it use? (4 marks) *(4 marks)*

> 1 Start. 2 Input length and width. 3 Area = length × width. 4 Display area. 5 Stop (3). It uses sequence (1).

3. Write steps to display "Pass" if a mark is 35 or more and "Fail" otherwise. Which structure is this? (3 marks) *(3 marks)*

> Input mark; if mark ≥ 35 then display "Pass" else display "Fail" (2). Selection (1).

4. Explain why a loop is better than writing DISPLAY 100 times to show the numbers 1 to 100. (2 marks) *(2 marks)*

> The loop needs only a few lines (1), is easier to change (e.g. to 1–1000) and has fewer mistakes (1).

5. Write the steps for making a cup of tea. Mark one step that is selection and one that could be iteration. (4 marks) *(4 marks)*

> Boil water; put tea bag in cup; pour water; if sugar is wanted add sugar (selection); stir until sugar dissolves (iteration) (2 for steps, 1 + 1 for marking).

Summary

- Algorithm = clear, ordered, finite steps.
- Three control structures: sequence, selection, iteration.
- Sequence: steps one after another.
- Selection: a condition chooses the path.
- Iteration: steps repeat (loop).
- A condition is True or False.
- Plan the algorithm before coding.
- Scratch blocks use the same three structures.

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MCQ answer key – 1.2

1. **B** – Definition of algorithm.
2. **D** – Sequence.
3. **A** – A condition chooses.
4. **B** – Repeated 4 times.
5. **A** – Compilation is translating code.
6. **C** – Yes/No = True/False.
7. **A** – 75+68+72 = 215.
8. **D** – 28 < 35.
9. **B** – Loop / repetition.
10. **A** – Decision.
11. **C** – Finite.
12. **C** – 1, 2, 3, 4, 5.
13. **B** – It repeats.
14. **D** – It chooses.
15. **C** – Plan first.

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