G.C.E. O/L Grade 11 ICT · Lesson 1

1.4 Identifiers, Variables, Constants and Data Types

Syllabus 10.4. A program must remember data – a name, a mark, a price. It keeps each value in a **named box in memory**. If the value can change, the box is a **variable**; if it never changes, it is a **constant**. The name of the box is an **identifier**, and the kind of value it holds is its **data type**. Some words are **reserved** and cannot be used as names.

1. Variables

A **variable** is a named memory location whose value **can change** while the program runs. Think of a labelled box: the label is “Marks”, and inside today is 65; later we can put 80 in the same box. The old value is replaced.

Step	Pseudocode	Value in Marks
1	Marks = 65	65
2	Marks = 80	80
3	Marks = Marks + 5	85

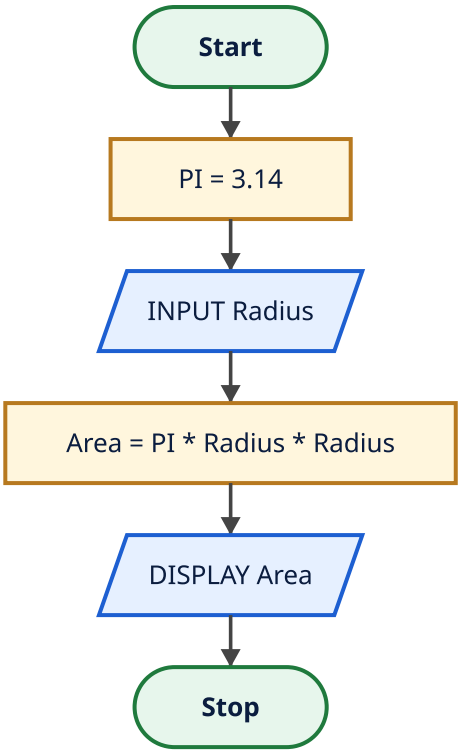
2. Constants

A **constant** is a named value that **does not change** while the program runs, such as π = 3.14 or the pass mark 35. Using a constant makes the program **easy to read** and **easy to change** – if the pass mark changes, you change it in one place only. In Pascal we write it under **const**. Python has no real constants, so by custom we write the name in CAPITALS.

Pseudocode

```
BEGIN
  CONSTANT PI = 3.14
  INPUT Radius
  Area = PI * Radius * Radius
  DISPLAY Area
END
```

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Flowchart – A constant: area of a circle

A constant: area of a circle

Pascal

```
program CircleArea;
const
  PI = 3.14;
var
  radius, area: real;
begin
  write('Enter radius: ');
  readln(radius);
  area := PI * radius * radius;
  writeln('Area = ', area:0:2);
end.
```

Python

```
PI = 3.14            # a constant (capital letters by custom)
radius = float(input("Enter radius: "))
area = PI * radius * radius
print(f"Area = {area:.2f}")
```

Sample run

```
Enter radius: 7
Area = 153.86
```

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3. Data types

The **data type** tells the computer what kind of value a variable holds and how much memory it needs. The O/L syllabus uses four basic types:

Data type	Holds	Examples	Pascal	Python
Integer	Whole numbers	16, −5, 2026	integer	int
Floating point (real)	Numbers with a decimal point	1.62, 3.14, 71.67	real	float
Character	One letter, digit or symbol	'A', '7', '#'	char	str of length 1
Logical (Boolean)	Only True or False	True, False	boolean	bool
String (extra)	Text – many characters	'Nimal', 'Kandy'	string	str

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Variables of different data types

Pascal

```
program DataTypes;
var
  name: string;
  age: integer;
  height: real;
  grade: char;
  isPrefect: boolean;
begin
  name := 'Nimal';
  age := 16;
  height := 1.62;
  grade := 'A';
  isPrefect := true;
  writeln('Name: ', name);
  writeln('Age: ', age);
  writeln('Height: ', height:0:2);
  writeln('Grade: ', grade);
  if isPrefect then
    writeln('Prefect: Yes')
  else
    writeln('Prefect: No');
end.
```

Python

```
name = "Nimal"        # string
age = 16              # integer
height = 1.62         # floating point (real)
grade = "A"           # character
is_prefect = True     # logical (Boolean)
print("Name:", name)
print("Age:", age)
print(f"Height: {height:.2f}")
print("Grade:", grade)
if is_prefect:
    print("Prefect: Yes")
else:
    print("Prefect: No")
```

Sample run

```
Name: Nimal
Age: 16
Height: 1.62
Grade: A
Prefect: Yes
```

💡 In **Pascal** you must **declare** every variable with its type before using it (var age: integer;). In **Python** you just assign a value (age = 16) and Python works out the type itself. Both are fine – but the idea of a data type is the same.

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4. Identifiers and naming rules

An **identifier** is the name we give to a variable, constant, program or sub-program. Rules (Pascal and Python):

- Use letters, digits and the underscore _ only.
- It must **start with a letter** (or _), never a digit.
- **No spaces** and no symbols such as -, %, @.
- It must **not be a reserved word**.
- Python is **case-sensitive** (Total and total are different). Pascal is **not** (Total and TOTAL are the same name).

Identifier	Valid?	Reason
total_marks	Yes	Letters and _
Mark2	Yes	Digit not at the start
2ndMark	No	Starts with a digit
total marks	No	Has a space
pass%	No	Has a symbol
begin / if	No	Reserved word

5. Reserved words (keywords)

Reserved words are words that already have a special meaning in the language, so they cannot be used as identifiers. Pascal: program, var, const, begin, end, if, then, else, for, while, repeat, until, and, or, not, div, mod. Python: if, else, elif, for, while, def, return, True, False, and, or, not, import.

6. Meaningful names

Choose names that **tell you what the value is**. Compare x = a * b with total = price * quantity. The second is much easier to understand and to fix later. Good: studentName, totalMarks, unit_price. Poor: a, x1, abc.

> 💡 Pascal trap: because Pascal ignores capital letters, a program called **Discount** cannot also have a variable called **discount** – the compiler says “Duplicate identifier”. Our discount program in 1.6 is therefore named **BillDiscount**.

Key Words

Variable – A named memory location whose value can change.

Constant – A named value that does not change while the program runs.

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Identifier – The name of a variable, constant, program or sub-program.	**Reserved word** – A word with a special meaning in the language; not allowed as a name.
Data type – The kind of value a variable holds.	**Integer** – A whole number such as 16 or −5.
Floating point – A number with a decimal point such as 1.62 (Pascal: real).	**Character** – A single letter, digit or symbol such as 'A'.
Logical (Boolean) – A type with only two values: True and False.	**Declaration** – Telling the computer a variable's name and type before use.
Case-sensitive – Capital and small letters are treated as different (Python).	**Meaningful name** – A name that shows what the value is, e.g. totalMarks.

Sample Q&A

1. What is the difference between a variable and a constant?

> **Answer:** A variable's value can change while the program runs; a constant's value cannot.

2. Name the four basic data types in the syllabus.

> **Answer:** Integer, floating point (real), character and logical (Boolean).

3. Is 2ndMark a valid identifier? Why?

> **Answer:** No – an identifier cannot start with a digit.

4. Give the data type for: 16, 1.62, 'A', True.

> **Answer:** Integer, floating point, character, logical.

5. Why should we use meaningful names?

> **Answer:** The program is easier to read, understand and fix.

6. What is a reserved word? Give two examples.

> **Answer:** A word with a special meaning in the language, e.g. if, while (begin, end, for...).

MCQ

1. A named memory location whose value can change is a...

A. variable
B. reserved word
C. comment
D. constant

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2. The value 3.14 used for π, which never changes, is best stored as a…

A. character
B. constant
C. variable
D. Boolean

3. Which is a valid identifier?

A. 2total
B. total marks
C. total_marks
D. total-marks

4. Which is NOT a valid identifier?

A. Mark2
B. unit_price
C. begin
D. studentName

5. The data type of 1.62 is…

A. integer
B. character
C. logical
D. floating point (real)

6. The data type of 'A' is…

A. integer
B. real
C. character
D. Boolean

7. A logical (Boolean) variable can hold…

A. only decimals
B. any text
C. any whole number
D. only True or False

8. The number of students in a class is best stored as…

A. integer
B. real
C. Boolean
D. character

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9. In Pascal, the type for a floating point number is…

A. char
B. real
C. int
D. float

10. In Python, the type for a whole number is…

A. int
B. real
C. integer
D. bool

11. Which language is case-sensitive (Total ≠ total)?

A. Pascal
B. Both
C. Neither
D. Python

12. Which is the most meaningful name for the price of one item?

A. abc
B. a1
C. unitPrice
D. x

13. After Marks = 65, Marks = 80, Marks = Marks + 5, the value of Marks is…

A. 85
B. 150
C. 65
D. 70

14. In Pascal, variables are declared under the word…

A. const
B. var
C. def
D. begin

15. For radius 7 and PI = 3.14, the circle program shows…

A. Area = 21.98
B. Area = 153.86
C. Area = 43.96
D. Area = 49.00

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Structured Questions

1. (i) Define a variable and a constant. (2 marks)
(ii) Give one example of each from a school-fees program. (2 marks) *(4 marks)*

> (i) Variable – named memory location whose value can change; constant – named value that does not change. (ii) Variable: number of students / amount paid; constant: fee per term (e.g. 500).

2. Give the most suitable data type for: (a) a student's age (b) height in metres (c) a grade letter (d) whether a student is a prefect. (4 marks) *(4 marks)*

> (a) integer (b) floating point / real (c) character (d) logical / Boolean.

3. State whether each identifier is valid and give a reason: total, 3sum, my mark, if, Avg_1. (5 marks) *(5 marks)*

> total – valid; 3sum – invalid, starts with a digit; my mark – invalid, space; if – invalid, reserved word; Avg_1 – valid.

4. Explain two advantages of using a constant such as PASSMARK = 35 instead of typing 35 everywhere. (2 marks) *(2 marks)*

> Easy to read (the name tells the meaning) (1); easy to change – change in one place only (1).

5. A Pascal program called Discount has a variable discount. Why does it not compile? How can you fix it? (2 marks) *(2 marks)*

> Pascal is not case-sensitive, so both names are the same identifier ("Duplicate identifier") (1). Rename the program, e.g. BillDiscount (1).

Summary

- Variable: value can change.
- Constant: value stays fixed.
- Identifier = a name; start with a letter, no spaces.
- Reserved words cannot be names.
- Integer, floating point, character, logical.
- Pascal: integer, real, char, boolean.
- Python: int, float, str, bool; case-sensitive.
- Use meaningful names like totalMarks.

MCQ answer key – 1.4

1. **A** – Variable.

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2. **B** – Fixed value = constant.
3. **C** – Letters and underscore only.
4. **C** – begin is reserved in Pascal.
5. **D** – Has a decimal point.
6. **C** – Single letter.
7. **D** – Two values only.
8. **A** – Whole number.
9. **B** – Pascal uses real.
10. **A** – Python uses int.
11. **D** – Python is case-sensitive; Pascal is not.
12. **C** – Tells what it is.
13. **A** – 80 + 5.
14. **B** – var section.
15. **B** – 3.14 × 7 × 7 = 153.86.

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