A-LEVEL COMPUTER SCIENCE • EXERCISE SHEET

11.1 Programming Basics

Name: _____ Class: _____ Date: _____ **Total: 19 marks**

Objective

Build the skills to answer exam questions on **programming basics** 编程基础—constants, variables, operators and built-in functions.

You must be able to:

- declare **constants** and **variables**, and use **assignment**
- evaluate expressions with arithmetic, comparison and logic **operators** (including `DIV` and `MOD`)
- use **built-in functions** such as `LENGTH`, `LEFT`, `MID`, `UCASE`

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

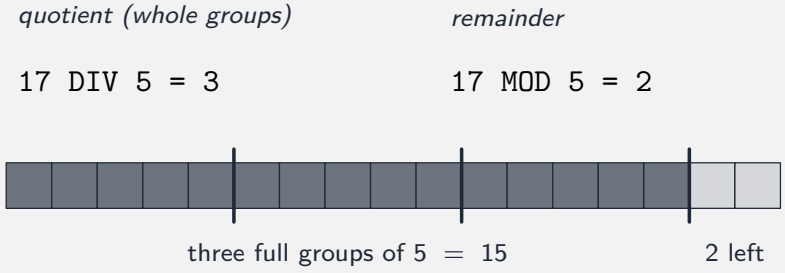
■ Constants and variables

A **constant** holds a value that never changes; a **variable** holds one that can. Declare with a type, assign with ←:

```
CONSTANT Pi ← 3.14159
DECLARE Radius : REAL
Radius ← 5
Area ← Pi * Radius * Radius
```

■ Operators: DIV and MOD

`DIV` is the **whole-number quotient**; `MOD` is the **remainder**:



Precedence (do first → last): `NOT` → `* / DIV MOD` → `+ -` → comparisons → `AND` → `OR`. So `3 + 4 * 2` = `3 + 8` = `11`. Use brackets when unsure.

■ **Built-in functions**

Function	Example	Result
`LENGTH(s)`	`LENGTH("Computer")`	`8`
`LEFT(s, n)`	`LEFT("Computer", 3)`	`"Com"`
`MID(s, start, len)`	`MID("Computer", 4, 3)`	`"put"`
`UCASE(s)`	`UCASE("hi")`	`"HI"`
`INT(x)`	`INT(3.9)`	`3`

`MID` counts characters from **1**. Use the exact names from the paper's reference list.

2 Practice

Now apply the methods above.

2.1 Write pseudocode to declare a **constant** `Pi` of `3.14159` and a **real** variable `Radius`. [2]

2.2 Evaluate `23 DIV 4` and `23 MOD 4`. [2]

2.3 Evaluate `3 + 4 * 2` (use precedence). [1]

2.4 State the result of `LENGTH("Computer")` and `LEFT("Computer", 3)`. [2]

3 Exam-style questions

3.1 Write pseudocode that inputs a `Price`, adds **20% tax**, and outputs the total. Use a **constant** for the tax rate. [4]

3.2 Evaluate each expression. [5]

Expression	Value
`7 DIV 2`	
`7 MOD 2`	
`(5 > 3) AND (2 > 4)`	
`NOT (1 = 1)`	
`MID("PROGRAM", 2, 3)`	

3.3 Write pseudocode that reads a word and outputs it in **capitals** followed by its **length**, using built-in functions. [3]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **11.1 Programming Basics** past-paper sheet in the Library, or try these in **Practice mode**:

- 9618/21 J24 —Q1 (expressions and operators)
- 9618/22 N25 —Q1 (declarations and built-in functions)
- 9618/21 N25 —Q1 (programming basics)
- 9618/21 J25 —Q2 (operators and functions)

Solutions

2.1

```
CONSTANT Pi ← 3.14159
DECLARE Radius : REAL
```

2.2 `23 DIV 4 = 5`; `23 MOD 4 = 3`.

2.3 `11` —multiply first (`4 * 2 = 8`), then add `3`.

2.4 `LENGTH("Computer") = 8`; `LEFT("Computer", 3) = "Com"`.

3.1

```
CONSTANT TaxRate ← 0.20
DECLARE Price : REAL
DECLARE Total : REAL
INPUT Price
Total ← Price * (1 + TaxRate)
OUTPUT "Total: ", Total
```

3.2 `7 DIV 2 = 3`; `7 MOD 2 = 1`; `(5 > 3) AND (2 > 4) = FALSE`; `NOT (1 = 1) = FALSE`; `MID("PROGRAM", 2, 3) = "ROG"`.

3.3

```
OUTPUT "Enter a word:"
INPUT Word
OUTPUT UCASE(Word)
OUTPUT "Length: ", LENGTH(Word)
```