

10.1 Data Types and Records

Name: _____ Class: _____ Date: _____

Total: 37 marks

KEY WORDS data type 数据类型 • record 记录 • record structure 记录结构 • array 数组
• index 索引

Objective

Build the skills to answer exam questions on **data types** 数据类型 and **records** 记录 — choosing the right type, and defining and using a record structure.

You must be able to:

- choose the most appropriate **data type** for a value
- explain the purpose of a **record** structure
- write pseudocode to **define** a record and to **read/write** its fields

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.

■ Choosing a data type

Pick the **smallest precise type** that fits the value:

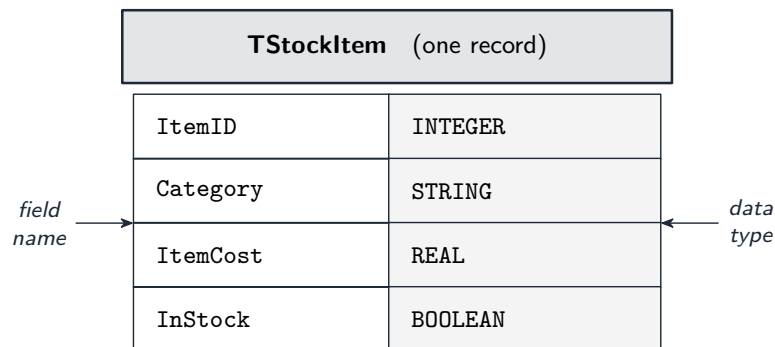
To store	Best type	Why
a count, an index, an ID	INTEGER	whole number
a price, a measurement	REAL	has a decimal part
a name, a sentence	STRING	text
a single grade letter	CHAR	exactly one character
"is it paid?"	BOOLEAN	a TRUE/FALSE flag

Exam method — “give the data type of this expression”. Look at the **operation**, not the inputs:

- one character — `LEFT(Name, 1)` or `'A'` — gives a **CHAR**
- text in `"..."`, or joined with `&` — gives a **STRING**
- `+` `-` `*` on whole numbers gives an **INTEGER**; any `/` or a decimal value gives a **REAL**
- a comparison (`>=`, `=`) or `AND/OR/NOT` gives a **BOOLEAN**

■ Defining a record

A **record** groups several fields of **different types** under one type name:



```
TYPE TStockItem
  DECLARE ItemID    : INTEGER
  DECLARE Category  : STRING
  DECLARE ItemCost  : REAL
  DECLARE InStock   : BOOLEAN
ENDTYPE
```

■ Using a record

Declare a variable of that type (or a whole **array of records**), then use **dot notation** to reach each field:

```
DECLARE Item1 : TStockItem
DECLARE Items : ARRAY[1:100] OF TStockItem

Item1.Category ← "Fruit"
Item1.ItemCost ← 2.50
OUTPUT Item1.Category, " costs ", Item1.ItemCost
```

2 Practice

Now apply the methods above.

2.1 Give the most appropriate data type for each value: (a) a student's age; (b) a price in dollars; (c) whether a light is on. [3]

2.2 State the purpose of a **record** structure. [1]

2.3 A record type **TBook** must store a **Title** (text), **Pages** (whole number) and **InLibrary** (a flag). Write pseudocode to **define** it. [3]

2.4 **Book1** is a variable of type **TBook**. Write one pseudocode line to set its **Title** to "Maths". [1]

3 Exam-style questions

3.1 The table shows four pseudocode assignment statements. Give an appropriate **data type** to declare each variable. [4]

Statement	Data type
A ← LEFT(Name, 1)	
B ← Price * Quantity	
C ← Count + 1	
D ← (Score >= 50)	

3.2 A factory stores data about each component in a record type **Component**:

Field	Example	Meaning
Item_Num	123478	a numeric ID
Reject	FALSE	rejected?
Stage	'B'	a stage letter
Limit_1	13.5	a value 0–100

(i) Write pseudocode to **declare the record structure** **Component**.

[4]

(ii) A 1D array **Item** of **2000** elements will store all components. Write pseudocode to **declare** the **Item** array.

[2]

3.3 State **two** benefits of using an **array of records** instead of several separate arrays.[2]

3.4 A bicycle-hire company stores one record for each hire. Each record holds a hire reference (up to 8 characters), the bicycle number, the date of hire, the number of hours hired, the cost per hour and whether the bicycle has been returned.

(a) **Complete** the table by giving an appropriate data type for each field. [3]

field	example value	data type
HireRef	"HR004821"	_____
HoursHired	3	_____
CostPerHour	4.50	_____
Returned	TRUE	_____

(b) **Write** pseudocode to declare the record structure `HireRecord`, including a field for the date. [5]

(c) A 1D array `Hire` of 500 elements will hold all the records. **Write** the pseudocode declaration for this array. [2]

(d) **Write** pseudocode to assign the value 4.50 to the cost per hour of the **first** record in the array. [2]

(e) **Outline** three benefits of storing the data as an array of records rather than as six separate parallel arrays. [3]

(f) **Evaluate** the expression `Hire[1].HoursHired * Hire[1].CostPerHour`, and **state** the data type of the result. [2]
