AP COMPUTER SCIENCE PRINCIPLES • EXERCISE SHEET

3.9 Developing Algorithms

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **developing algorithms**.

You must be able to:

- explain how an **algorithm** 算法 is a finite, step-by-step set of instructions
- express an algorithm using **sequencing** 顺序, selection, and iteration
- represent an algorithm as **pseudocode** 伪代码, a flowchart, or natural language
- refine an algorithm to be correct, clear, and **efficient** 高效

1 Worked examples

Study these first. Each one shows the method for a question type used later.

> ■ **What an algorithm is**
>
> A **finite**, step-by-step set of instructions to complete a task, built from three building blocks: **sequencing**, **selection**, and **iteration**.
>
> ■ **Representations**
>
> The same algorithm can be written as **pseudocode**, drawn as a **flowchart**, or described in **natural language**.
>
> ■ **Different algorithms, same result**
>
> Two different algorithms can solve the same problem correctly; we compare them by clarity and **efficiency**.

2 Practice

2.1 Define an algorithm. [1]

2.2 Name the three building blocks of an algorithm. [2]

2.3 Name two ways to represent an algorithm. [1]

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3 Exam-style questions

3.1 An algorithm must be [1]

- **A** infinite
- **B** finite and step-by-step
- **C** random
- **D** written without any words

3.2 Which of these is **not** a way to represent an algorithm? [1]

- **A** pseudocode
- **B** a flowchart
- **C** natural language
- **D** an overflow

3.3 Two students write different programs that both correctly sort a list.

(a) State whether both can be valid algorithms. [1]

(b) Name one quality by which to compare them. [1]

(c) Name the three building blocks of algorithms. [1]

4 Go further

- work through the **3.9 Developing Algorithms** lesson on the **Learn** page;
- read the **Algorithms and Programming** section of the AP Computer Science Principles handout on the **Know** page.

Solutions

2.1 a finite, step-by-step set of instructions to complete a task.

2.2 sequencing, selection, iteration.

2.3 any two of: pseudocode, a flowchart, natural language.

3.1 B.

3.2 D.

3.3 (a) yes. (b) efficiency (or clarity). (c) sequencing, selection, iteration.