

3.17 Algorithmic Efficiency

Name: _____ Class: _____ Date: _____ Total: 8 marks

KEY WORDS heuristic 启发式 • efficiency 效率 • algorithmic efficiency 算法效率
• algorithm 算法

Objective

Build the skills to answer exam questions on **algorithmic efficiency**.

You must be able to:

- explain how **algorithmic efficiency** 算法效率 compares algorithms by the resources they use
- estimate the number of **steps** an algorithm takes as the input grows
- distinguish a **reasonable** from an **unreasonable** running time
- use a **heuristic** 启发式 when an exact solution is too slow

1 Worked examples

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

■ Efficiency

Compares algorithms by the **resources** (steps or time) they use as the input grows.

■ Reasonable vs unreasonable

A **reasonable** running time grows slowly (e.g. proportional to n or n^2). An **unreasonable** one grows explosively (e.g. 2^n), becoming impractical on large inputs.

■ Heuristics

When an exact solution is too slow, a **heuristic** finds a **good-enough** answer quickly.

2 Practice

2.1 State what algorithmic efficiency compares. [1]

2.2 State what a heuristic is. [1]

2.3 State why some correct algorithms are not used in practice. [1]

3 Exam-style questions

3.1 Algorithmic efficiency compares algorithms by [1]

- | | |
|---|---|
| A | B |
| C | D |
- A their length in lines
B the resources they use
C their author
D the language used

3.2 A heuristic gives a [1]

- | | |
|---|---|
| A | B |
| C | D |
- A guaranteed exact answer
B good-enough answer quickly
C deliberately wrong answer
D random answer

3.3 Algorithm A takes about n steps; algorithm B takes about 2^n steps.

- (a) State which is more efficient for large n . [1]
(b) State whether B could be too slow to use. [1]
(c) State one option when an exact solution is too slow. [1]