Exercise walk-through

Parallel and Distributed Computing ▪ 4.3

eXercise

You must be able to

- distinguish **sequential** 顺序 from **parallel** 并行 computing
- explain how **distributed** 分布式 computing spreads a task across computers
- calculate the **speedup** 加速比 from parallel processing
- explain why speedup is limited by the parts that must run sequentially

Method — Sequential vs parallel

Sequential computing runs steps one after another; **parallel** computing runs steps **at the same time** on multiple processors.

Method — Distributed computing

Spreads a task across **multiple computers** working together.

Method — Speedup

$$\text{speedup} = \frac{\text{sequential time}}{\text{parallel time}}.$$

A 60 s job done in 20 s has a speedup of 3. Speedup is **limited** by the parts that must still run sequentially.

Practice 2.1 ▪ 2 marks

State the difference between sequential and parallel computing.

Solution 2.1

Method: Sequential vs parallel

Worked steps

sequential runs steps one after another; parallel runs steps at the same time B1 B1.

Practice 2.2 ▪ 2 marks

A task takes 40 s sequentially and 10 s in parallel. Find the speedup.

Solution 2.2

Method: Speedup

Worked steps

$$\text{speedup} = \frac{40}{10} = 4 \quad \text{M1} \; \text{A1}.$$

Practice 2.3 ▪ 1 mark

State what distributed computing does.

Solution 2.3

Method: Distributed computing

Worked steps

it spreads a task across multiple computers B1.

Exam-style 3.1 ▪ 1 mark

Parallel computing runs steps

A one after another

B at the same time

C never

D in random order

Solution 3.1

Method: Sequential vs parallel

A one after another

B at the same time ✓

C never

D in random order

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

Speedup is

A parallel time $-$ sequential time

B sequential time $\div$ parallel time

C parallel $\times$ sequential time

D always 1

Solution 3.2

A parallel time $-$ sequential time

B sequential time $\div$ parallel time ✓

C parallel $\times$ sequential time

D always 1

Worked steps

B.

Exam-style 3.3 ▪ 2 marks

A job takes 100 s on one processor and 25 s split across four.
(a) Find the speedup.
(b) State what limits parallel speedup.

Solution 3.3

Method: Speedup

Worked steps

(a) $\dfrac{100}{25} = 4$ M1 A1. (b) the parts of the task that must run sequentially B1.