

2.11 Nested Iteration

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **nested iteration**.

You must be able to:

- write a **nested loop** 嵌套循环 by placing one loop inside another
- understand that the **inner loop** runs fully for each pass of the outer loop
- calculate how many times the inner body runs in total

1 Worked examples

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

■ Nested loops

A loop inside another loop. The **inner loop runs completely** for **every** pass of the outer loop:

```
for (int i = 0; i < 3; i++)
    for (int j = 0; j < 4; j++)
        // this body runs 3 × 4 = 12 times
```

■ Counting total runs

Total inner-body runs = (outer passes) × (inner passes per outer pass).

2 Practice

2.1 State what a nested loop is.

[1]

2.2 State how many times the inner body runs if the outer loop runs 4 times and the inner 5 times.

[2]

2.3 State what runs fully for each pass of the outer loop. [1]

3 Exam-style questions

3.1 In a nested loop, the inner loop runs [1]

- **A** once in total
 - **B** fully for each pass of the outer loop
 - **C** never
 - **D** only on the last pass
-

3.2 An outer loop of 3 and an inner loop of 3 run the inner body [1]

- **A** 3
- **B** 6
- **C** 9
- **D** 1

times.

3.3 `for (int i = 0; i < 3; i++) for (int j = 0; j < 4; j++)`

- (a) State the number of outer passes. [1]
- (b) State the inner passes per outer pass. [1]
- (c) State the total number of inner-body runs. [1]

4 Go further

- work through the **2.11 Nested Iteration** lesson on the **Learn** page;
- read the **Iteration** section of the AP Computer Science A handout on the **Know** page.

Solutions

2.1 a loop placed inside the body of another loop.

2.2 $4 \times 5 = 20$.

2.3 the inner loop.

3.1 B.

3.2 C.

3.3 (a) 3. (b) 4. (c) 12.