

Exercise walk-through

Nested Iteration ■ 2.11

eXercise

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

Method — Nested loops

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

```
kfor+w p(k+ktint+w ni+w o+=w l+m+mi0p;+w ni+w o+w l+m+mi3p;+w nio+o+p)
+w      kfor+w p(k+ktint+w nj+w o+=w l+m+mi0p;+w nj+w o+w l+m+mi4p;+w njo+o+p)
+w          c+c1// this body runs  $3 \times 4 = 12$  times
```

Method — Counting total runs

Total inner-body runs = (outer passes) $\times$ (inner passes per outer pass).

Practice 2.1 ■ 1 mark

State what a nested loop is.

Solution 2.1

Method: Nested loops

Worked steps

a loop placed inside the body of another loop **B1**.

Practice 2.2 ■ 2 marks

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

Solution 2.2

Method: Nested loops

Worked steps

$4 \times 5 = 20$ **M1** **A1**.

Practice 2.3 ■ 1 mark

State what runs fully for each pass of the outer loop.

Solution 2.3

Method: Nested loops

Worked steps

the inner loop **B1**.

Exam-style 3.1 ■ 1 mark

In a nested loop, the inner loop runs

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

Solution 3.1

Method: Nested loops

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

Worked steps

B.

Exam-style 3.2 ■ 1 mark

An outer loop of 3 and an inner loop of 3 run the inner body times.

A 3

B 6

C 9

D 1

Solution 3.2

Method: Nested loops

A 3

B 6

C 9



D 1

Worked steps

C.

Exam-style 3.3 ■ 1 mark

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

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

Solution 3.3

Method: Counting total runs

Worked steps

(a) 3 **B1**. (b) 4 **B1**. (c) 12 **B1**.