

Loop Patterns

Most pseudocode output questions are loop-pattern questions.

FOR loop

```
FOR i = 1 TO 5  
    DISPLAY i  
END FOR
```

Output:

```
1 2 3 4 5
```

If loop includes both ends, count is:

```
end - start + 1
```

FOR loop with step

```
FOR i = 2 TO 10 STEP 2  
    DISPLAY i  
END FOR
```

Output:

```
2 4 6 8 10
```

Reverse loop

```
FOR i = 5 DOWNTO 1  
    DISPLAY i  
END FOR
```

Output:

```
5 4 3 2 1
```

WHILE loop

Condition checked before loop body.

```
SET i = 1
WHILE i <= 3
    DISPLAY i
    SET i = i + 1
END WHILE
```

Output:

```
1 2 3
```

REPEAT UNTIL loop

Body executes first. Condition checked later.

```
SET i = 5
REPEAT
    DISPLAY i
    SET i = i + 1
UNTIL i > 5
```

Output:

```
5
```

Nested loop count

```
FOR i = 1 TO 3
    FOR j = 1 TO 2
        DISPLAY i, j
    END FOR
END FOR
```

Inner loop runs 2 times for each i.

Total output lines:

```
3 × 2 = 6
```

Pattern printing

Triangle

```
FOR i = 1 TO 4
  FOR j = 1 TO i
    DISPLAY "*"
  END FOR
  DISPLAY newline
END FOR
```

Output:

```
*
**
***
****
```

Number of stars:

1 + 2 + 3 + 4 = 10

Common loop output patterns

Pattern	Code idea	Output idea
Sum 1 to n	<code>sum = sum + i</code>	$n(n+1)/2$
Factorial	<code>fact = fact * i</code>	$n!$
Count digits	divide by 10	number of digits
Reverse number	<code>rev = rev*10 + digit</code>	reversed digits
Multiplication table	<code>n*i</code>	table values
Nested count	outer $\times$ inner	total iterations

Off-by-one examples

```
FOR i = 1 TO 5
```

Runs 5 times.

```
WHILE i < 5
```

If i starts at 1, runs for i=1,2,3,4 = 4 times.

```
WHILE i <= 5
```

If i starts at 1, runs for i=1,2,3,4,5 = 5 times.