EEE 103 - Computer Programming

L5 - Loops

Part 2: Loops

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What is a loop?

- The ability to repeat a block of code a number of times.
- A loop executes a piece of code repeatedly until a condition is met.
- When we use loops: iterate over data, repeat tasks, or wait for a condition.
- Common loop types: while, do...while, for

while loop - Syntax

The while loop checks the condition first. If true, it runs the body and repeats.

Syntax:

```
loop variable
while (condition) {
    statements;
    increment/decrement;
}
```

Explanation:

- loop variable: a control variable that usually changes inside the loop
- while(condition) { ... } : condition evaluated before each iteration
- Body executes only if condition is true
- Use increment (i++) or decrement (i--) to eventually make condition false

Print 0 to 9 using while loop

```c
#include <stdio.h>

int main() {
 int i = 0; // Initialize counter
 // loop starts here
 while (i < 10) {
 printf("%d ", i);
 i++; // Increment counter
 }
 return 0;
}
```

Output:

```
0 1 2 3 4 5 6 7 8 9
```

do...while loop - Syntax

The do...while loop executes the body first, then checks the condition. It runs at least once.

Syntax:

```
do {
    statements;
    increment;
} while (condition);
```

Explanation:

- Condition checking is at the bottom
- Will execute at least once even if condition is false
- Common error: forgetting the semicolon after while ("while(condition);")

Print 0 to 9 using do...while loop

do...while ensures the body runs at least once.

```c
#include <stdio.h>

int main() {
 int i = 0; // Initialize counter
 // loop starts here
 do {
 printf("%d ", i);
 i++; // Increment counter
 } while (i < 10);
 return 0;
}
```

Output:

```
0 1 2 3 4 5 6 7 8 9
```

Difference: while vs do...while

while loop (checked first)

```
int i = 10;

while (i < 10) {
 printf("%d ", i);
 i++;
}
```

```
Output: (nothing) // condition false at start
```

do...while loop (body runs first)

```
int i = 10;

do {
 printf("%d ", i);
 i++;
} while (i < 10);
```

```
Output: 10 // runs once even though condition false
```

for loop - Syntax

for(initialize; condition; increment) { statements; }

Syntax:

```
for (initialization; condition; increment) {
    // statements to repeat
}
```

Explanation:

- Give an initial value to the loop-control variable
- Test the loop-control variable against a target value
- If true: execute the statement(s) and perform increment; repeat
- If false: stop and continue with next line after loop

Print 0 to 9 using for loop

Compact and commonly used for counted loops. Reveal groups show structure clearly.

```c
#include <stdio.h>

int main() {
 int i;
 for (i = 0; i < 10; i++) {
 printf("%d ", i);
 }
 return 0;
}
```

Output:

```
0 1 2 3 4 5 6 7 8 9
```

Practice Problems

1. Print even numbers between 1 and N.
2. Print all numbers between 1 and N divisible by 3 (or 5).
3. Sum of first N numbers.
4. Product of first N numbers.
5. Print multiplication table for a given number.
6. Factorial of N.
7. Count numbers between 1 and 50 divisible by 3 and 5.
8. Determine if a number is prime.

Thank You

Keep practicing — happy coding!