Pre-Lab/Lab #3: Looping

—

L2D
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Initialization Expression

Test Condition — false

true

for Loop Body

Update Expression

Loop Terminates

Learning Goal

- Write a program in C to solve a problem that requires loops, including nested loops

Types of Loops You've Seen Before

1. **While loops**

    while (testExpression) {
    *   // statements inside the body of the loop*
    }

    e.g. Printing all numbers between 1 and 10 that are divisible by 2
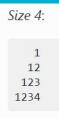
2. **Do-while loops**

    do {
    *   // statements inside the body of the loop*
    } while (testExpression);

    e.g. Asking for user input until a valid value is entered

3. **Nested loops**

    while (testExpressionOuter) {
    *   // statements inside the body of the outer loop*
    *   while (testExpressionInner) {*
    *   // statements inside the body of the*
    *   // inner loop*
    *   }*
    }

    e.g. Printing a number triangle (from this pre-lab)

    Size 4:

    ```
       1
      12
     123
    1234
    ```

Loop Example

```
int i = 3;
while (i >= 0) {
        if (i > 0 && i <= 3) {
                printf("%d\n", i);
        } else {
                printf("Surprise!");
        }
}
```

Fixed Loop Example

```c
int i = 3;
while (i >= 0) {
    if (i > 0 && i <= 3) {
        printf("%d\n", i);
    } else {
        printf("Surprise!");
    }
    i--;
}
```

Beware the Infinite Loop!

Output

TIMEOUT! Typically this means the program took too long,
requested more inputs than provided, or an infinite loop was found.
If your program is reading data using scanf inside a loop, this
could also mean that scanf does not support the input provided
(e.g., reading an int if the input is a double).

Aside on Error Messages

plate.c
```
1   #include <stdio.h>
2   #include <stdlib.h>
3
4 ▾ int main( void ) {
5       int x1 = 30;
6       int x2 = 45;
7
8       printl("x1 = %d", x1);
9       printf("x2 = %d", x2)
10
11      return 0;
12  }
```

Submitted answer 5 **invalid, not gradable**

Submitted at 2021-02-07 23:01:51 (PST)

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Invalid, not gradable

Message

```
Compilation errors, please fix and try again.

plate.c: In function 'main':
plate.c:8:5: warning: implicit declaration of function 'printl'; did you mean 'printf'? [-Wimplicit
     printl("x1 = %d", x1);
     ^~~~~~
     printf
plate.c:11:5: error: expected ';' before 'return'
     return 0;
     ^~~~~~
```

A New Type of Loop: *For Loops!* NEW

- The syntax of a for loop is as follows:

    for (initializationStatement; testExpression; updateStatement) {
    *   // statements inside the body of loop*
    }

- Here is a concrete example, and its equivalent while loop:

```
for (int i = 0; i < 11; i++) {
    printf("%d", i);
}
```

```
int i = 0;
while (i < 11) {
    printf("%d", i);
    i++;
}
```

Steps for Writing Programs

1. Understand the problem
2. Think through your algorithm
3. Come up with a test suite (both valid inputs and edge cases)
4. Code your algorithm
5. Test your algorithm
   - *Beware the infinite loop* 😈

Thanks for listening! 😊

Feel free to ask any Pre-Lab #3 related questions,
or really any other questions you might have!
Good luck on your midterm today!