CSE 1310 - Introduction to Computers & Programming Loops

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Loops allow us to express multiple *iterations* of statements compactly.

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We will cover:

- Loop statements
  - while
  - do-while
  - ▶ for
- Exiting gracefully

```
Syntax
    while (EXPRESSION)
        STATEMENTS
Simple Example
    int count = 0;
    while (1) {
        printf("%d\n", count++;);
    }
```

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- EXPRESSION evaluated at the top of the loop.
- Statements in loop are executed.
- Once the bottom is reached, return to the top.
- **Control the loop through the** EXPRESSION.

/\* Count to 10 \*/
int count = 0;
while (count < 10) {
 printf("%d\n", count++);
}
Does this program do what was intended?</pre>

/\* Count to 10 \*/
int count = 0;

**Does this program do what was intended? Answer:** No! It only counts to 9.

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```
Let's modify this slightly.
    /* Count to 10 */
    int count = 0;
    while (count <= 10) {
        printf("%d\n", count++);
    }
Does this program do what was intended?
```

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```
Let's modify this slightly.
    /* Count to 10 */
    int count = 0;
    while (count <= 10) {
        printf("%d\n", count++);
    }
Does this program do what was intended?
Answer: Yes! It now includes 10.
```

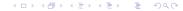


#### Example: Is Prime? (is\_prime.c)





#### Example: Guessing Game (guess.c)





#### Example: System Menu (menu.c)





for loops provide a convenient syntax for looping a specified number of times.

Syntax

for (INIT.; CONDITION; PROCESSING)
STATEMENTS

Simple Example

/\* Count to 10 \*/
for (int i = 0; i < 10; i++) {
 printf("%d\n", i);
}</pre>

## for Loops

- Initialization Allows us to create the loop counting variable.
- Condition Set the test condition for which the loop should continue or stop.
- Processing Defines what should happen after each iteration of the loop.



#### Example: Multiples of 3 and 5 (multiple.c)



## do-while loops guarantee a single iteration of the loop.

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#### Syntax

do STATEMENTS while (CONDITION)



#### Example: Guessing Game Again (guess2.c)



Infinite loops are most common with while loops.

- Make sure the condition can be broken.
- Remember to update your loop counter (if applicable).

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► Use control statements.

## Infinite Loops

#### With a while loop: while (1);

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## Infinite Loops

# With a for loop: for (;;);

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## Nested Loops

- Any amount of loops can be nested.
- Increases the computation time.
- Useful for having an outer control loop to keep the user in a program.

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## **EXAMPLE:** Prime Factorization (prime\_factor.c)

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Additional control is available with loops through the following statements.

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- break;
- continue;
- return;
- exit();

## Additional Control – break

The break statement immediately exits a loop.

If the loop is the inner loop of a nested loop, it will return control to the outer loop.

## Additional Control – break

while (!found) {

// Break if target found
if (input == target) {
 break;
}

```
input++;
}
```

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## Adding Control – continue

The continue statement skips to the bottom of the loop.

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This is commonly used to skip unnecessary calculations depending on the data.

## Adding Control – continue

// Don't divide by anything
// that is divisible by 11
for (int i = 0; i < n; i++) {
 if (i % 11 == 0)
 continue;</pre>

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input /= i;
}

## Adding Control – return

The return statement immediately exits the current function.

If executed in main, the program exits.

## Adding Control - exit

The exit() function will immediately exit the program, regardless of where it is executed.

There is typically always a better way to exit the functions and program without it.

Adding Control - exit

```
int main() {
    for (int i = 0; i < 10; ++i) {
        if (i == 5) {
            exit();
        }
    }
    return 0;
}
```

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