do/while and Nested Loops

Section 5.5 & 5.11

Nested Loops (5.11)

- A loop within a loop
- Can repeat multiple things within a loop
- Example:
  - o Read in 10 grades for each of 20 students
  - o How would we write loops to do this?

What is the Output?

```
for (int i = 0; i < 3; i++)
{
  for (int j = 0; j < 2; j++)
  {
     // how many times will this run?
     cout << "*";
  }
  // how many times will this run?
  cout << endl;
}
```

What is the Output?

```
for (int i = 3; i > 0; i-- )
{
  for (int j = i; j < 4; j++)
  {
    cout << "*";
  }
  cout << endl;
}
```

Practice

- Write C++ statements that will read in an integer from the user (n) and produce:

```
1
22
333
4444
....
nnnnnnnnn
```

do/while Loop (5.5)

- So far, we have looked at
  - o while
  - o for
  - o both of these are pretest loops
- do/while is another repetition structure
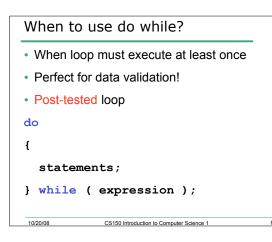- Post-test: test happens at the end of the loop

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`do/while` Loops

```
do
{
  cout << "Enter a year:" << endl;
  cin >> year;
} while (year < 0); // TEST!
// The body of the loops happens
// before the test
```

When to use do while?

- When loop must execute at least once
- Perfect for data validation!
- Post-tested loop

```
do
{
  statements;
} while ( expression );
```

What's the output?

```
int m = 10;
do
{
  cout << m << endl;
  m = m - 3;
} while (m > 0);
```

Example

- Write C++ statements that will read in integers from the user until the user inputs an integer between 5 and 10.

Rewrite as a do/while loop

```cpp
int num = 0;
// what is the output?
while (num <= 6)
{
  cout << num << endl;
  num += 2;
}
```

Rewrite as a do/while Loop

```cpp
// what is the output?
for (n = 3; n > 0; n--)
{
  cout << n << " squared is"
       << n * n << endl;
}
```

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What is the Output?

```cpp
int counter = 1;
do
{
  cout << counter << " ";
} while( ++counter <= 10 );
```

```cpp
int counter = 1;
do
{
  cout << counter << " ";
} while( counter++ <= 10 );
```

What is the Purpose?

```cpp
char ch;
do
{
  cout << "Enter a valid code (h,c,i): ";
  cin >> ch;
} while ((ch != 'h') && (ch != 'c') && (ch != 'i'));
```