`do/while` and Nested Loops

Nested Loops

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

16.1 What is the Output?

```
for (int i = 0; i < 5; i++)
{
  for (int j = 0; j < i; j++)
  {
    cout << "*";
  }
  cout << endl;
}
```

16.2 What is the Output?

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


`do/while` Repetition Structure

- What repetition structures have we covered so far?
- `do/while` is another repetition structure
- Useful when the test happens at the end of the loop

`do/while` Loops

```
do
{
  cout << "Enter a year:" << endl;
   cin >> year;
} while (year < 0);
```

When to use do while?

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

```
do
{
  statements;
} while (condition is true);
```


16.3 Example

- Write a program segment that takes as input a number between 5 and 10. Error proof the segment.

16.7 What's the output?

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

16.8 Rewrite as a **do/while**

```
int num = 10;
while (num <= 100)
{
  cout << num << endl;
  num += 10;
}
```


16.9 Rewrite as a do/while Loop

```
for (n = 3; n > 0; n--)
{
  cout << n << " squared is"
       << n * n << endl;
}
```


16.10 What is the Output?

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

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

16.11 What is the Purpose?

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


16. 12 Rewrite as a **do-while** Loop

```
int i;
for(i = 0; i <= 50; i++)
{
  sum += i;
}
```