

## Code Trace - Nested Loops

### #1

```
1  for (int k = 1; k <= 2; k++)
2      for (int m = 1 ; m <= 3; m++)
3          cout << k << ' ' << m << endl;
4
5  // -- OUTPUT --
6  1 1
7  1 2
8  1 3
9  2 1
10 2 2
11 2 3
```

### #2

```
1  for (int d = 6; d >= 4; d--)
2      for (int e = 2; e <= 4; e++)
3          cout << d << ' ' << e << endl;
4
5  // -- OUTPUT --
6  6 2
7  6 3
8  6 4
9  5 2
10 5 3
11 5 4
12 4 2
13 4 3
14 4 4
```

### #3

```
1  x = 1;
2  while (x <= 5)
3  {
4      sum = 0;
5      y = 1;
6      while (y <= x)
7      {
8          sum += y;
9          y++;
10     }
```

```
11     cout << sum << ' ' ;
12     x++;
13 }
14
15 // -- OUTPUT --
16 1 3 6 10 15
```

#### #4

```
1  for (i = 1 ; i <= 5 ; i++)
2  {
3      cout << i << endl;
4      for (j = i ; j >= 1 ; j -= 2)
5          cout << j << endl;
6  }
7
8  // -- OUTPUT --
9  1
10 1
11 2
12 2
13 3
14 3
15 1
16 4
17 4
18 2
19 5
20 5
21 3
22 1
```

#### #5

```
1  for (i = 1 ; i <= 3 ; i++)
2      for (j = 1 ; j <= 3 ; j++)
3      {
4          for (k = i ; k <= j ; k++)
5              cout << i << j << k << endl;
6          cout << endl;
7      }
8
9  // -- OUTPUT --
10 111
11
12 121
13 122
```

```
14
15 131
16 132
17 133
18
19
20 222
21
22 232
23 233
24
25
26
27 333
```

### #6

```
1  for (i = 3 ; i > 0 ; i--)
2      for (j = 1 ; j <= i ; j++)
3          for (k = i ; k >= j ; k--)
4              cout << i << j << k << endl;
5
6  // -- OUTPUT --
7  313
8  312
9  311
10 323
11 322
12 333
13 212
14 211
15 222
16 111
```

## Nested Loops

7. Write statements that will read numbers and print out the sum of the numbers. The program should stop when the user enters -999, or after reading 5 numbers, whichever comes first.

```
1 int in_count = 0;
2 int sum = 0;
3 int number;
4
5 while (in_count < 5) {
6     cin >> number;
7
8     if (number == -999) {
9         break;
10    }
11
12    sum += number;
13    in_count++;
14 }
15
16 cout << sum << '\n';
```

8. Test your program from problem 7 with the following data: 10 20 30 -999

```
1 60
```

9. Test your program from problem 7 with the following data: 10 20 30 40 50 60 70

```
1 150
```

10. Write a program segment using nested loops to create the following output:

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

```
1 for (int i = 1; i <= 9; ++i) {
2     for (int j = 0; j < i; ++j) {
3         cout << '*';
4     }
5     cout << '\n';
6 }
```

11. Write a program segment using nested loops to create the following output:

```
1      *
2     ***
3    *****
4   *********
5  ***********
```

```
1  int max_width = 9;
2
3  for (int i = 1; i <= max_width; i += 2) {
4      for (int j = 0; j < (max_width - i) / 2; j++) {
5          cout << ' ';
6      }
7
8      for (int k = 0; k < i; k++) {
9          cout << '*';
10     }
11
12     cout << '\n';
13 }
```

## Input Validation

12. Prompt the user to enter y or n. If the user enters an invalid character, keep re-prompting until a valid character is entered. Use a while loop.

```
1  char prompt;
2  while (prompt != 'y' && prompt != 'n')
3  {
4      cout << "Please enter 'y' or 'n': ";
5      cin >> prompt;
6  }
```

13. Redo problem 12 with a do-while loop.

```
1  char prompt;
2  do {
3      cout << "Please enter 'y' or 'n': ";
4      cin >> prompt;
5  } while (prompt != 'y' && prompt != 'n');
```