

# CS 111

nested loops with calculations

# Model for nested loop with calculations

```
SET UP OUTER LOOP {  
    OUTER LOOP ACTIONS  
    SET UP INNER LOOP {  
        INNER LOOP ACTIONS  
    }  
    MORE OUTER LOOP ACTIONS  
}
```

# Nested for loop - comments

- Usually the loops are for loops, but could be while loops
- OUTER LOOP ACTIONS will repeat from time to time, whereas inner loop actions will repeat all the time
- A clue that suggests using a nested loop that there are two categories of action frequency

# Example 1

- Write a complete C++ program that prints numbers from 28 to 387 with ten numbers (separated by spaces) on each line
- The output from the program should begin

28 29 30 31 32 33 34 35 36 37

38 39 40 41 42 43 44 45 46 47

# Example 1

28 29 30 31 32 33 34 35 36 37

38 39 40 41 42 43 44 45 46 47

- What action is repeated all the time?
- What action is repeated a few times?

# Example 1 – outer while, inner for

```
int main() {  
    int counter = 28;  
    while(counter < 388){  
        for(int i = 1; i <= 10; i++){  
            cout << counter << " ";  
            counter++;  
        }  
        cout << endl;  
    }  
}
```

# Example 1 – outer for, inner for

```
int main() {  
    for(int counter = 28; counter <388;){  
        for(int j = 1; j<=10; j++){  
            cout << counter << " ";  
            counter++;  
        }  
        cout << endl;  
    }  
}
```

## Example 2 –multiplication table

- Want to print 10 rows and 10 columns
- What action is repeated all the time?
  - Multiply row and column numbers
- What action is repeated a few times?
  - Print a new line

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100



## Example 2 – multiplication table

```
int main() {  
    for(int i = 1; i <= 10; i++){  
        for(int j = 1; j <= 10; j++){  
            cout << i * j << "\t";  
        }  
        cout << endl;  
    }  
    return 0;  
}
```

# 11.1 Pseudocode

Set up for loop with counter initialized to 28

Run for loop until counter less than 388

Print counter value separated by space

If the last digit of the counter value is 7 print a new line