**Question a:**

int sum = 16; //N=16

while (sum >= 1)

{

sum--;

cout<<sum<<endl;

}

**Answer:**

This code will check 17 comparisons, from sum = 16 to sum = 0.

When N = 16, the answer is N + 1 hence it equals 17.

**Question b:**

int sum = 1; //N=16

while (sum <= 16)

{

sum=sum\*2;

cout<<sum<<endl;

}

**Answer:**

This code will check 6 comparisons, from sum = 1, it will be multiplied by 2 each time until it reaches sum = 32 and will exit the loop. Therefore, it will check 1, 2, 4, 8, 16, 32.

This will be 24 = 16. So, when N = 16, the answer is log2 N + 2.

**Question c:**

int sum = 0; //N=16

for (int i = 0; i < 16; i++){

for(int j = 0; j < 16; j++) {

sum++; }}

**Answer:**

Since this program has a nested for loop, each iteration will count up to 16. So for each time it reaches i, the program will check it 16 times before updating i and doing the same thing over again until i = 16. So the total comparisons are 16 x 16 = 256. As seen:

When i = 0, j will check from 0 to 16 and this will repeat until i = 16.

Since this is a nested for loop, N = 16 will become N2 because there are two loops within one another.

**Question d:**

int sum = 0; //N=16

for (int i = 0; i < 16; i++){

for(int j = i; j < 16; j++) {

sum++; }}

**Answer:**

There are 136 comparisons because 16 \* 17. The list will go from 15 to 0 and will become:

15 -> +1

14 -> +2

13 -> +3

12 -> +4

.

.

0 -> +16

For this code, the formula will be (N(N+1))/2.

**Question e:**

int sum = 0; //N=16

for (int i = 1; i < 16; i +=2){

for (int j = 0; j < i; j++) {

sum++; }}

**Answer:**

There are 8 comparisons in this code: 1, 3, 5, 7, 9, 11, 13, 15 and for each loop, the number will be:

1 -> +1

3 -> +3

5 -> +5

.

.

15 -> +15

For this nested for loop, the formula will be N2/4.

**Question f:**

int sum = 0; //N=16

for (int i = 1; i < 16; i \*= 2)

for (int j = 0; j < 16; j++)

sum++;

**Answer:**

There are 4 comparisons in this code: 1, 2, 4, 8. So it will check both for loops and will then terminate when i and j = 16.

For this nested for loop, the formula will be Nlog2N.

**Question g:**

int sum = 0; //N=16

for (int i = 1; i < 16; i \*= 2)

for (int j = 0; j < i; j++)

sum++;

**Answer:**

There are 5 comparisons in this code: 1, 2, 4, 8. So when 1+2+4+8 =15, it will terminate because the number cannot go above 16.

For this for loop, the formula will be N – 1.