Answer: Running time is O(n)

Explanation: There is a single loop that runs n−5 times. Each time the loop runs it executes

instruction in the loop header and 1 instruction in the body of the loop. The total number

of instructions is 2 ∗ (n − 5) + 1 (for the last loop check) = 2n − 9 = O(n). (also OK: Θ(n)).

1)

num=0;

for (i = n; i>= 0; i−−)

num−−;

Answer: Running time is O(n)

Explanation: after the 1st instruction, there is a single loop that runs (n+1) times; each time the loop runs it executes the instruction in the loop header and 1 instruction in the body of the loop. The total number of instructions is 2\*(n+1) +1 (for the last loop check) + 1 = 2n + 4 = O(n).

2)

num=0;

for (i = 0; i<= n ∗ n; i=i+2)

num=num+2;

Answer: Running time is

Explanation: after the 1st instruction, there is a single loop that runs (n^2)/2 + 2 (including last loop check);

therefore 2[(n^2)/2 + 2] + 1 = n^2 + 5 = O(n^2).

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36

n=2 4

n=3 6

n=4 10

n=5 14

n=6 20

3)

num=0;

for (i = 1; i<= n; i=i\*2)

num++;

Answer: Since the number of iterations decreases by half, loop has logN +2 complexity (inclusive of last loop check); therefore 2(logN + 2) +1 = 2logN + 5 = O(logN).

4)

num=1;

for (i = 0; i<n; i++)

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

num = num \* 2

Answer: O(n^2)

5)

p=10;

num=0;

plimit=100000;

for (i = p; i<=plimit; i++)

for (j = 1; j<=i; j++)

num = num + 1;

Answer: O(n^2)

6)

num=0;

for (i = n\*n; i>=0; i=i/2)

for (j = 1; j<=n; j++)

num = num + i;

Answer: O(n^3 logN)

7)

num=0;

for (i = 0; i<n\*n-1; i++)

for (j = 0; j< i ∗ i; j++)

num = 2\*num;

Answer:

8)

num=0;

for (i = 0; i<= n\*n; i++)

num++;

for (i = 1; i<=n; i=i\*2)

for (j=n; j>= 1; j=j/2)

num++;

Ans: n^2 + logn\*logn

9)

for (i = 0; i < n; i++) {

smallest = i;

for (j = i+1; j <= n; j++) {

if (a[j] < a[smallest])

smallest = j;

}

swap(a, i, smallest); // has three instructions

}

Ans: O(n^2)

10)

num = 0;

i = 0;

while (i<n) {

j = 0;

while (j<100) {

//constant time operations

j++;

}

i++;

}

Ans: O(100n^2)