Orders of Growth

The order of growth of a program is how the ***running time*** *grows as a function of input size, n.*

	Name	Example
1	***linear***	***Array access***
log N	***logarithmic***	***Binary search***
N	***linear***	***Printing an array***
N log N	***linearithmic***	***MergeSort***
N^2	***quadratic***	***NBody***
N^3	***cubic***	***Matrix multiplication, Three-Sum***
2^N	***exponential***	***Nested circles, Sierpinski, H-Tree***
N!	***factorial***	***All possible orders, e.g., all possible orderings of a 52 card deck***

What are the orders of growth for the following code snippets?

For each, assume the following array has already been initialized:

```
int[] a = new int[n];
```

`a[n/2] = 126;`	***constant***

`for (int i = 0; i < n; i++)`
`  for (int j = 0; j < n;`
`j++)`
`  a[i] = i + j;`
	quadratic

`for (int i = 0; i < n; i++) {`
`  for (int j = 0; j < 3; j++)`
`{`
`  a[i] = i * j;`
`  a[j] = i / j;`
`  }`
`}`
	linear

`for (int i = 0; i < n; i++) {`
`  for (int j = i; j < n; j++)`
`{`
`  if (j == i * 2) {`
`  a[i] = j;`
`  }`
`  }`
`}`
	quadratic