

## Insertion Sort

I-

 $V_1 = \{7, 2, 5, 4, 9\}$ 

n	0	1	2	3	4	i	j	arr	$j \geq 0?$	$arr < v[j]?$
5	<del>7</del>	<del>2</del>	<del>5</del>	4	9	1	0	<del>7</del>	V	V
	2					<del>1</del>	<del>1</del>	<del>7</del>	F	
		<del>7</del>				<del>2</del>	<del>1</del>	<del>5</del>	V	V
		5					0	<del>7</del>	V	F
			<del>7</del>			<del>3</del>	<del>2</del>	4	V	V
			5				<del>1</del>	<del>7</del>	V	V
		4					0	<del>7</del>	V	F
						4	3	9	V	F

 $V_2 = \{7, 5, 5, 3, 9\}$ 

n	0	1	2	3	4	i	j	arr	$j \geq 0?$	$arr < v[j]?$
5	<del>7</del>	<del>5</del>	<del>5</del>	3	9	1	0	5	V	V
	5					<del>1</del>	<del>1</del>	<del>7</del>	F	
		<del>7</del>				<del>2</del>	<del>1</del>	<del>5</del>	V	V
		5					0	<del>7</del>	V	F
			<del>7</del>			<del>3</del>	<del>2</del>	<del>5</del>	V	V
			5				<del>1</del>	<del>7</del>	V	V
		5					0	<del>7</del>	V	V
	3					<del>1</del>	<del>1</del>	<del>5</del>	F	
						4	3	9	V	F

D S T Q Q S S

$$v3 = \{1, 2, 3, 4\}$$

n	0	1	2	3	i	j	aux	$j \geq 0?$	$aux < v[j]?$
4	1	2	3	4	1	0	2	V	F
					2	1	3	V	F
					3	2	4	V	F

$$v4 = \{4, 3, 2, 1\}$$

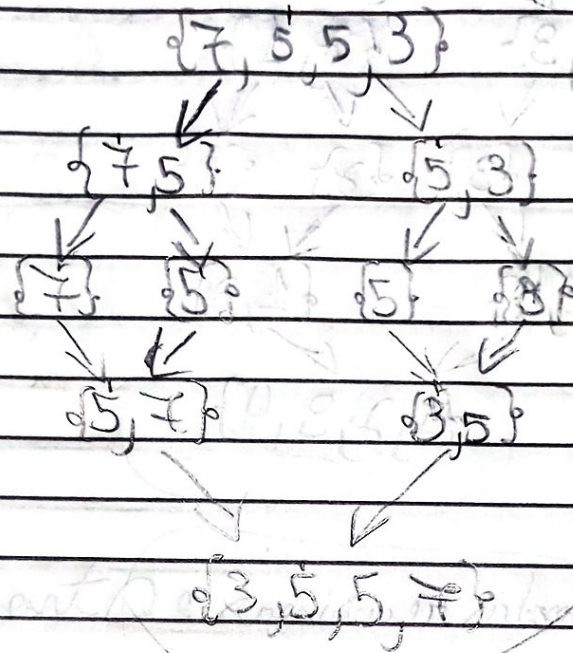
n	0	1	2	3	i	j	aux	$j \geq 0?$	$aux < v[j]?$
4	4	3	2	1	1	0	3	V	V
	3				2	1	2	F	V
		4			3	2	1	V	V
		3			4	3	1	V	V
		2			3	2	1	V	V
		1			4	3	1	V	V
			4		3	2	1	V	V
			3		4	3	1	V	V
			2		3	2	1	V	V
			1		4	3	1	V	V

II - Não realizadas 9 comparações e 7 trocas

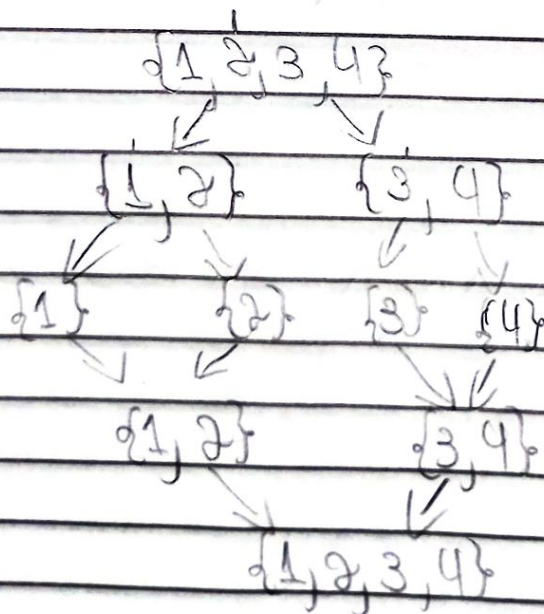


Merge Sort:

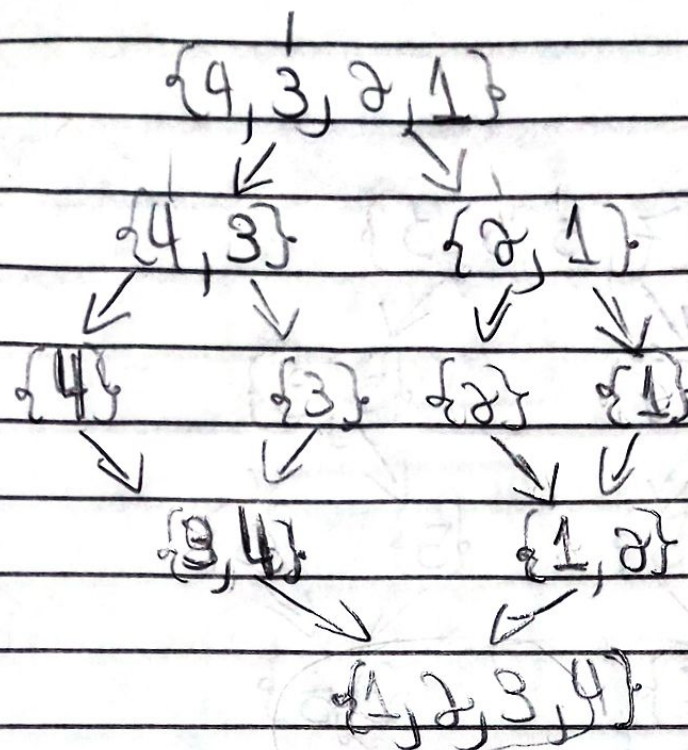
I-  $v1 = \{7, 5, 5, 3\}$



$v2 = \{1, 2, 3, 4\}$



$v3 = \{4, 3, 2, 1\}$



II - Serão feitas 6 comparações sucessivas e 0 trocas

III - Não é preciso trocar a condição do if na função interna na linha 5, trocando de  $v[i] < v[j]$  para  $v[i] \geq v[j]$ .



D S T Q Q S S

$$1 - v = \{3, 5, 6, 8, 2, 4, 6, 7, 9\}$$

$$\text{interval}(v, 0, 4, 9)$$

$$\{3, 5, 6, 8, 2, 4, 6, 7, 9\}$$

$$i = 0 \ 1 \ 2 \ 3 \ 4$$

$$j = 4 \ 5 \ 6 \ 7 \ 8 \ 9$$

$$k = 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8$$

$$u = \{2, 3, 4, 5, 6, 6, 7, 8, 9\}$$

$$v = \{2, 3, 4, 5, 6, 6, 7, 8, 9\}$$