Merge Sort

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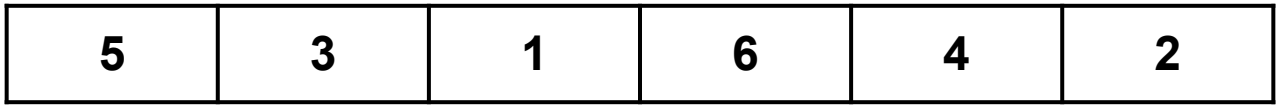
A ideia é dividir a lista ao meio, recursivamente, até aparecer sub-listas com um único elemento. O outro passo é combinar cada par (esquerda e direita) de sub-listas em uma sequência ordenada.

Intuição

- Dividir
  - Se a sequência (lista) de entrada tiver mais de um elemento, divida em duas;
- Conquistar
  - Chame o método (mergesort) para cada subsequência (sub-lista), recursivamente;
- Combinar
  - Junte as subsequências em uma sequência ordenada;

Exemplo



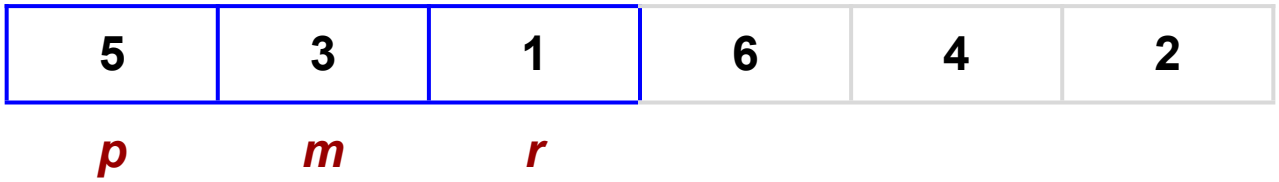
Iteração 1

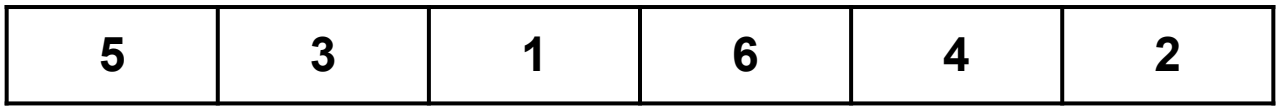
5	3	1	6	4	2

p *m* *r*

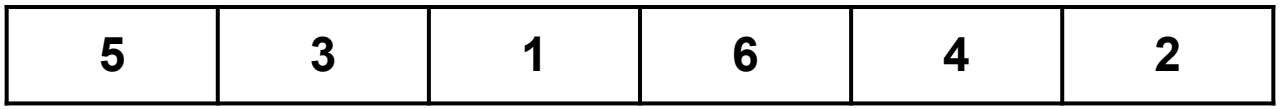
5	3	1	6	4	2

Iteração 2



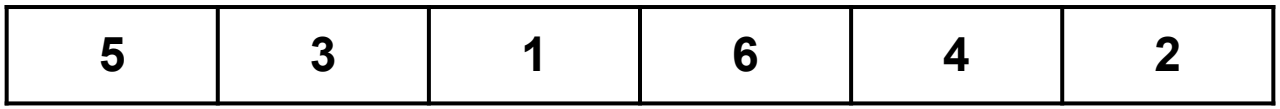


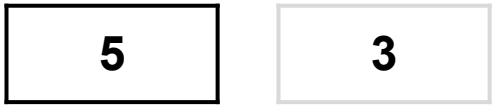
Iteração 3



Iteração 4

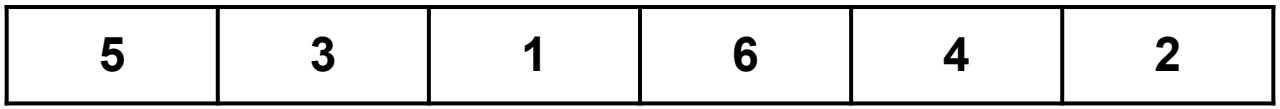
p, r

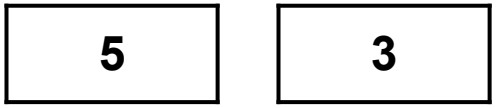




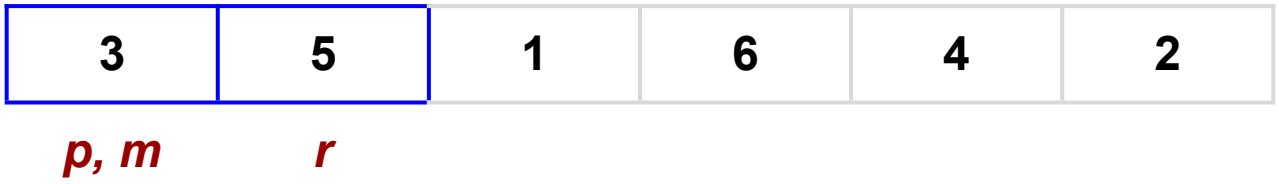
Iteração 5

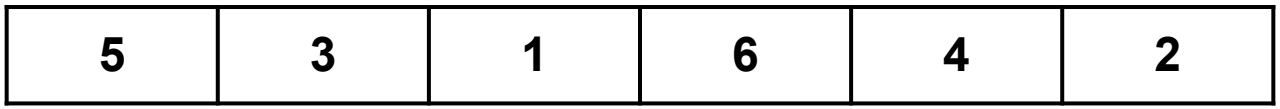
p, r

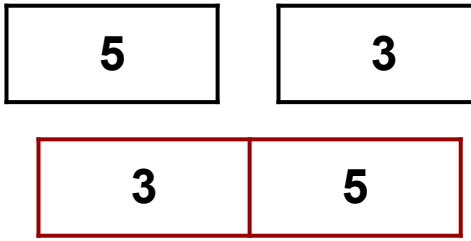




Iteração 3

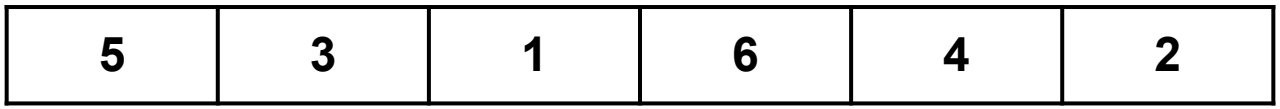


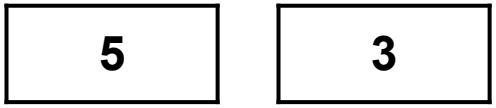




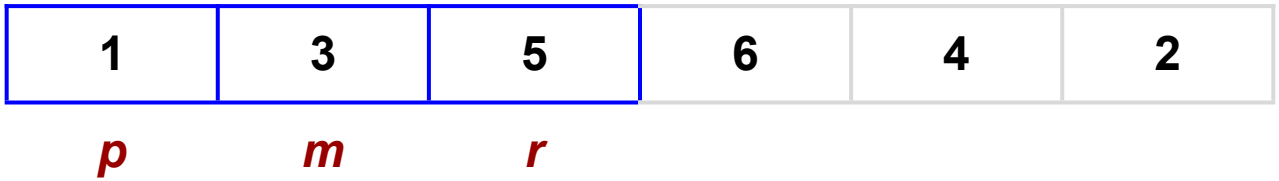
Iteração 6

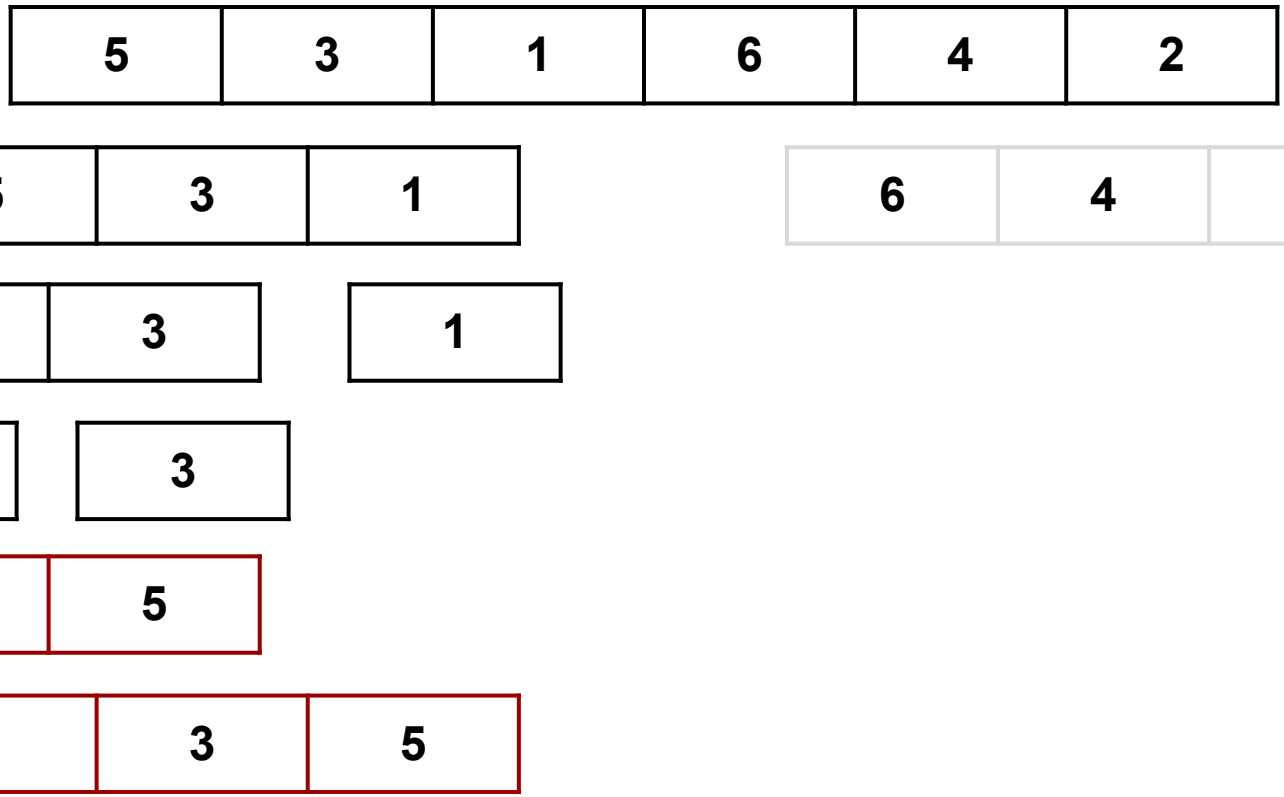
p, r



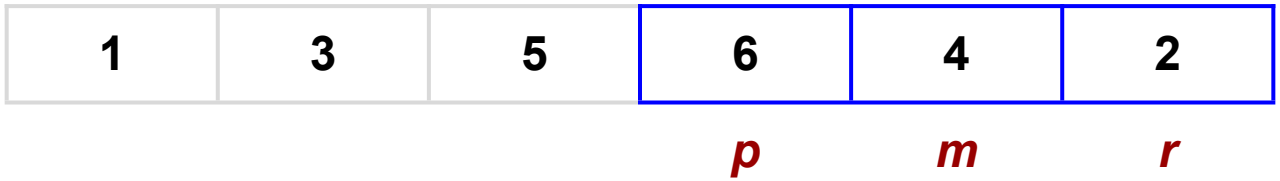


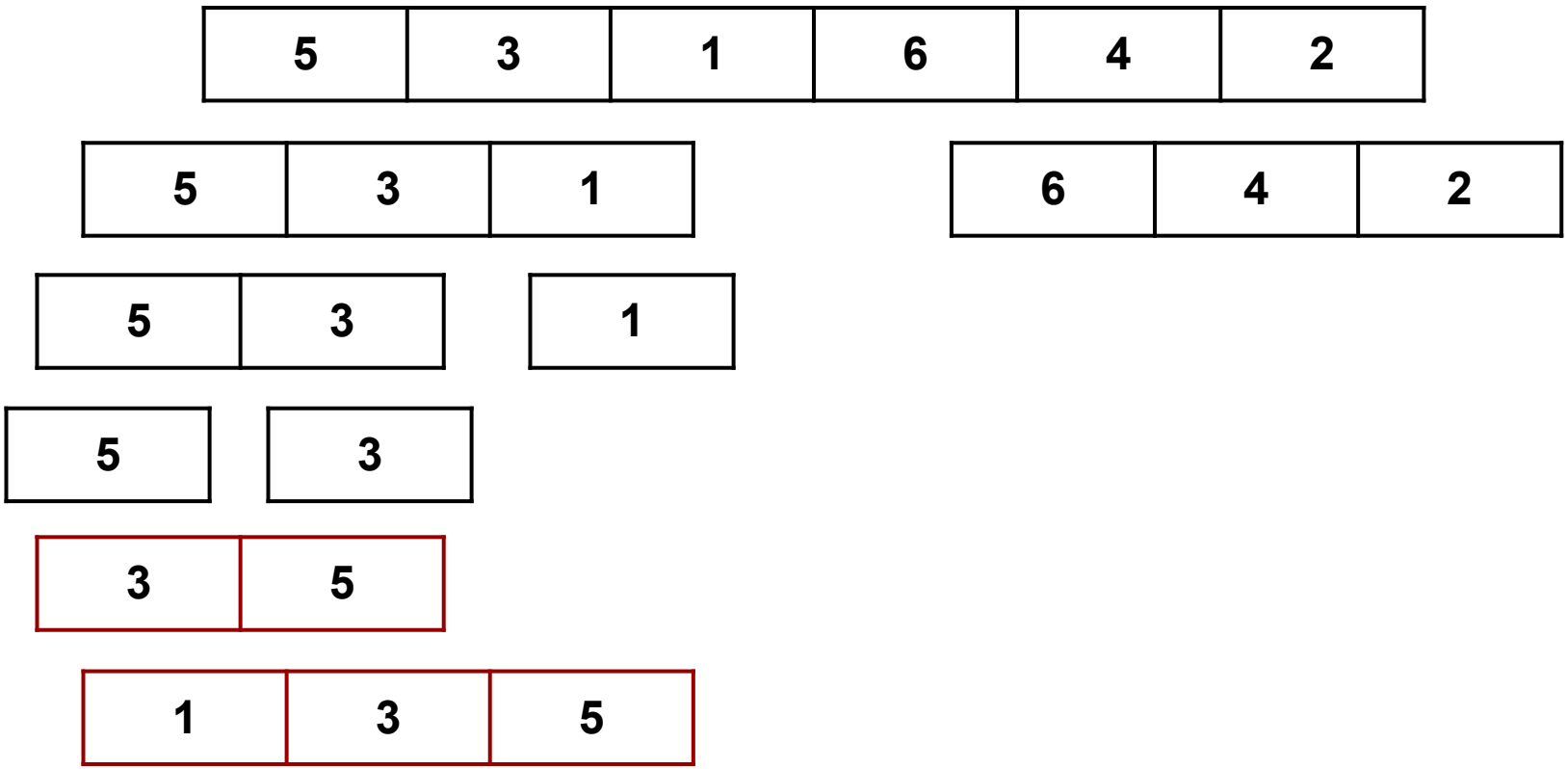
Iteração 2



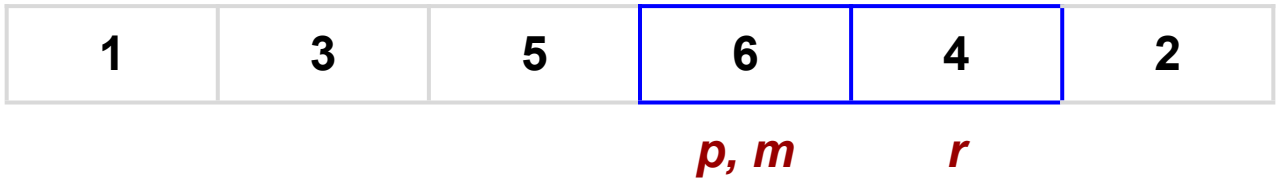


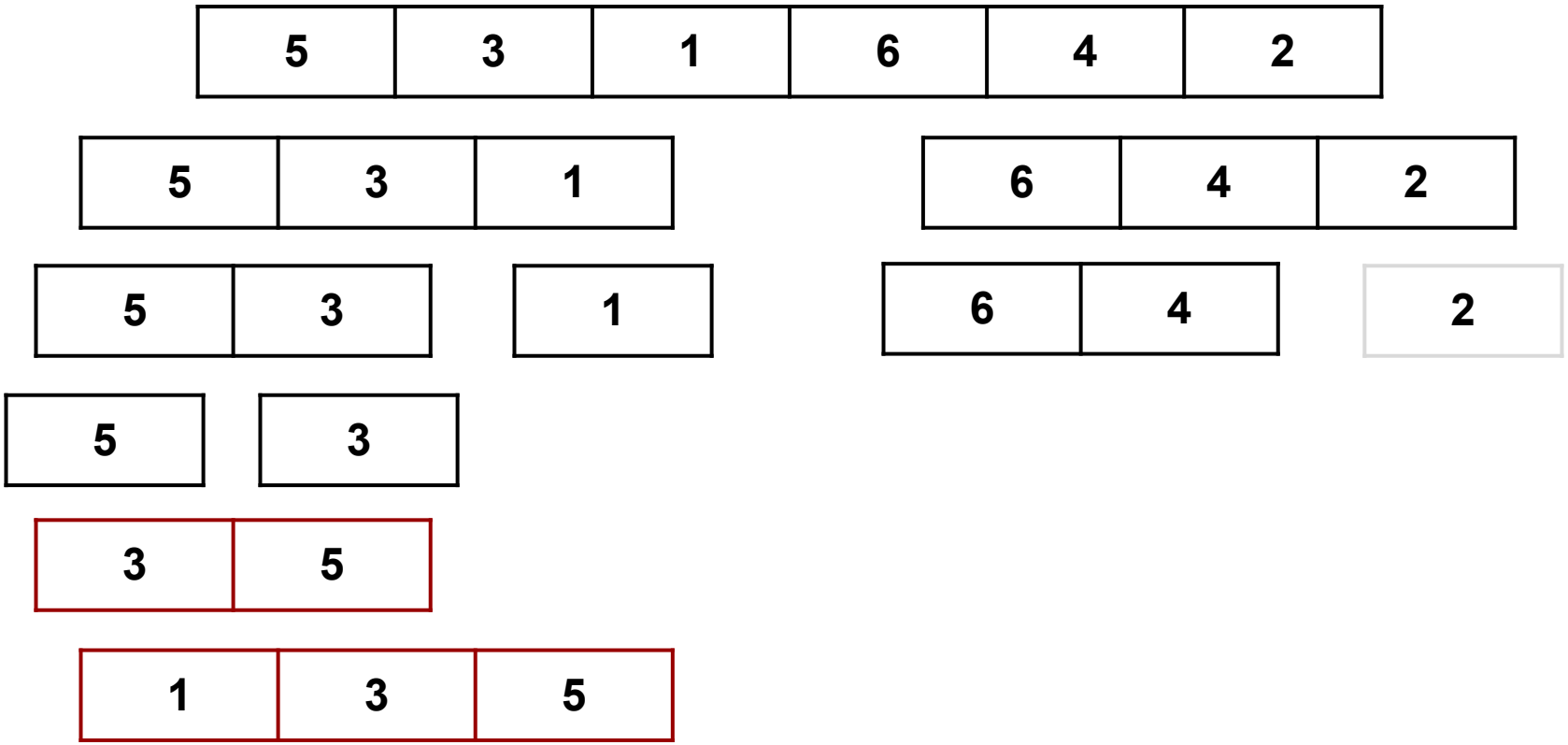
Iteração 7





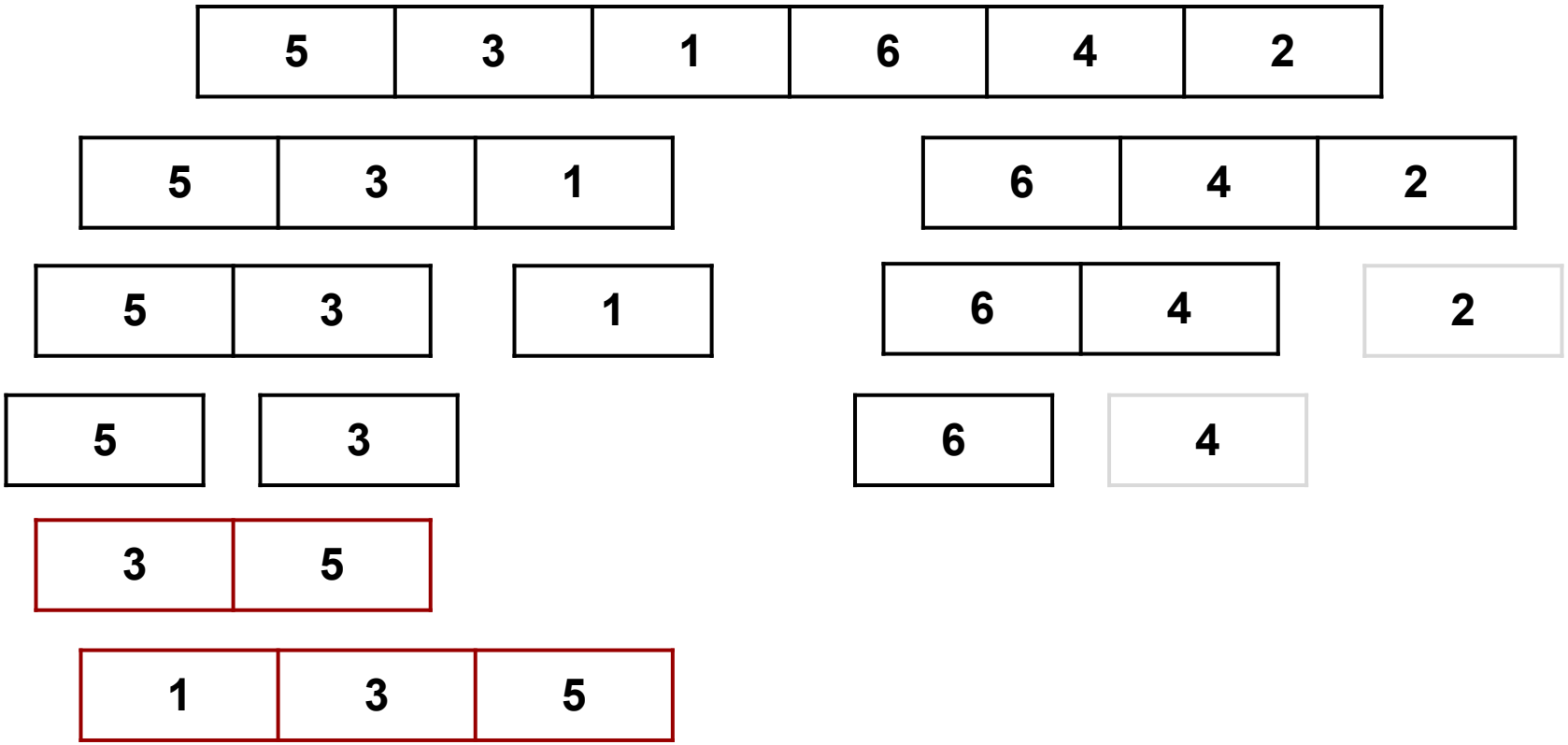
Iteração 8





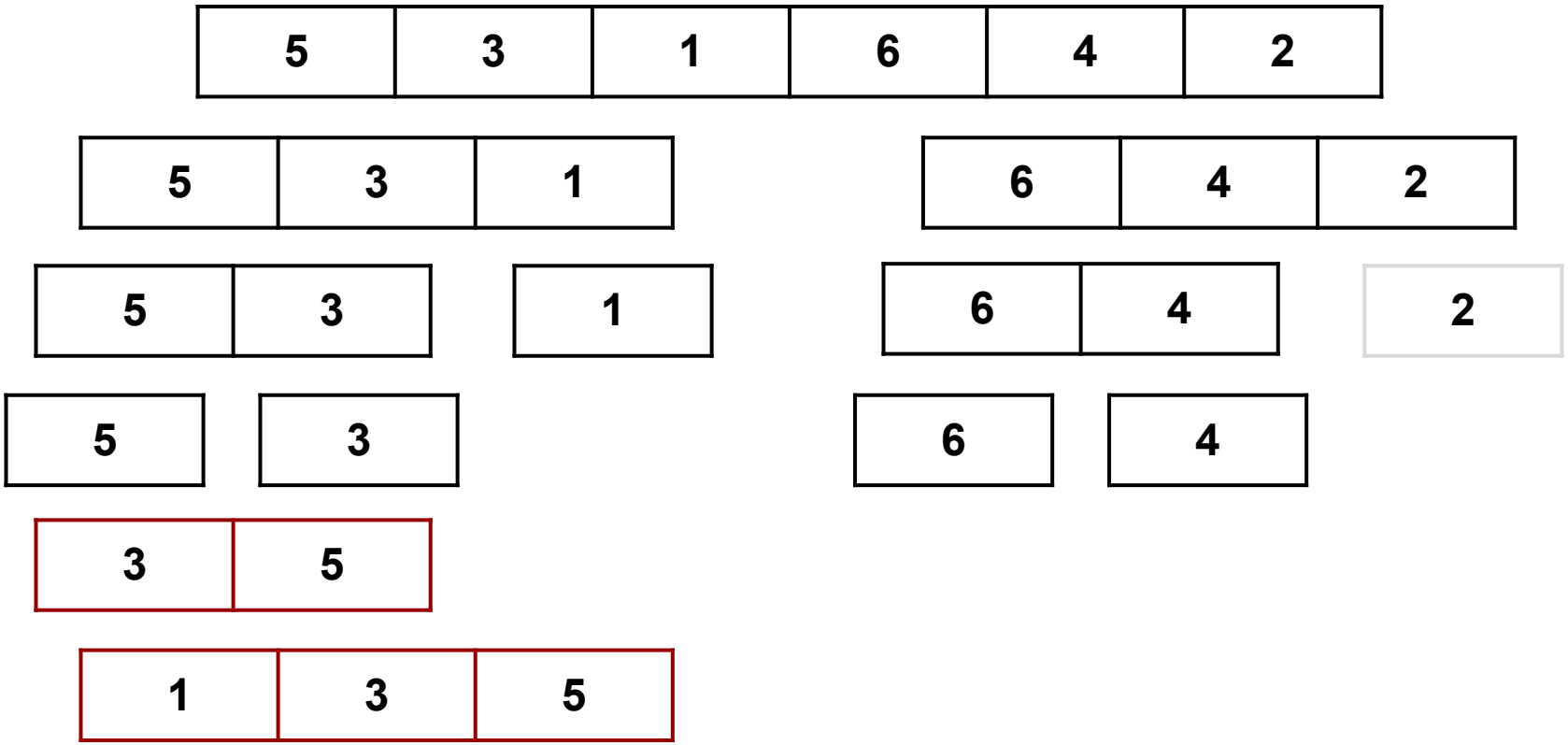
Iteração 9

p, r

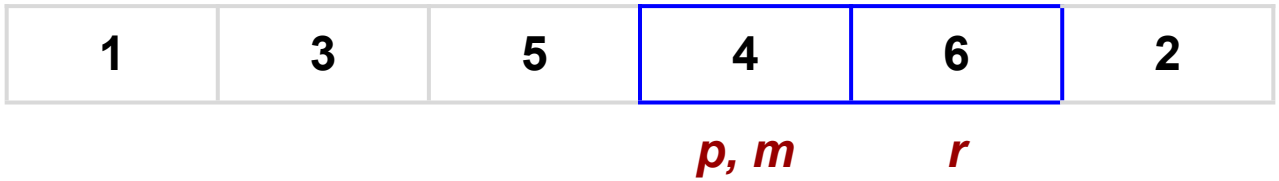


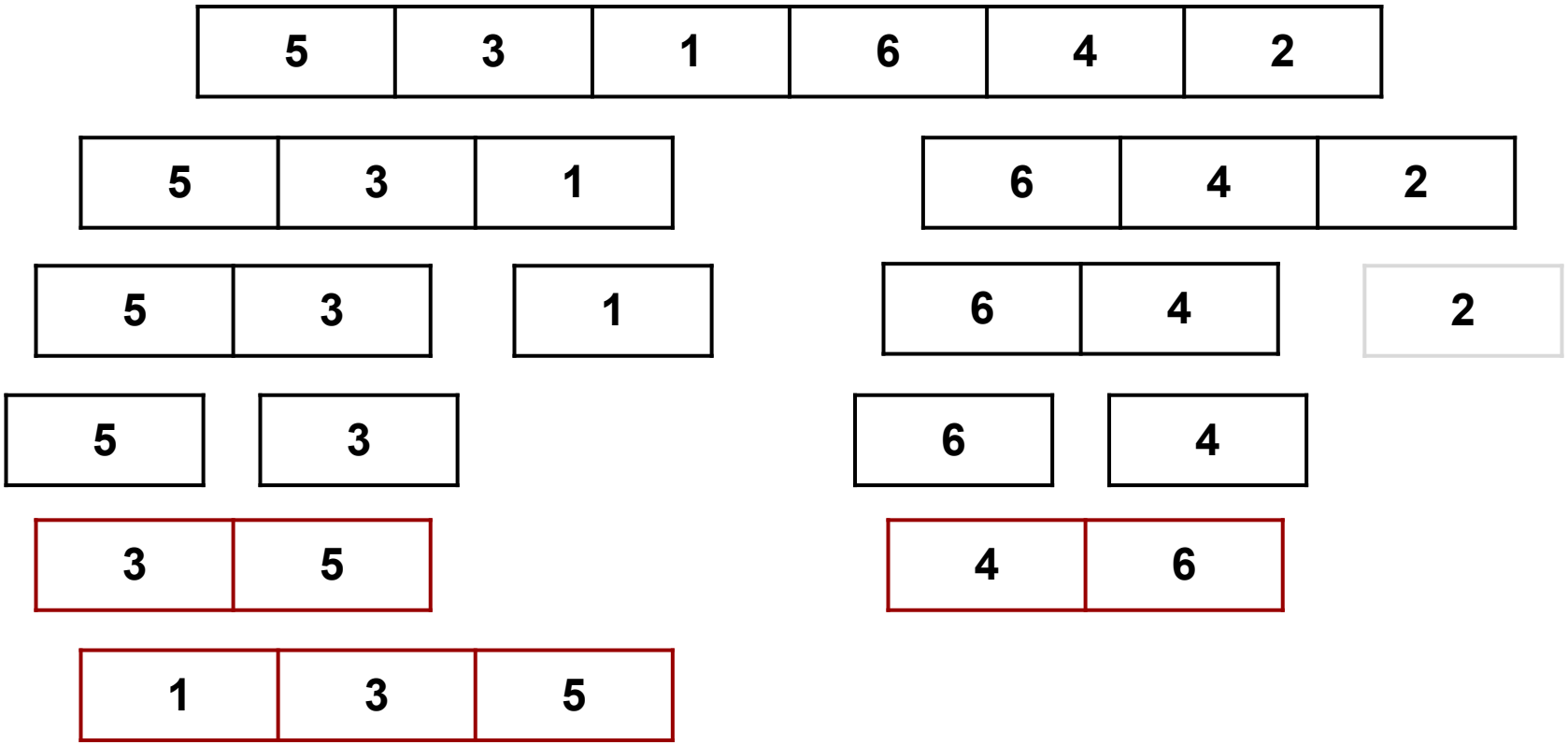
Iteração 10

p, r



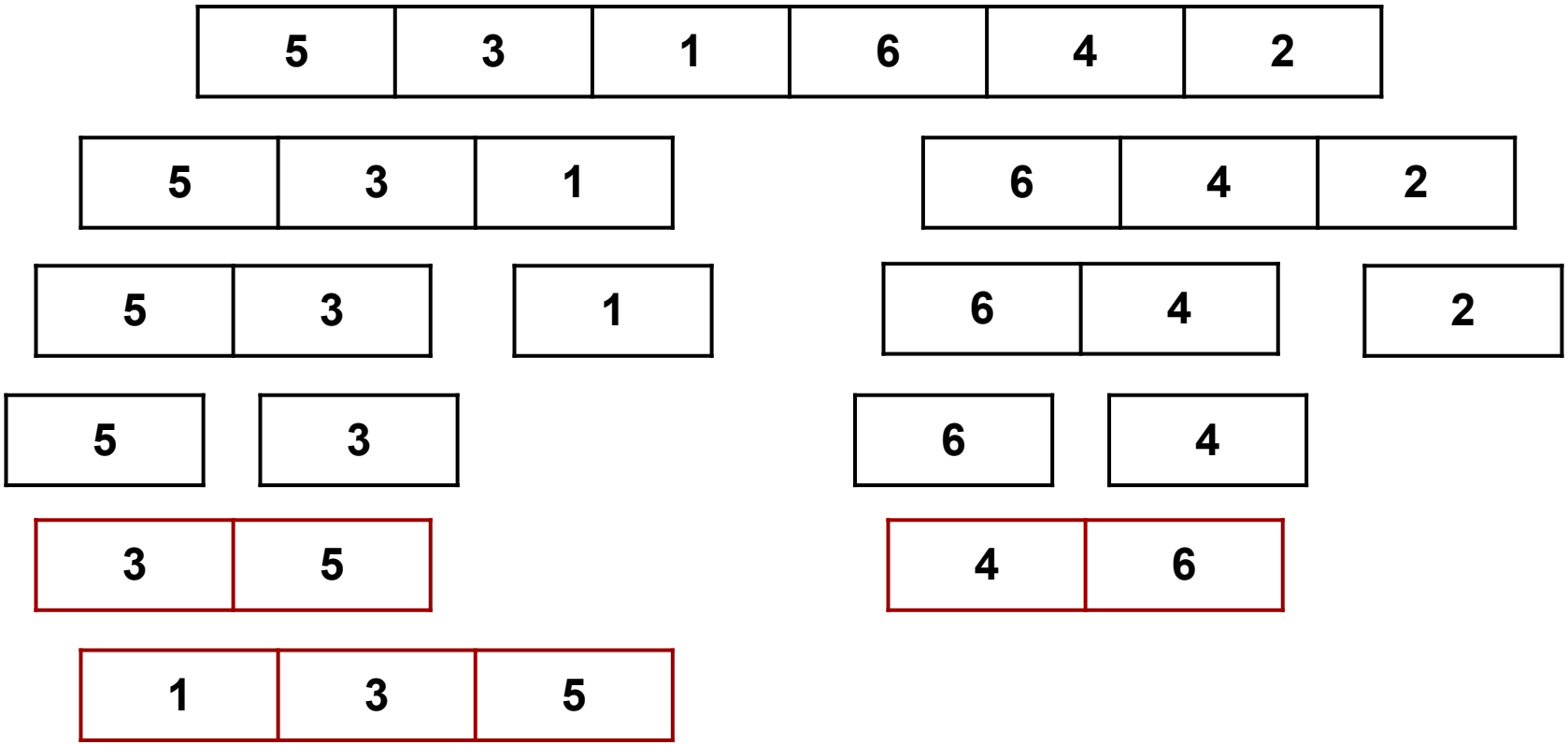
Iteração 8



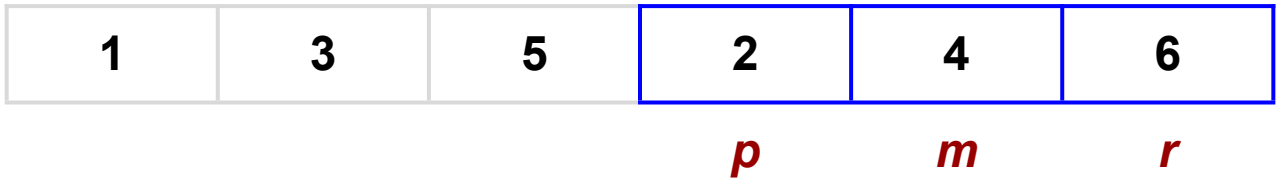


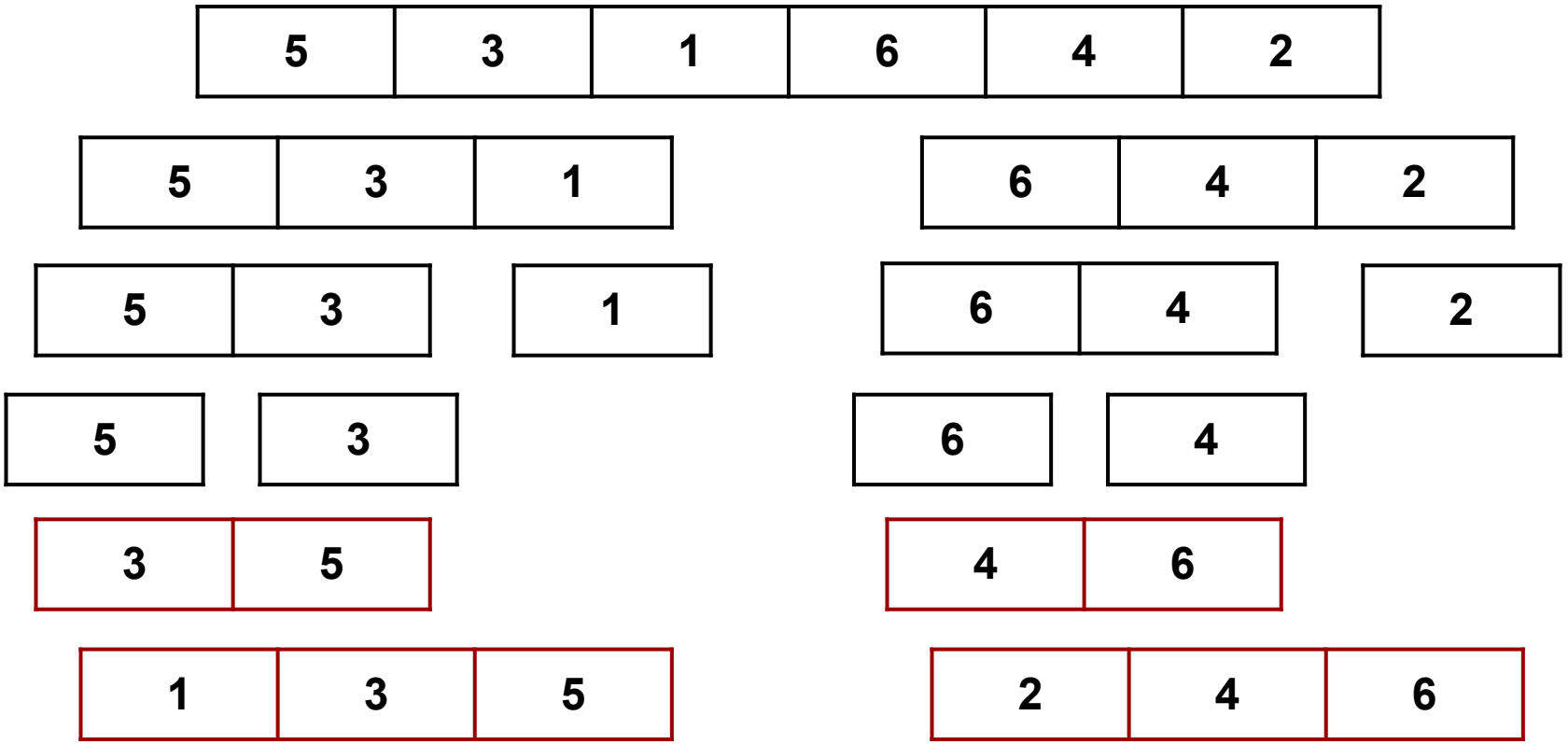
Iteração 9

p, r

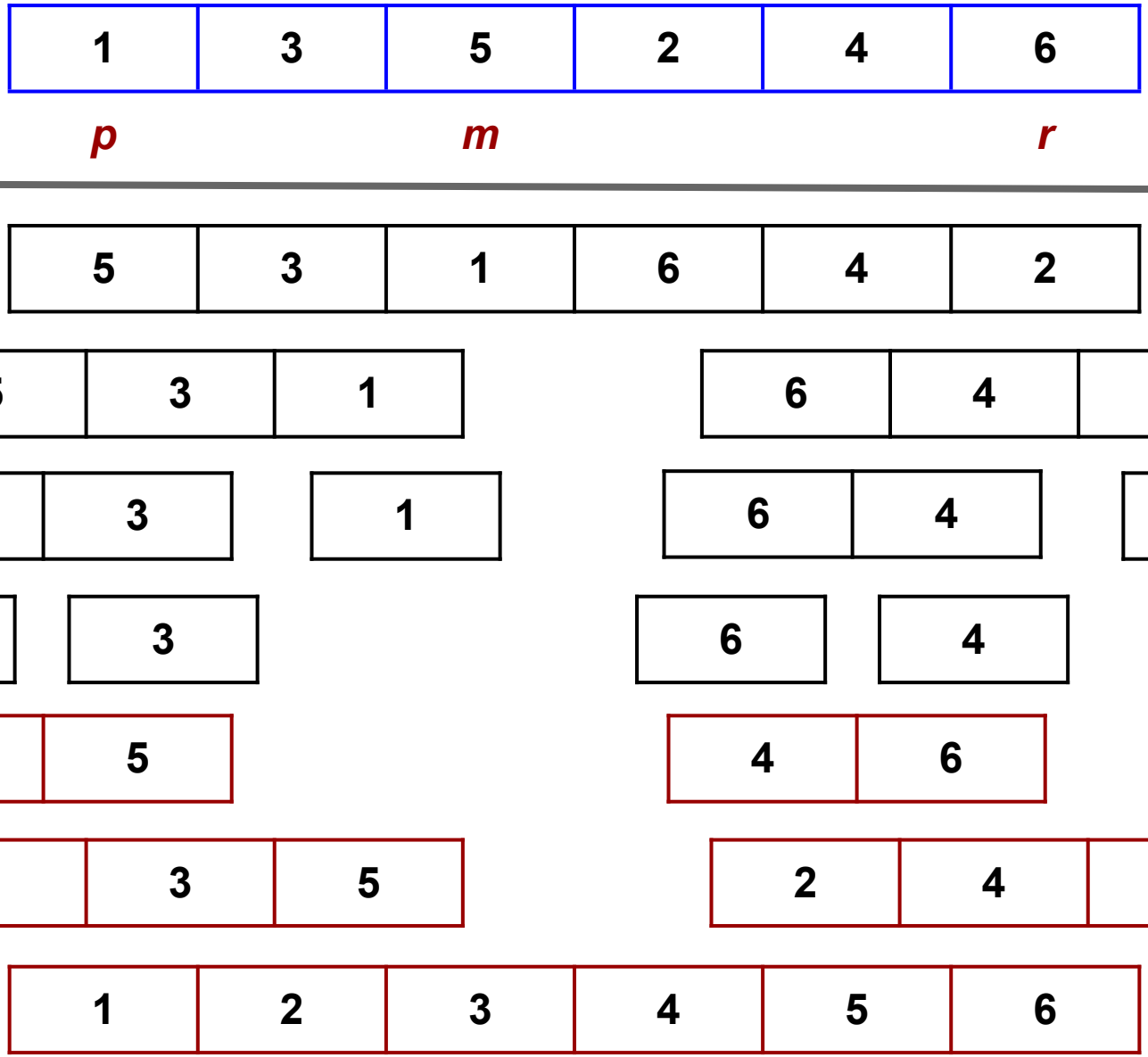


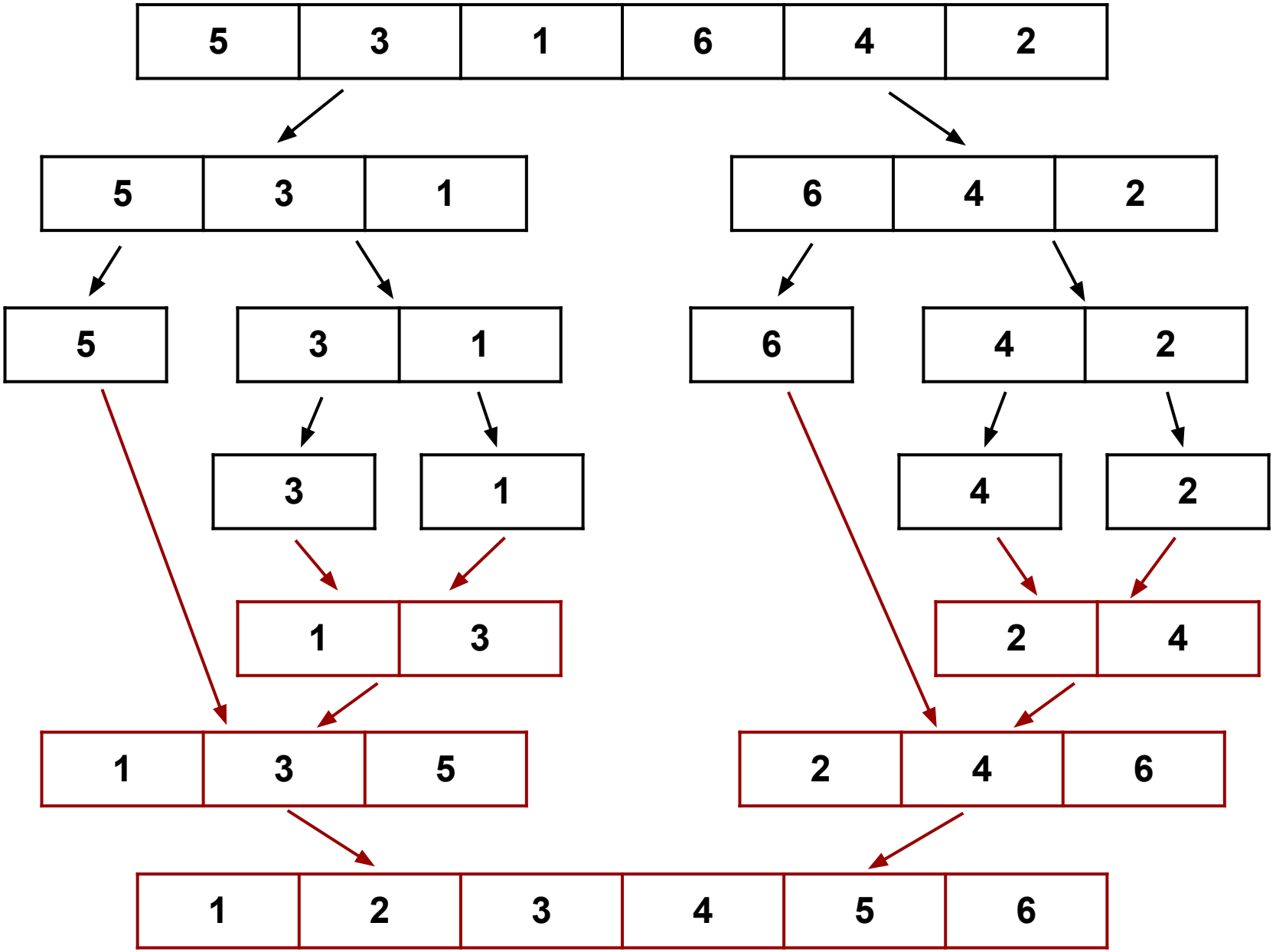
Iteração 7





Iteração 1

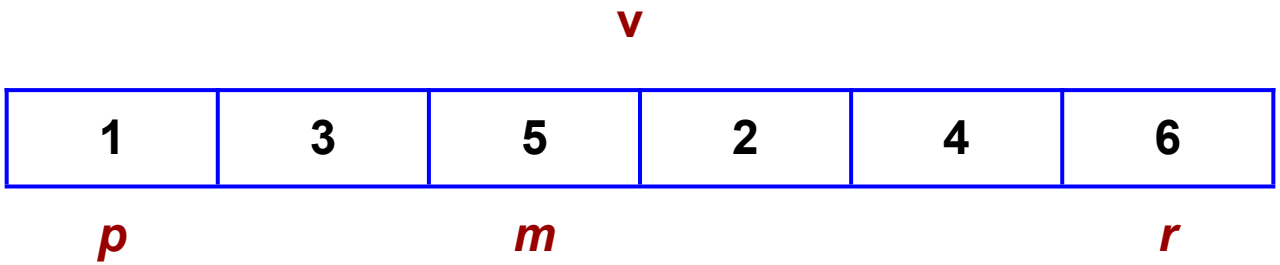




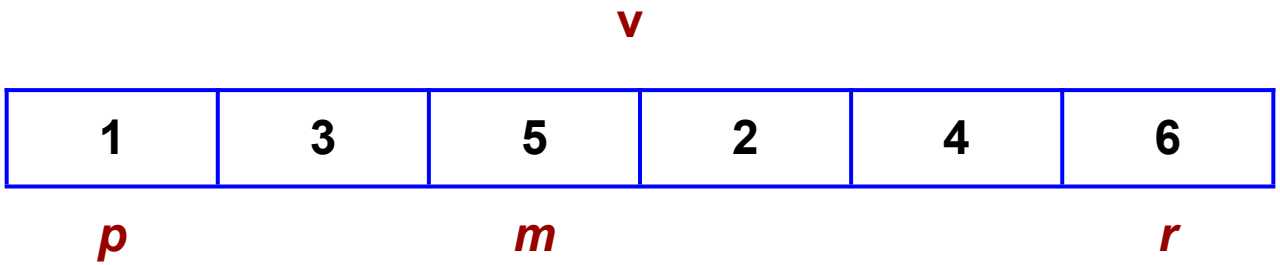
Exemplo do processo de divisão e conquista

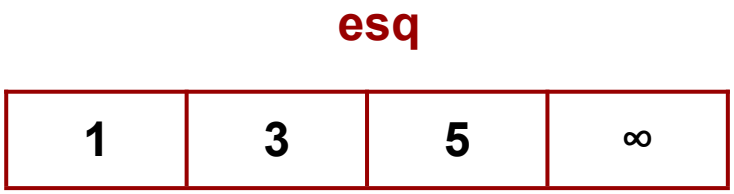
Se a sub-lista (esquerda ou direita) tiver um elemento, considera-se já ordenada.

Merge entre duas metades

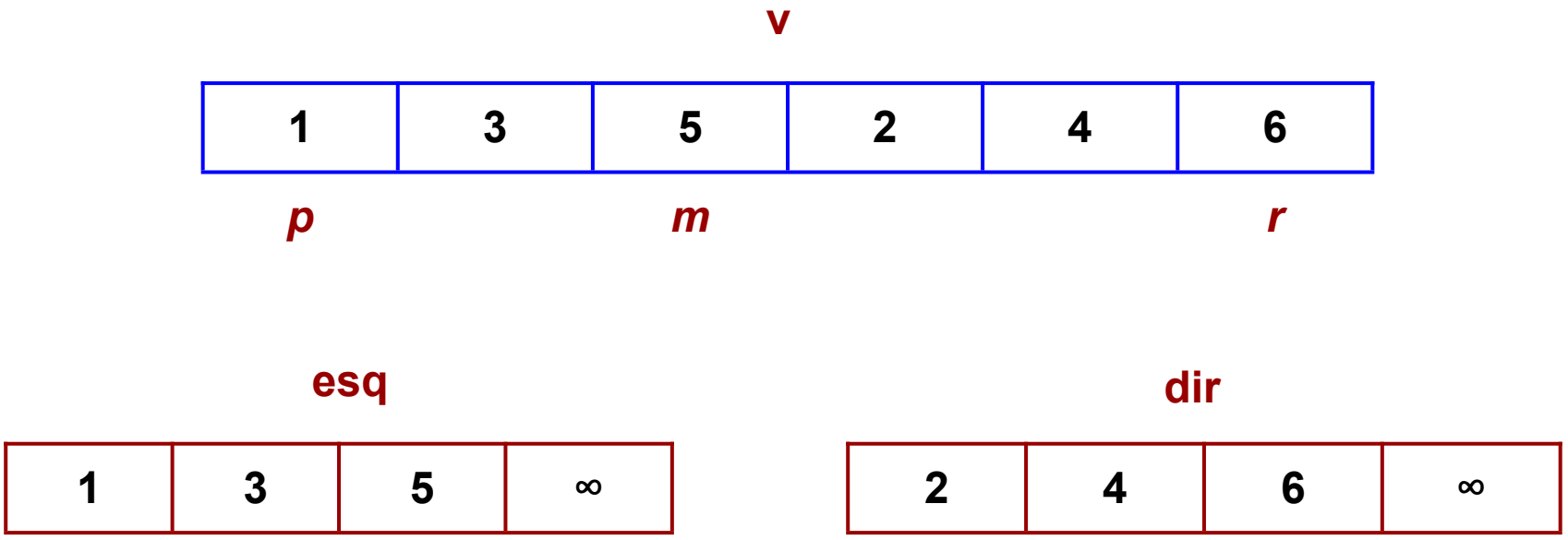


Merge entre duas metades

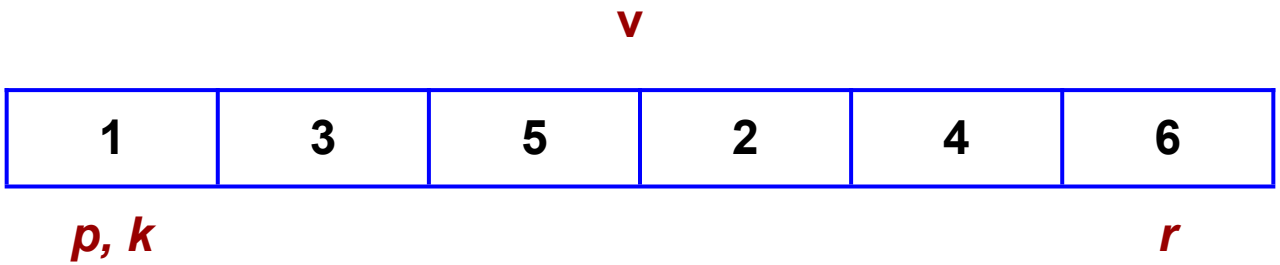


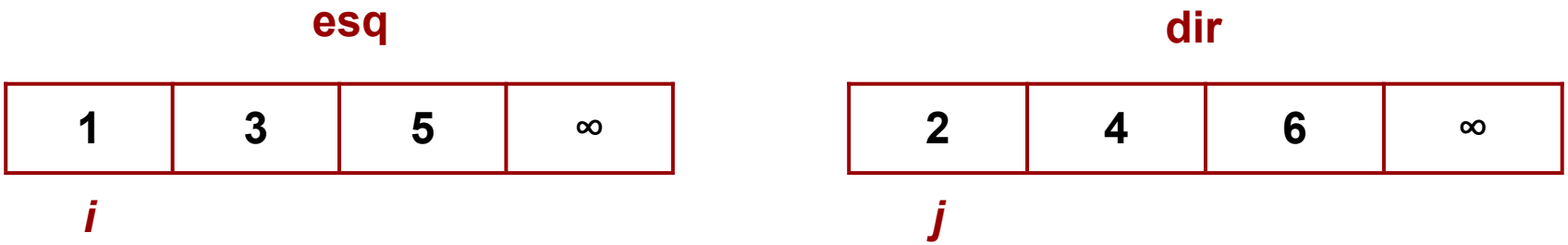


Merge entre duas metades



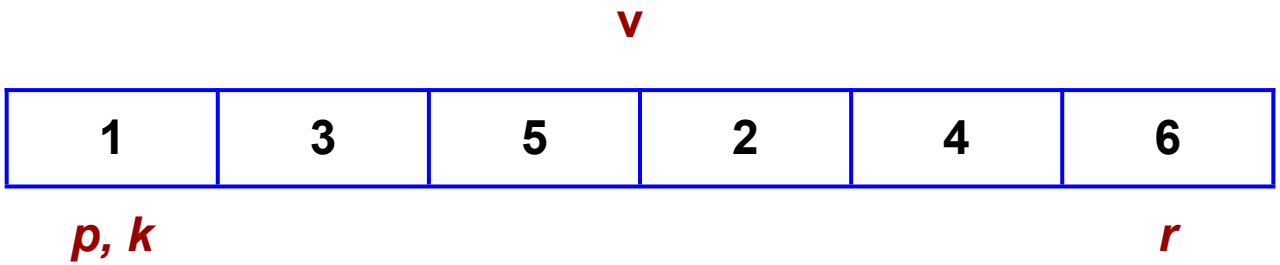
Merge entre duas metades

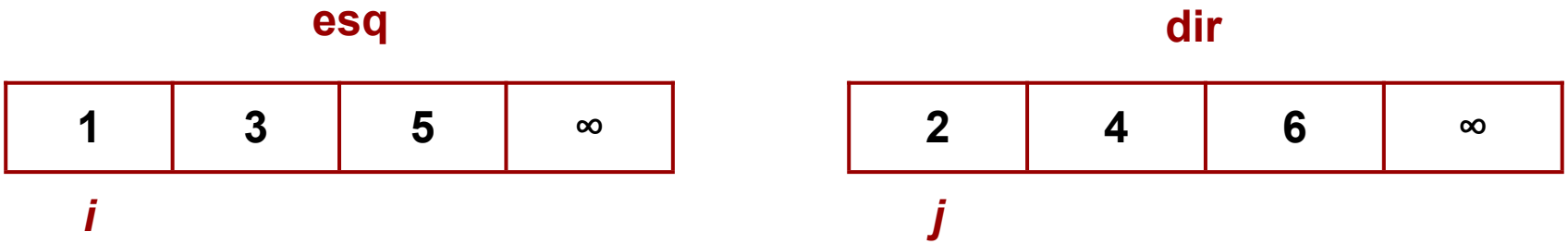




1 <= 2 ?

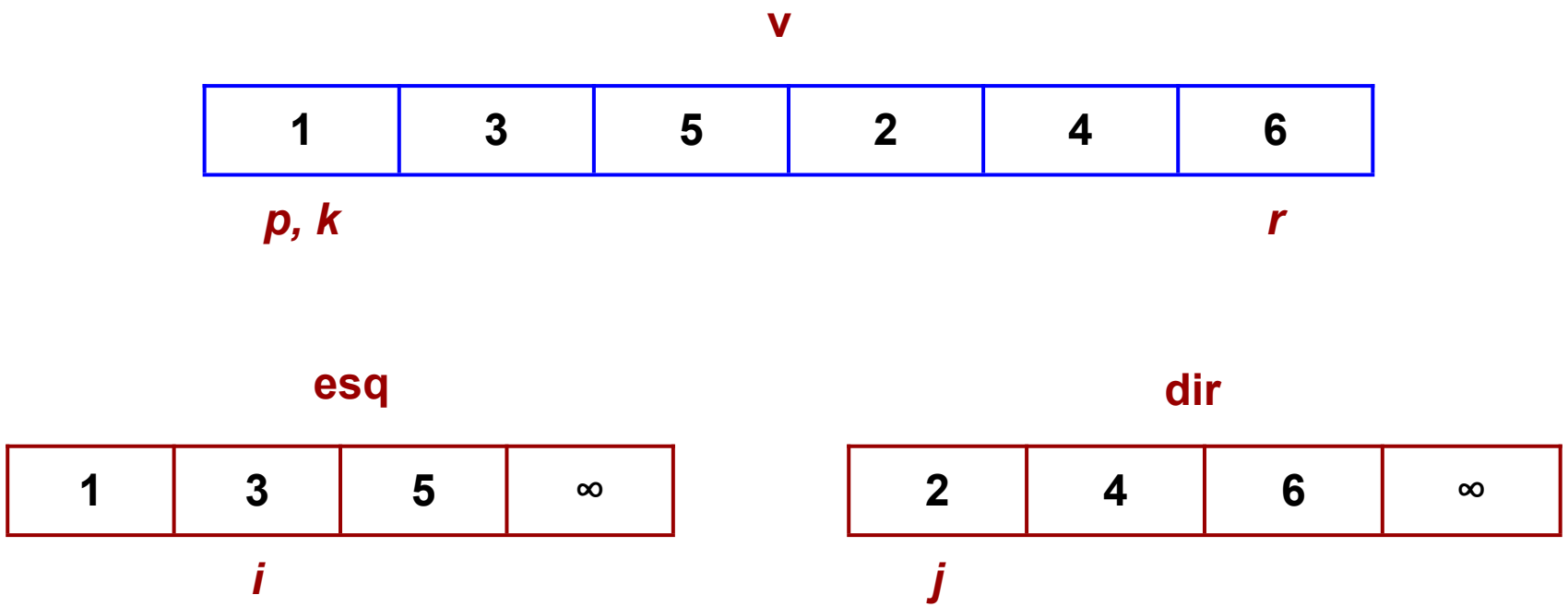
Merge entre duas metades



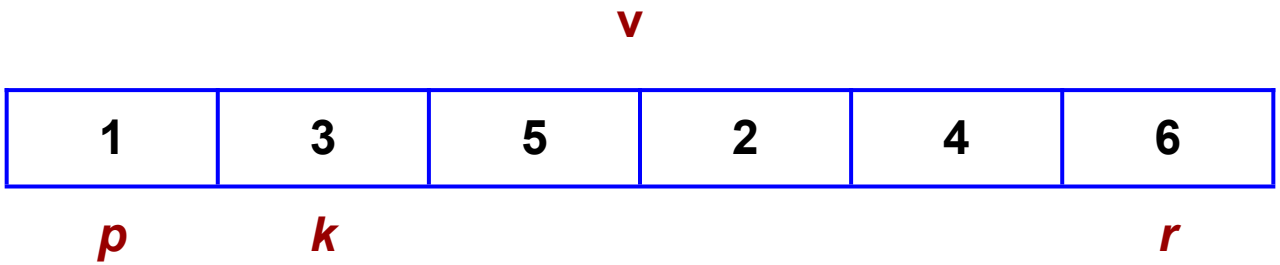


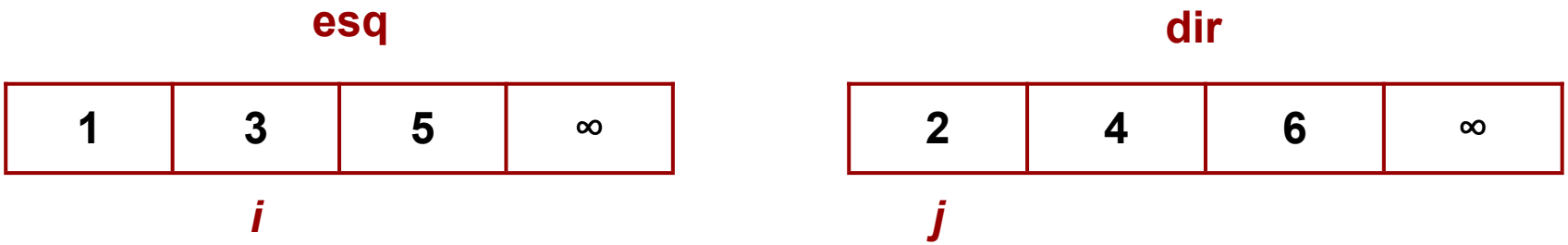
Coloca esq[i] em v[k]

Merge entre duas metades



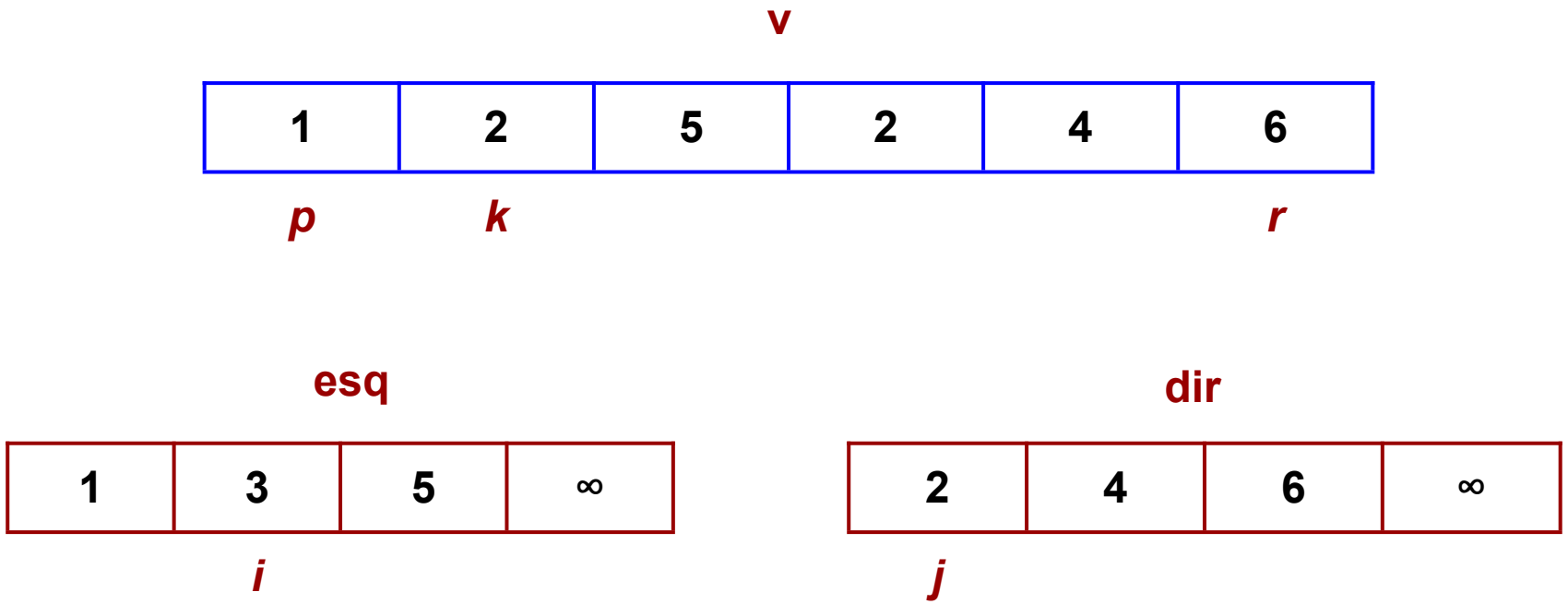
Merge entre duas metades





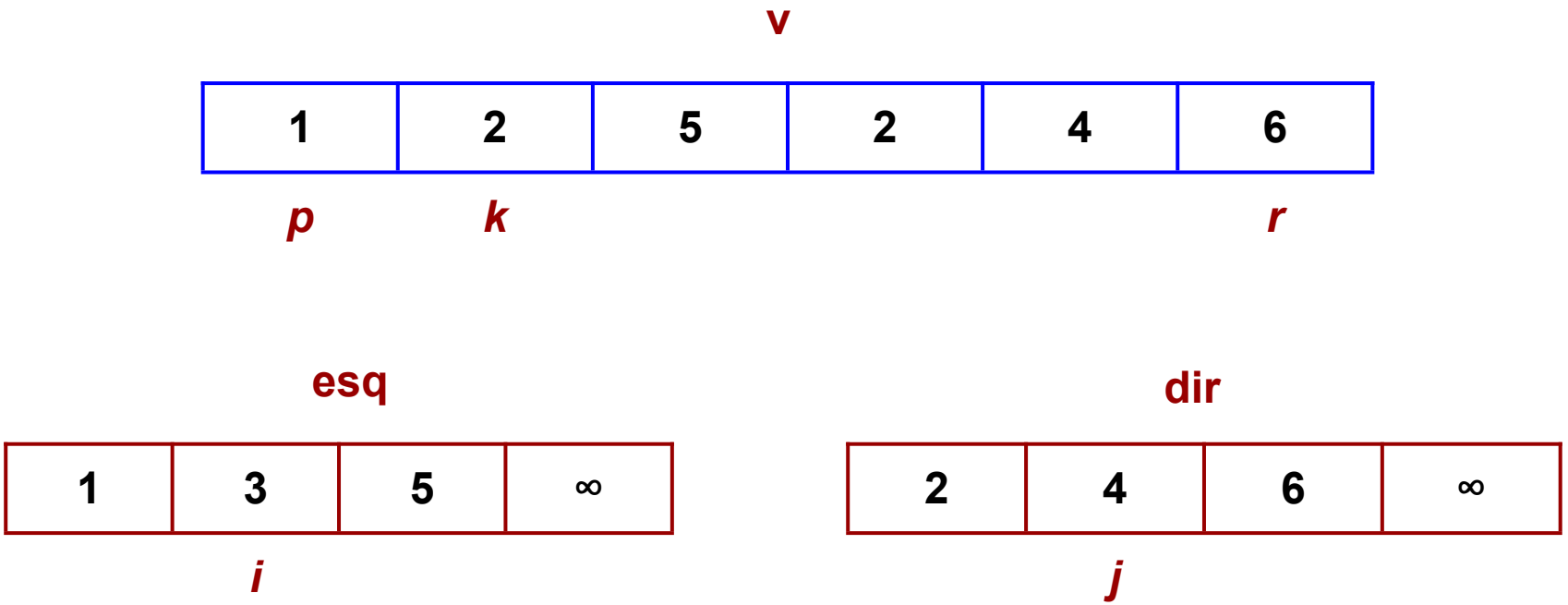
3 <= 2 ?

Merge entre duas metades

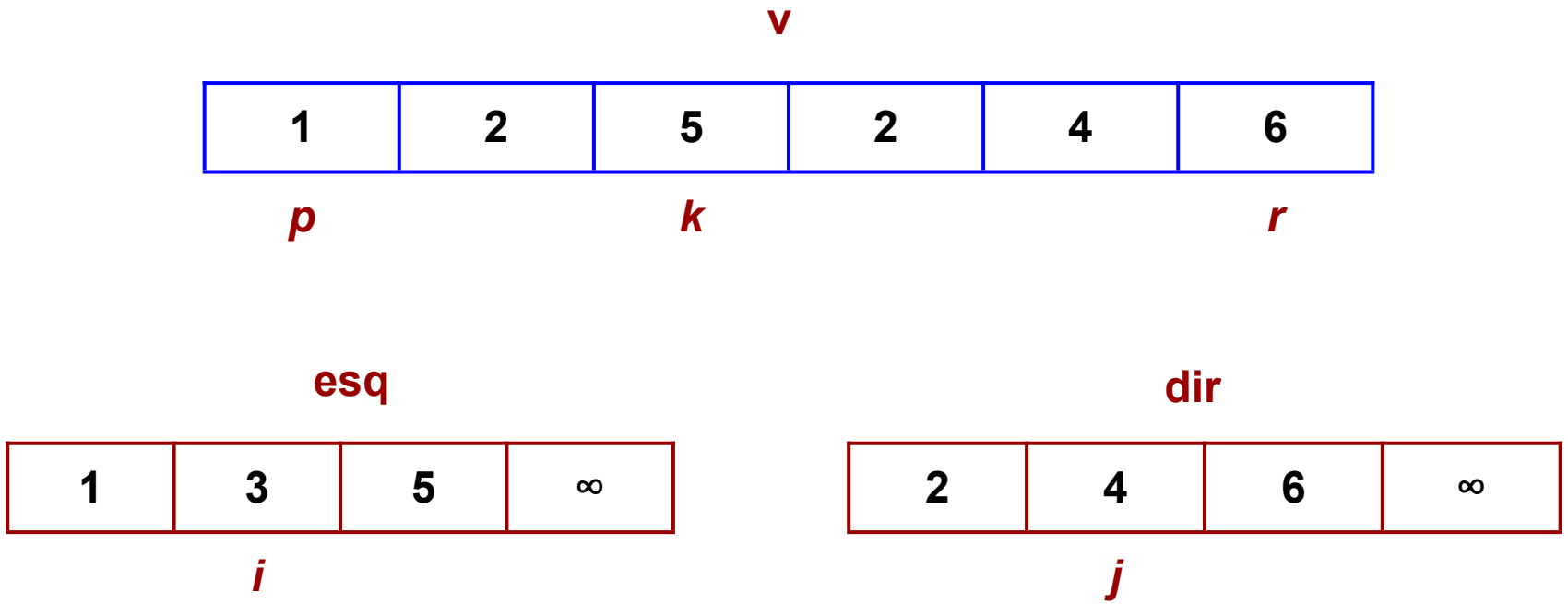


Coloca dir[j] em v[k]

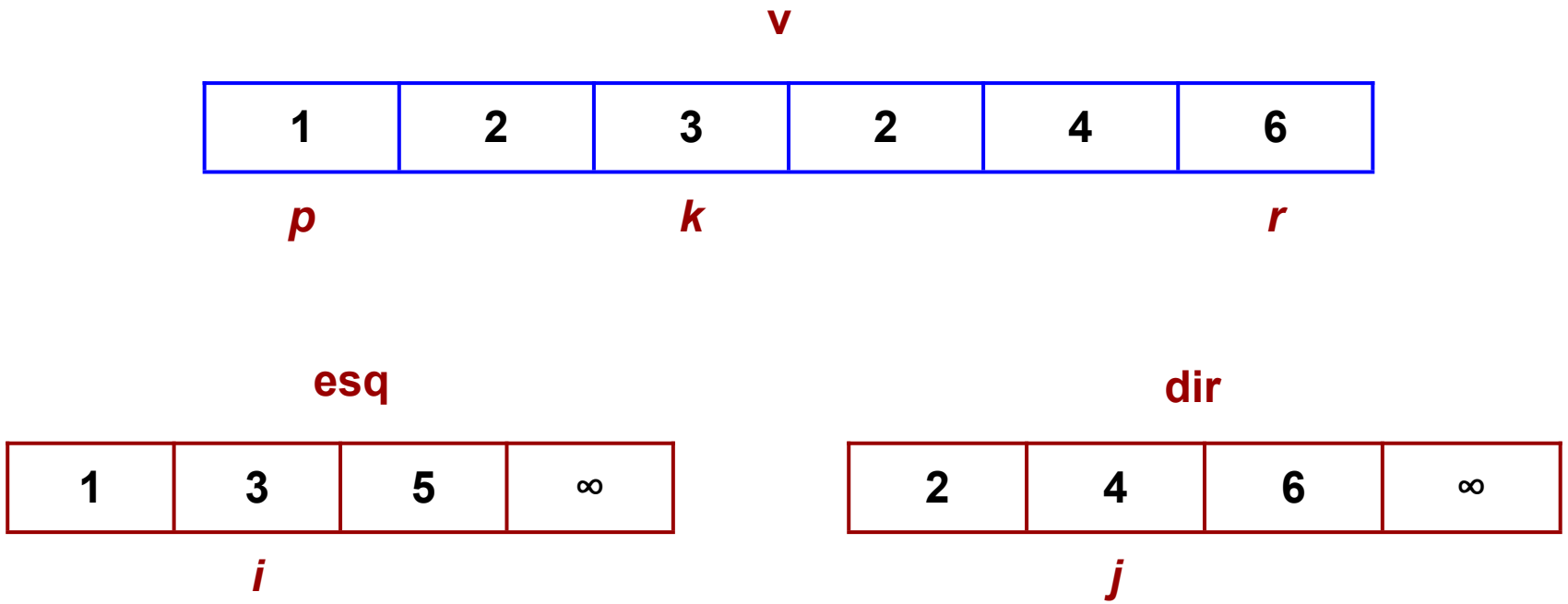
Merge entre duas metades



Merge entre duas metades

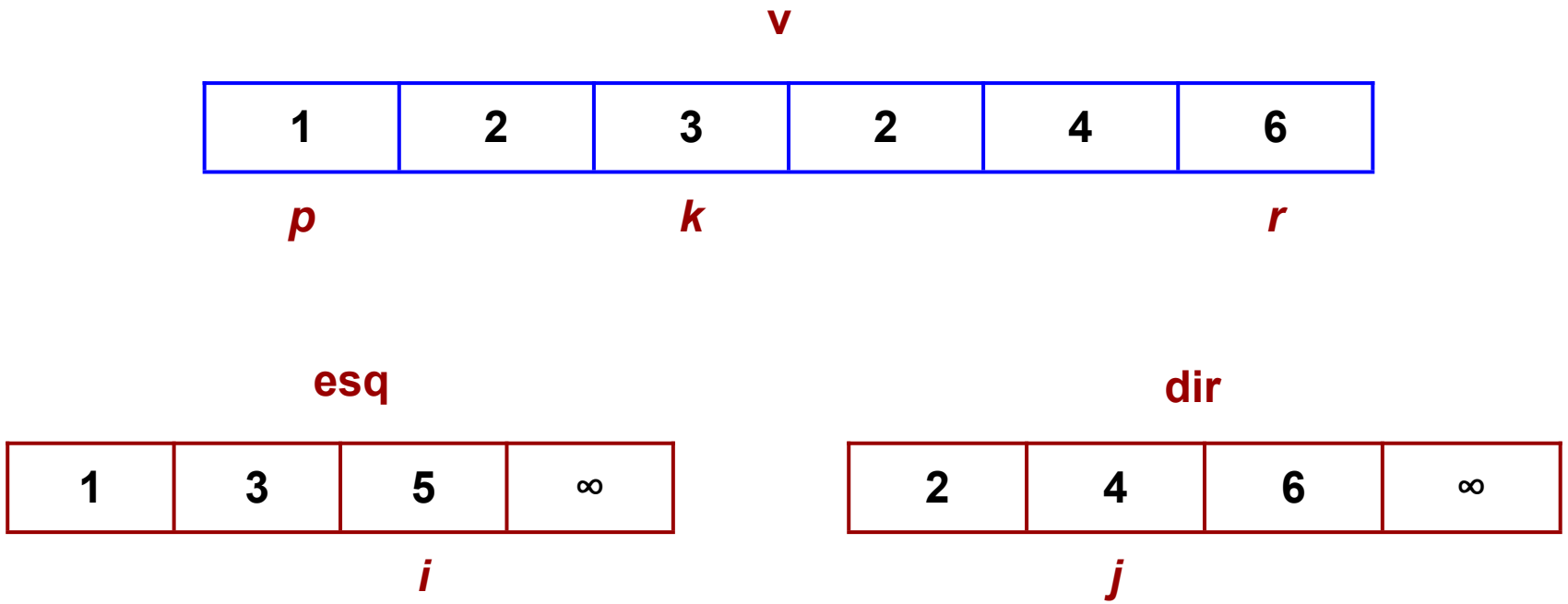


Merge entre duas metades

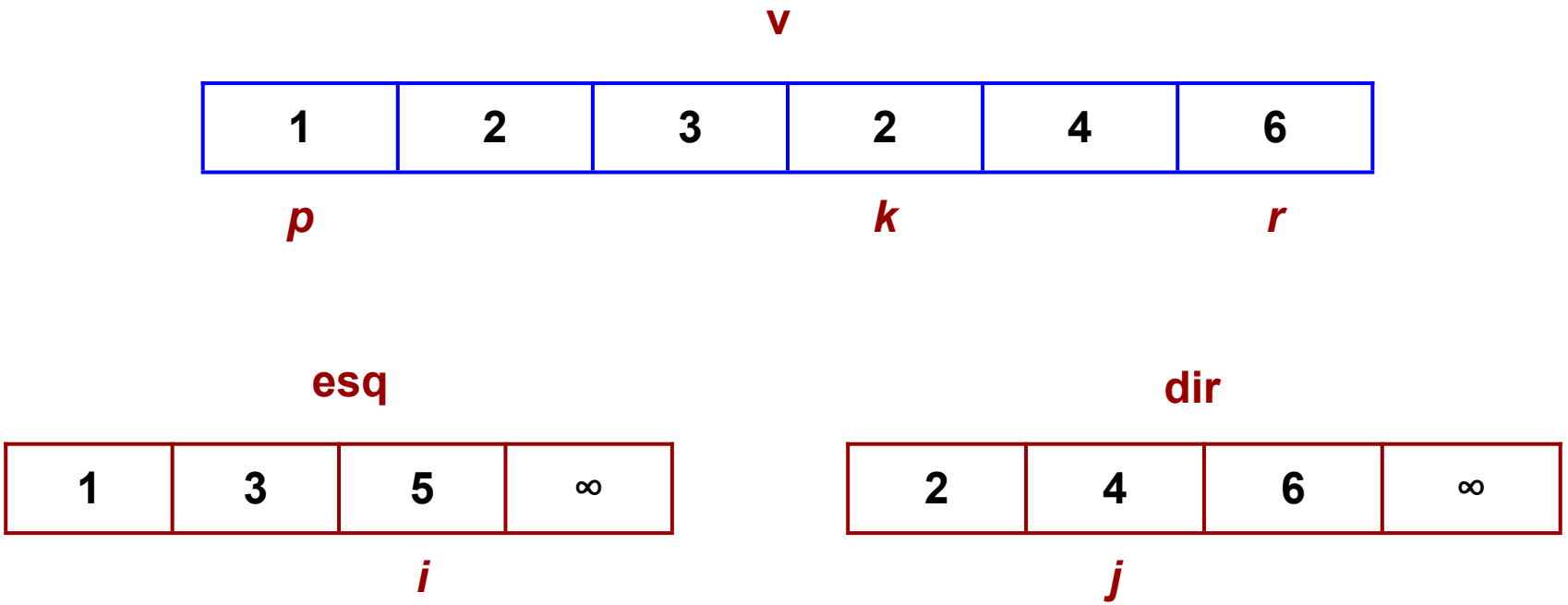


Coloca esq[i] em v[k]

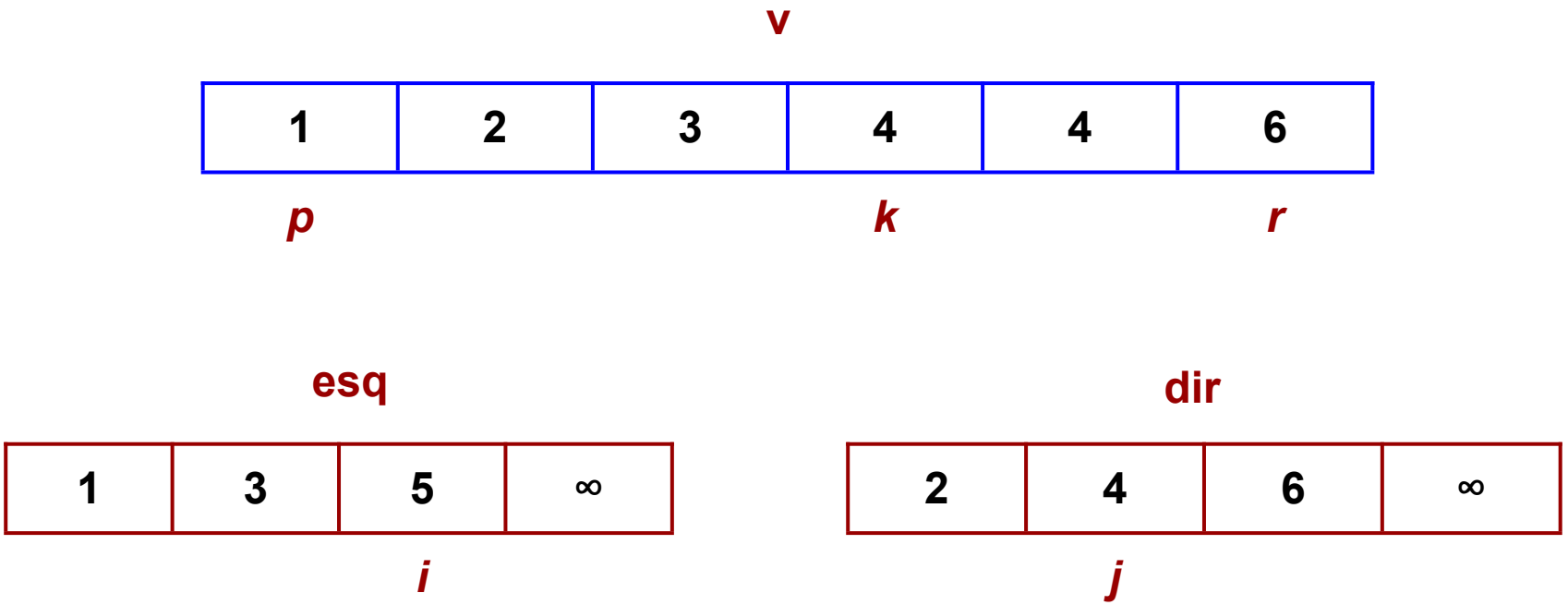
Merge entre duas metades



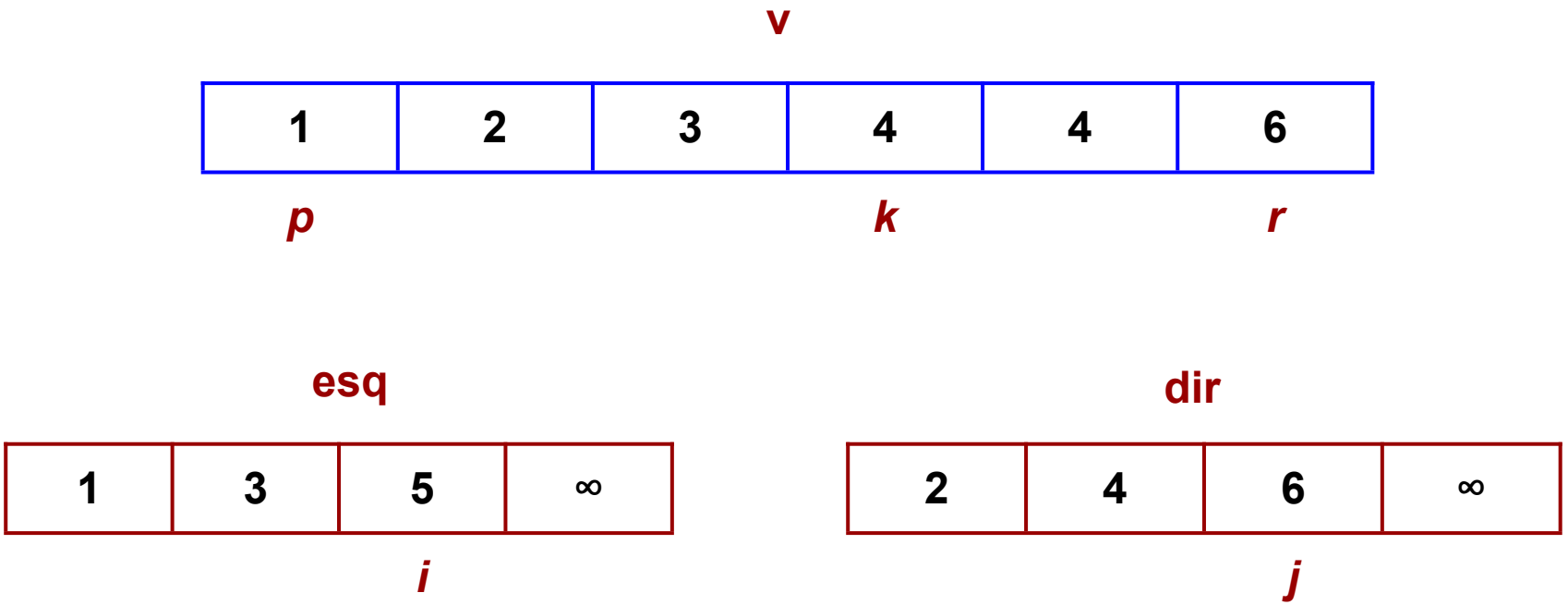
Merge entre duas metades



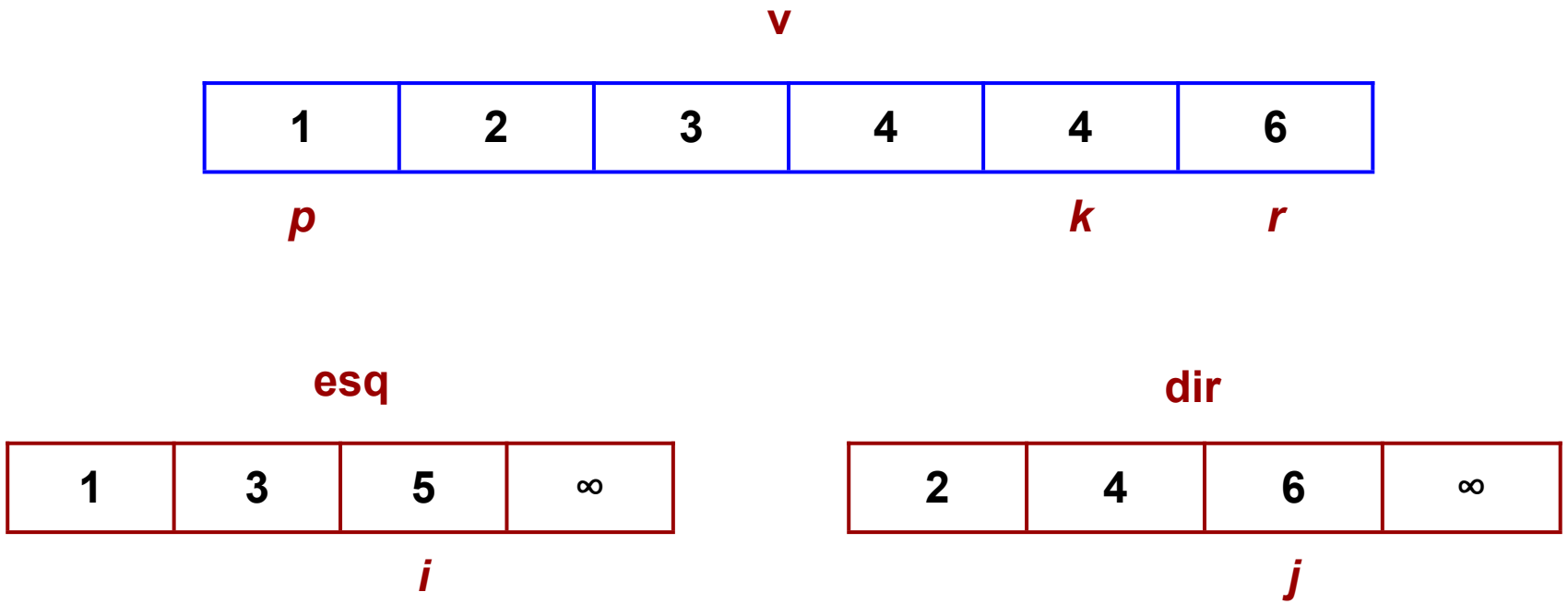
Merge entre duas metades



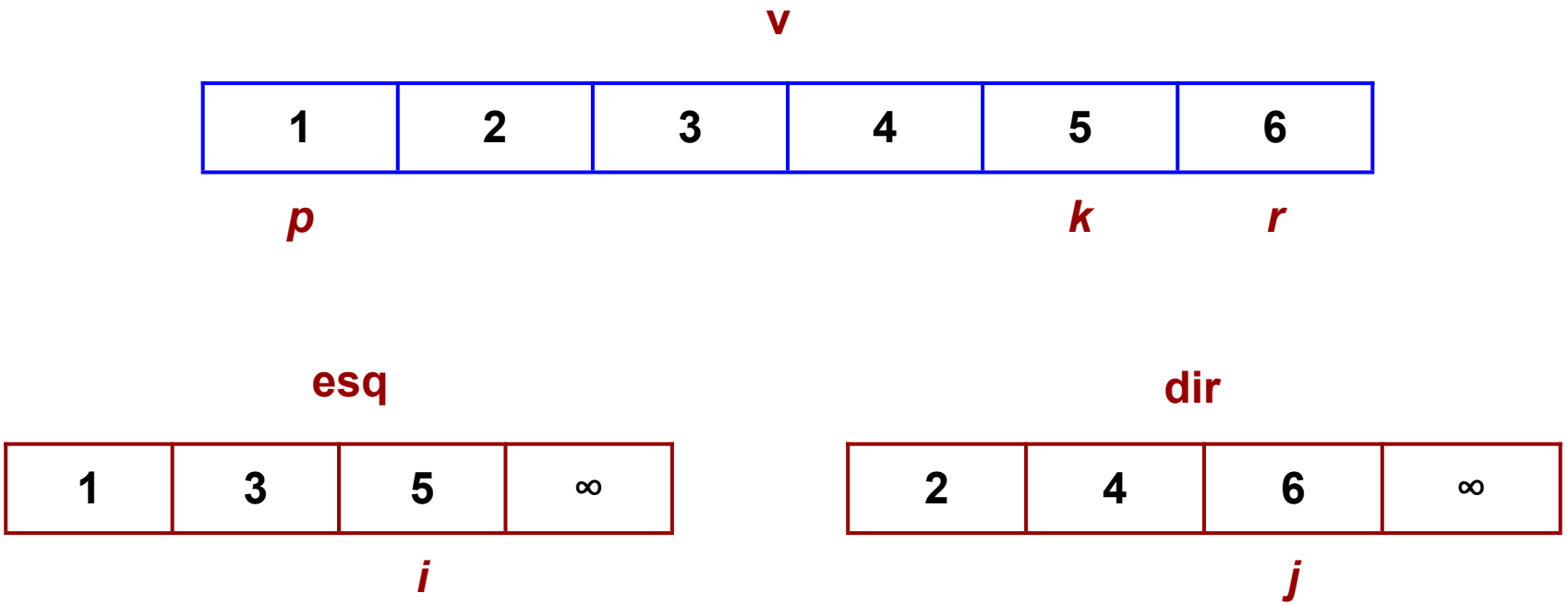
Merge entre duas metades



Merge entre duas metades

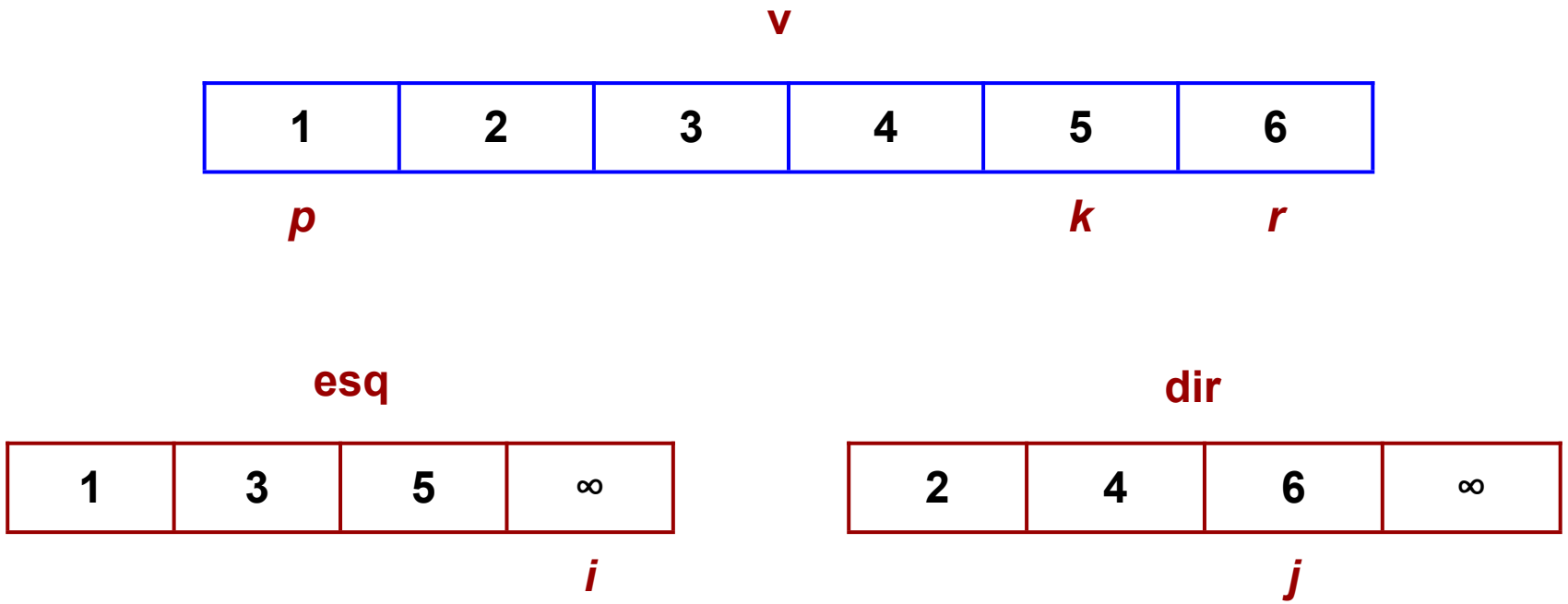


Merge entre duas metades

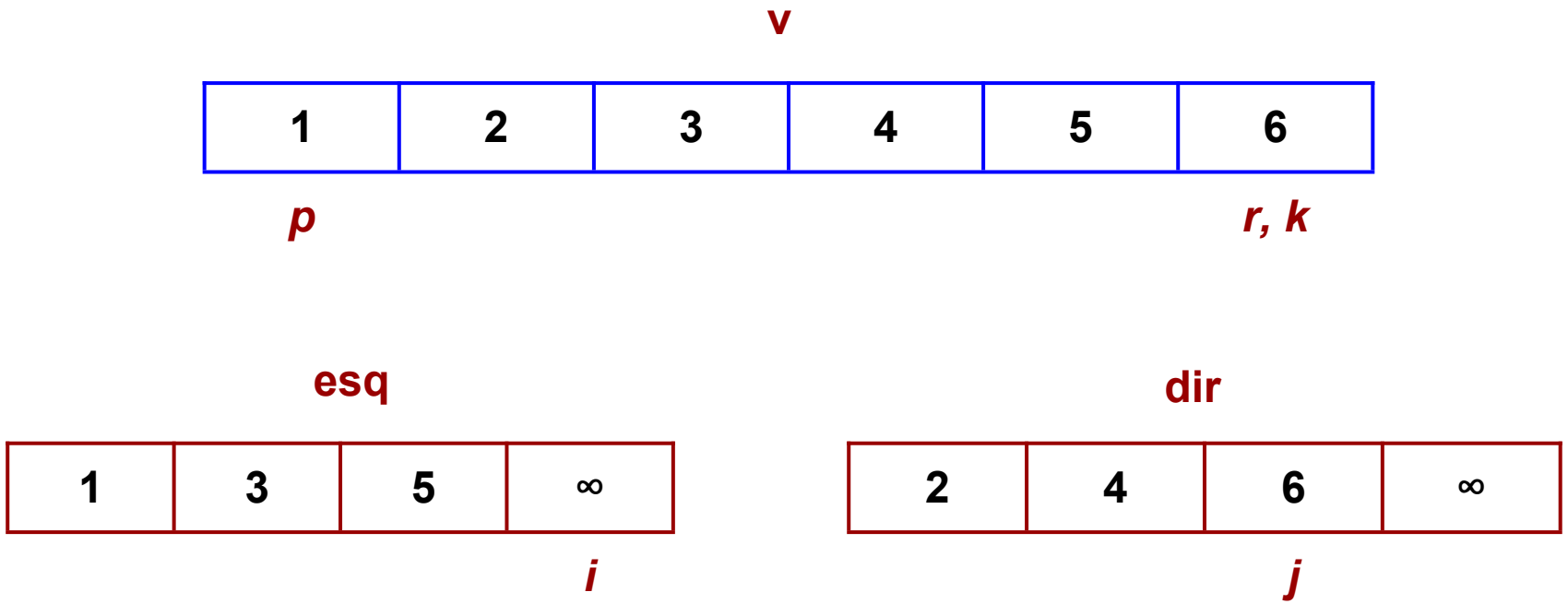


Coloca esq[i] em v[k]

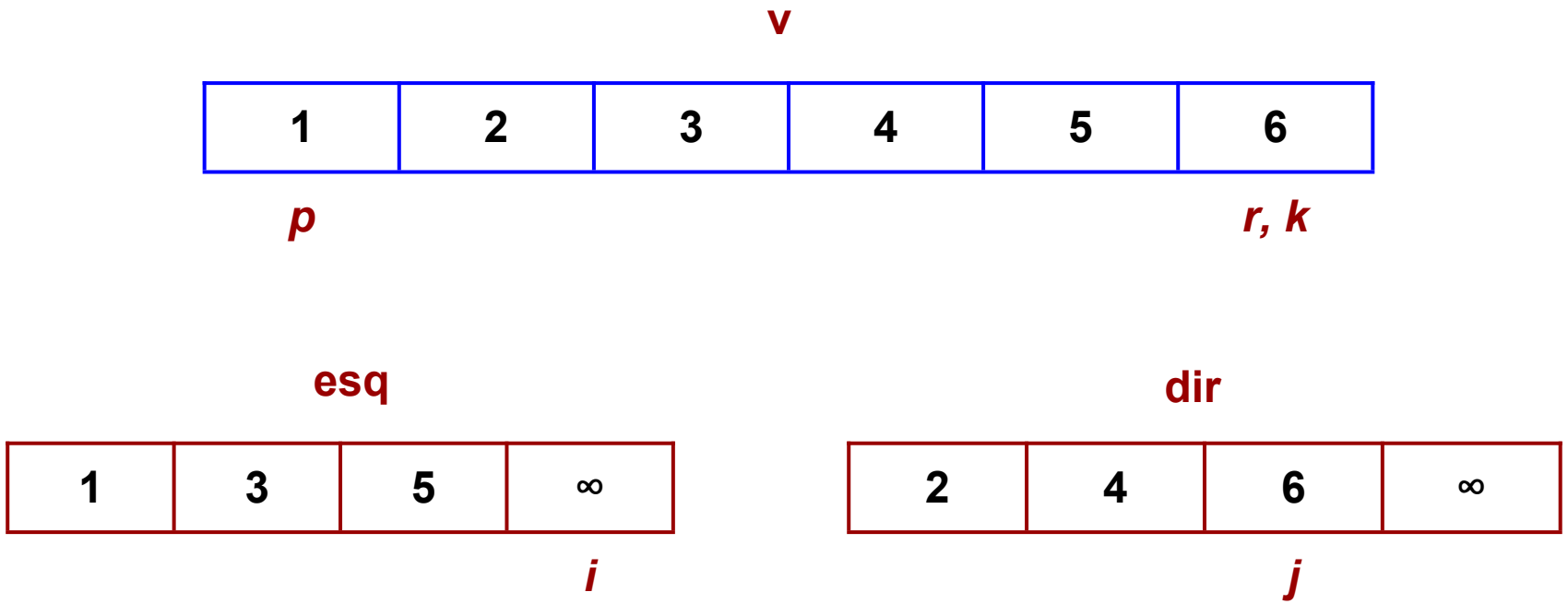
Merge entre duas metades



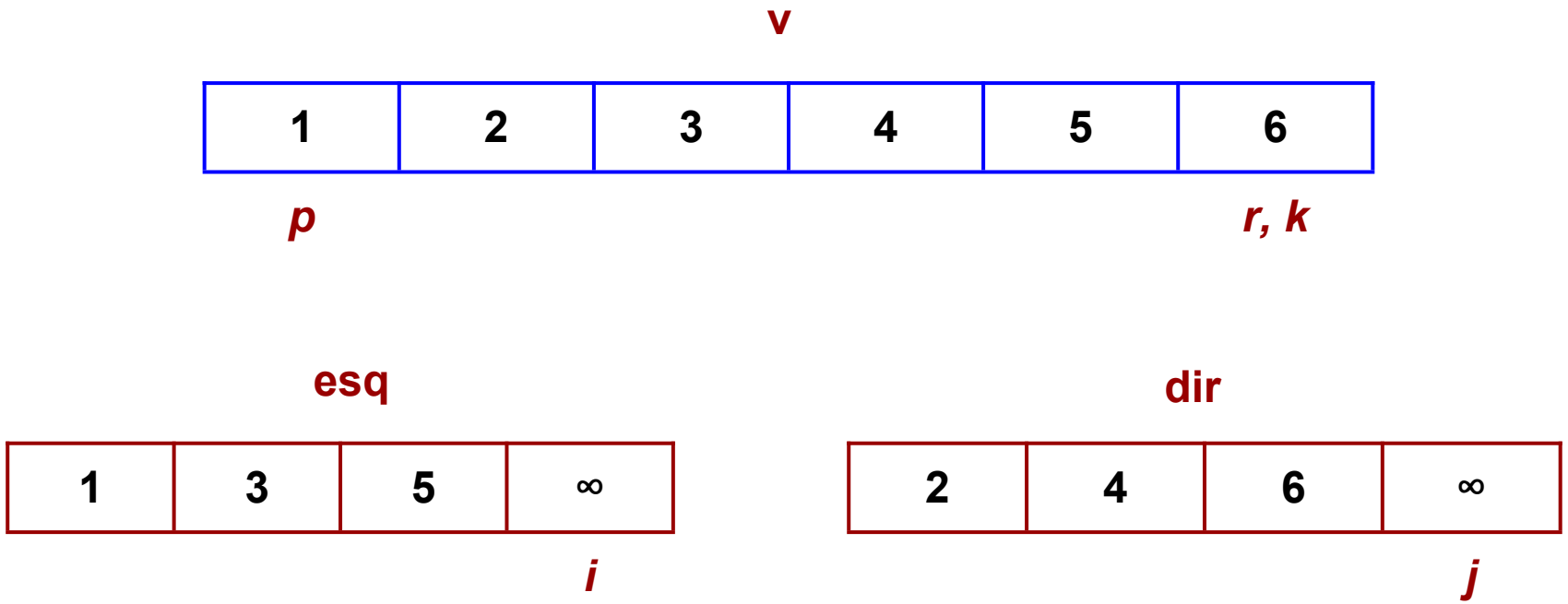
Merge entre duas metades



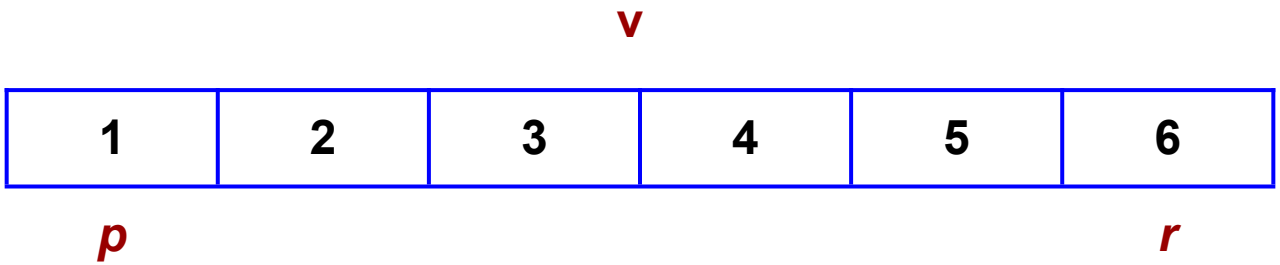
Merge entre duas metades



Merge entre duas metades



Merge entre duas metades



Fim do merge

Implementação em sala

Características

- Algoritmo do tipo dividir para conquistar;
- Bom desempenho;
- Não é In place
  - Requer espaço extra;
- Stable;
- Muito usado na prática;