Dominando Estruturas de Dados 1

Filas

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xavecoding

Fila

Lista linear em que **o primeiro a entrar é o primeiro a sair da fila**.

https://www.otempo.com.br/super-noticia/charges/charge-o-tempo-22-04-2019-1.2171251

Fila

Lista linear em que **o primeiro a entrar é o primeiro a sair da fila**.

Política de gerenciamento de elementos:

FIFO: First In First Out

https://www.otempo.com.br/super-noticia/charges/charge-o-tempo-22-04-2019-1.2171251

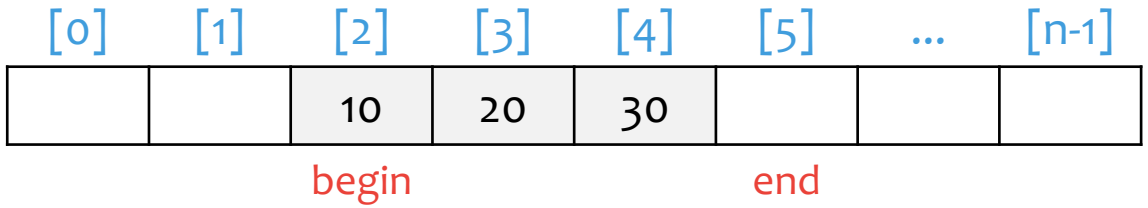
Aplicações

- Serviços de requisições em um único recurso compartilhado:
    - Escalonamento de tarefas de Sistemas Operacionais;
    - Impressões;
    - Atendimento de call center;
    - etc
- Alguns algoritmos de grafos: ex. Breadth First Search, path-finding algorithms

Tipos de Filas

Estáticas

- Implementadas com **vetores**

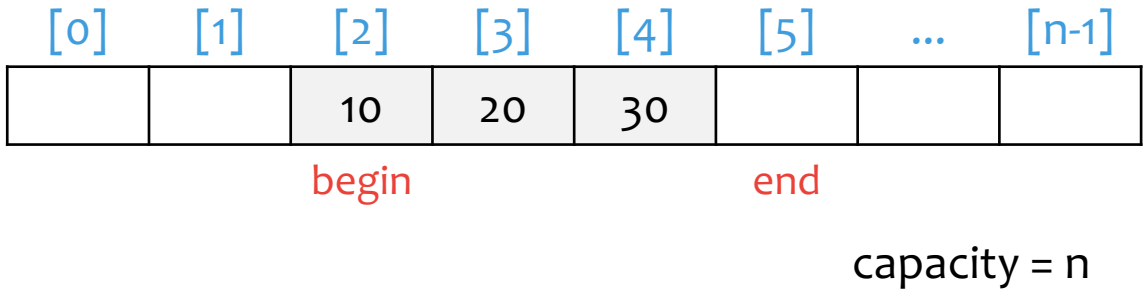


O vetor Q[begin .. end-1] armazena uma fila.

Tipos de Filas

Estáticas

- Implementadas com **vetores**

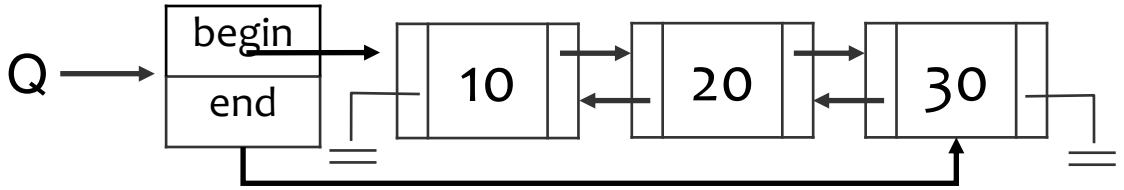


capacity = n

O vetor Q[begin .. end-1] armazena uma fila.

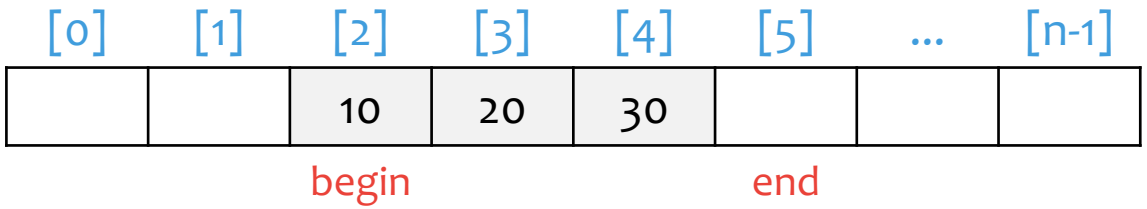
Dinâmicas

- Implementadas com **listas encadeadas**



size = 3

Filas Estáticas



capacity = n

O vetor Q[begin .. end-1] armazena uma fila.

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

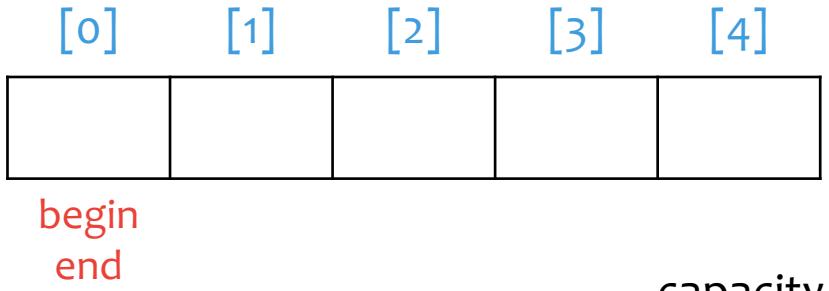
dequeue

enqueue(40)

enqueue(50)

dequeue

enqueue(100)



capacity = n = 5

A fila está **vazia!**

- **Enfileirar** (**enqueue**) um elemento y:
  - Q[end++] = y ;
- **Desenfileirar** (**dequeue**) um elemento da fila:
  - x = Q[begin++];

Exemplo

enqueue(10)

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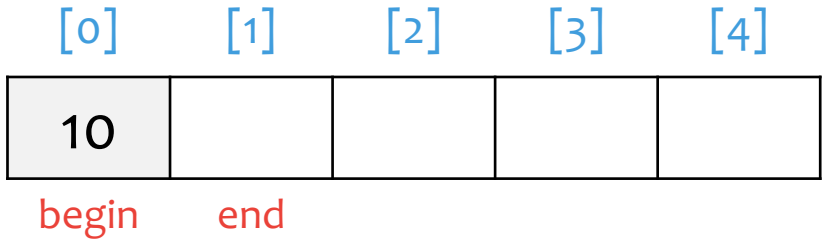

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Exemplo

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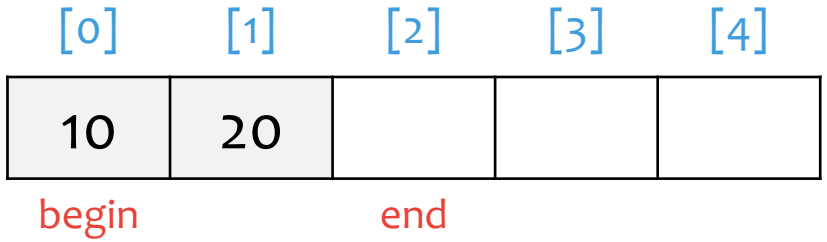

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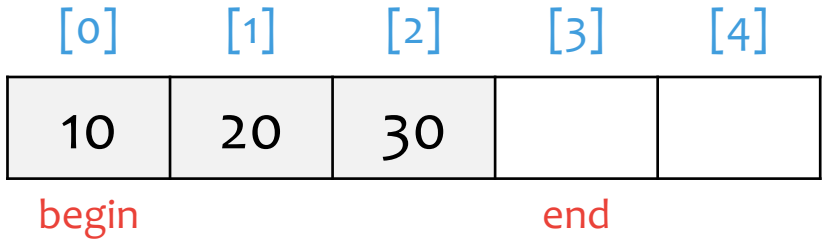

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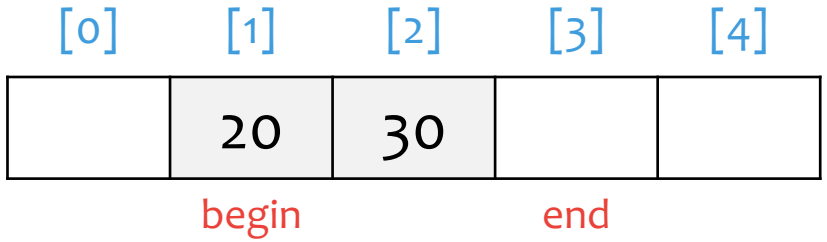
dequeue

enqueue(100)

10



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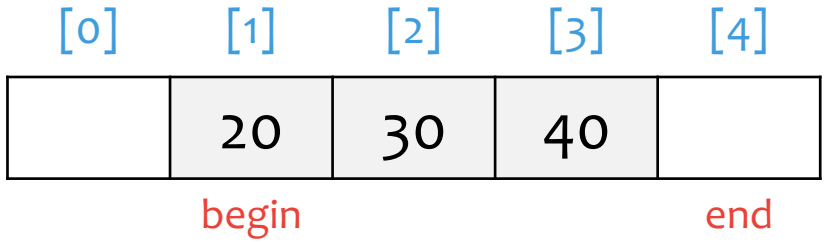

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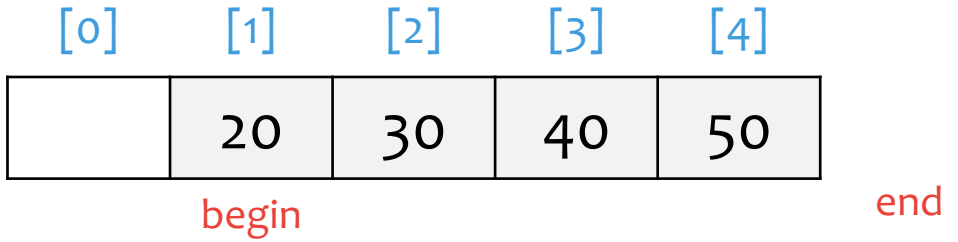

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Exemplo

enqueue(10)

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enqueue(30)

dequeue

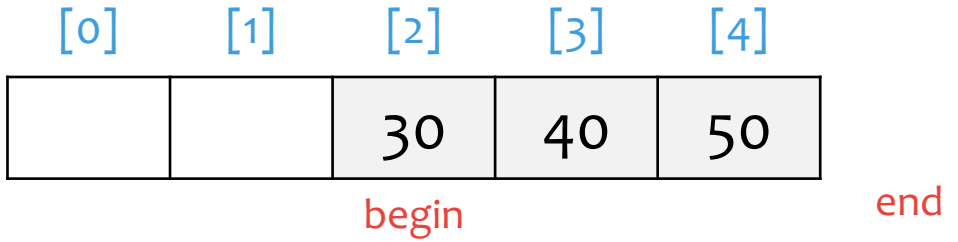
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

20



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- **Enfileirar** (**enqueue**) um elemento y:
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Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

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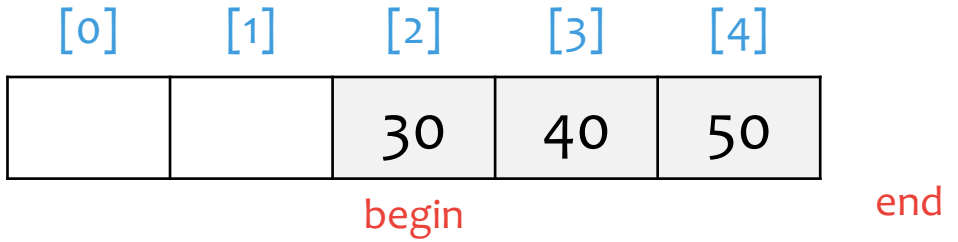

capacity = n = 5

PROBLEMA

Mesmo tendo **espaços livres**, chegamos **ao final do vetor**.

- **Enfileirar** (**enqueue**) um elemento y:
  - Q[end++] = y ;
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  - x = Q[begin++];

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

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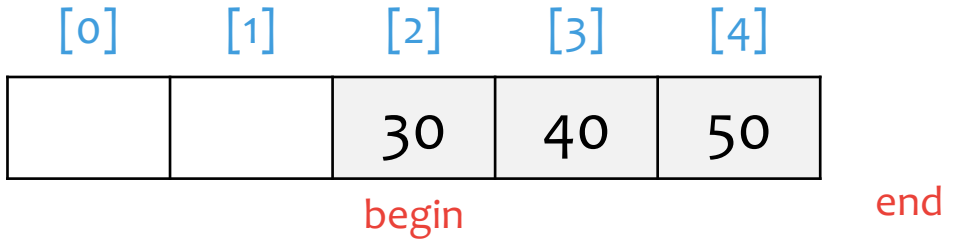
enqueue(50)

dequeue

enqueue(100)



capacity = n = 5

PROBLEMA

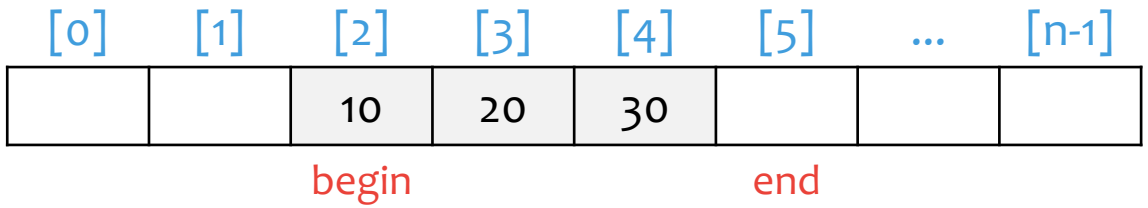
Mesmo tendo **espaços livres**, chegamos **ao final do vetor**.

SOLUÇÃO

Fila Circular Estática

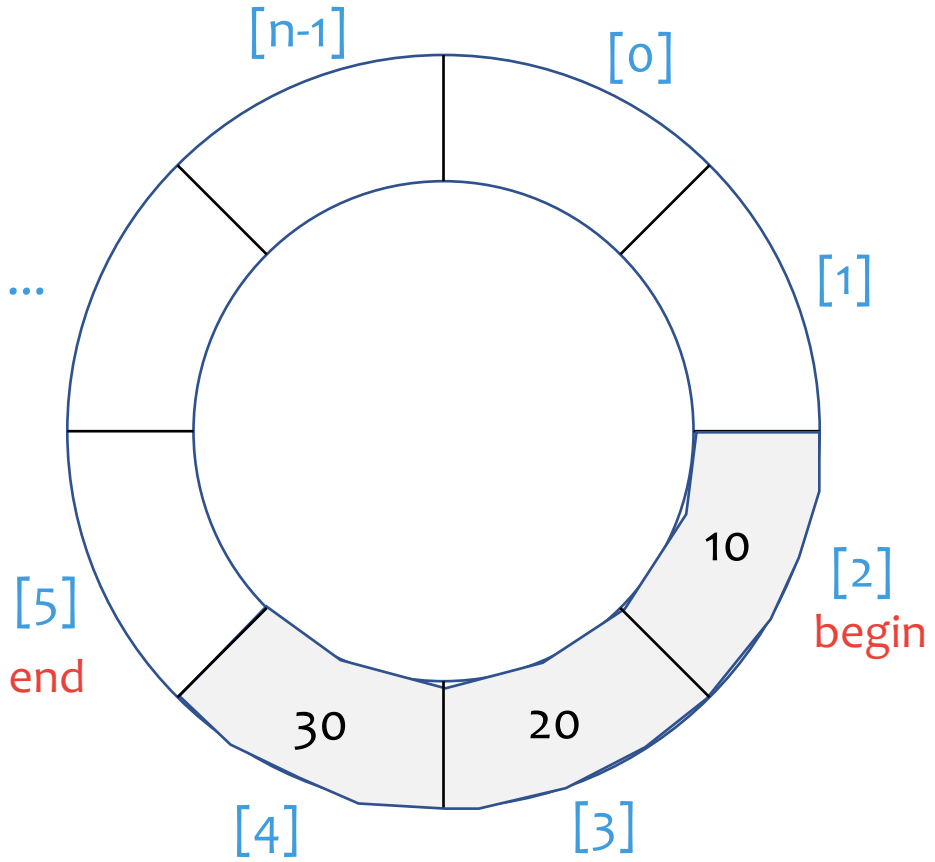
- **Enfileirar** (**enqueue**) um elemento y:
  - Q[end++] = y ;
- **Desenfileirar** (**dequeue**) um elemento da fila:
  - x = Q[begin++];

Filas Circulares Estáticas



capacity = n

size = 3



Filas Circulares Estáticas

Enfileirar (**enqueue**) um elemento y:

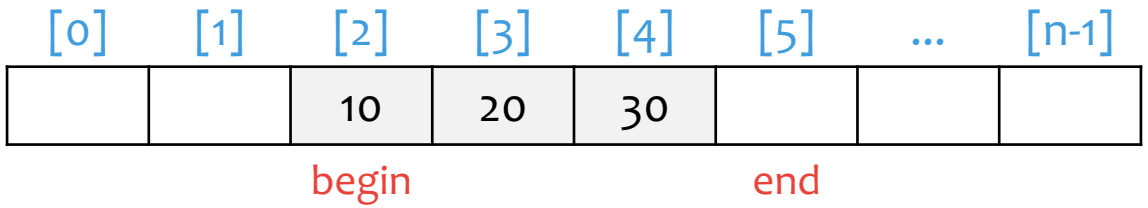
- Q[end] = y;
- end = (end + 1) % capacity;

Consultar (**peek**) um elemento da fila sem removê-lo:

- x = Q[begin];

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;



Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

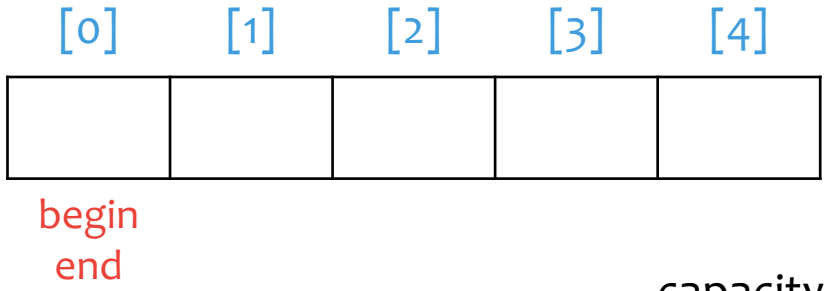
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 0

A fila está **vazia!**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

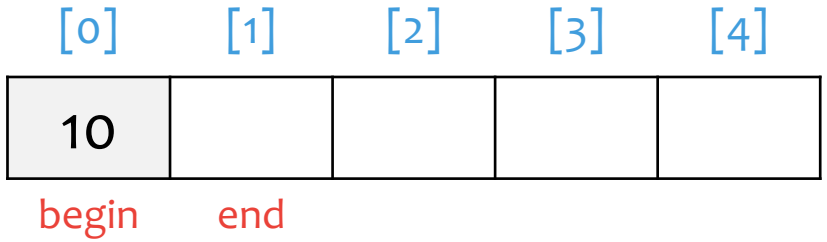
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 1

Q[0] = 10;

end = (0 + 1) % 5 = **1**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

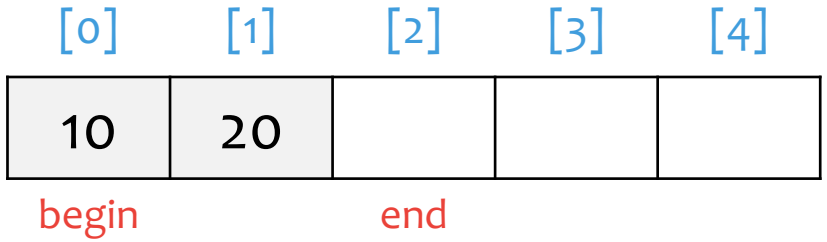
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 2

Q[1] = 20;

end = (1 + 1) % 5 = **2**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

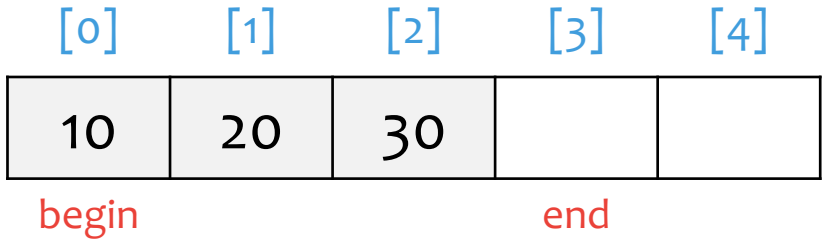
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 3

Q[2] = 30;

end = (2 + 1) % 5 = **3**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

enqueue(40)

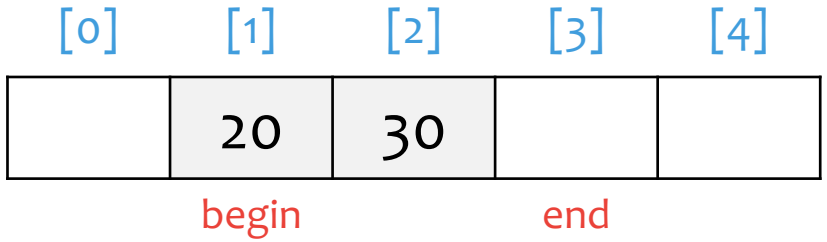
enqueue(50)

dequeue

enqueue(100)

enqueue(200)

10



capacity = n = 5

size = 2

x = Q[0];

begin = (0 + 1) % 5 = 1

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

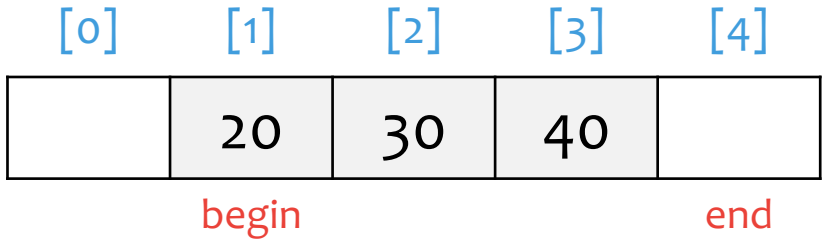
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 3

Q[3] = 40;

end = (3 + 1) % 5 = **4**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

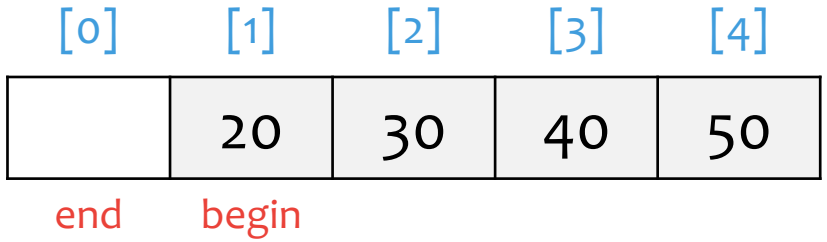
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 4

Q[4] = 50;

end = (4 + 1) % 5 = **5**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

enqueue(40)

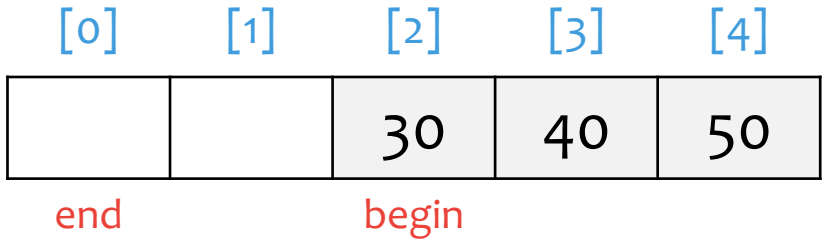
enqueue(50)

dequeue

enqueue(100)

enqueue(200)

20



capacity = n = 5

size = 3

x = Q[1];

begin = (1 + 1) % 5 = **2**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

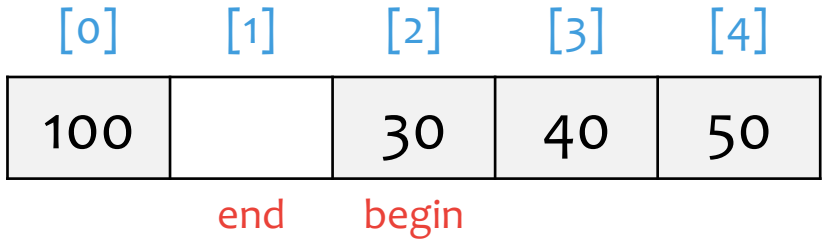
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 4

Q[0] = 100;

end = (0 + 1) % 5 = **1**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

- x = Q[begin];
- begin = (begin + 1) % capacity;

Exemplo

enqueue(10)

enqueue(20)

enqueue(30)

dequeue

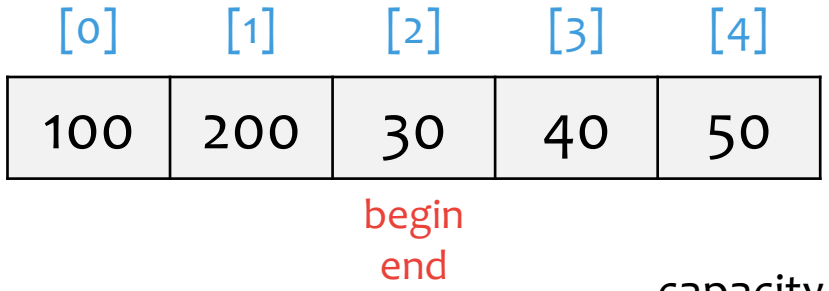
enqueue(40)

enqueue(50)

dequeue

enqueue(100)

enqueue(200)



capacity = n = 5

size = 5

Q[1] = 200;

end = (1 + 1) % 5 = **2**

A fila está **cheia!**

Enfileirar (**enqueue**) um elemento y:

- Q[end] = y;
- end = (end + 1) % capacity;

Desenfileirar (**dequeue**) um elemento da fila:

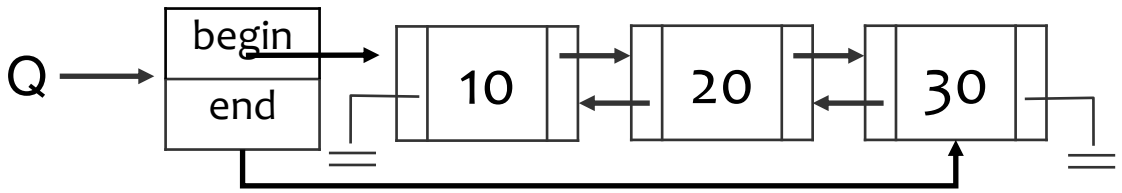
- x = Q[begin];
- begin = (begin + 1) % capacity;

Codificando: TAD Fila Circular Estática

- create
- destroy
- is_empty
- is_full
- enqueue
- dequeue
- peek

Filas Dinâmicas

- **Enfileirar** (**enqueue**) um elemento y:
  - Adicionar um nó com o elemento y no **final da lista**
- **Consultar** (**peek**) um elemento da fila sem desempilhá-lo:
  - Retornar o **valor** do nó **inicial da lista**
- **Desenfileirar** (**dequeue**) um elemento da fila:
  - Remover o nó **inicial da lista** retornando seu valor



size = 3

Codificando: TAD Fila Dinâmica

- create
- destroy
- is_empty
- enqueue
- dequeue
- peek

Dominando Estruturas de Dados 1

Filas

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