

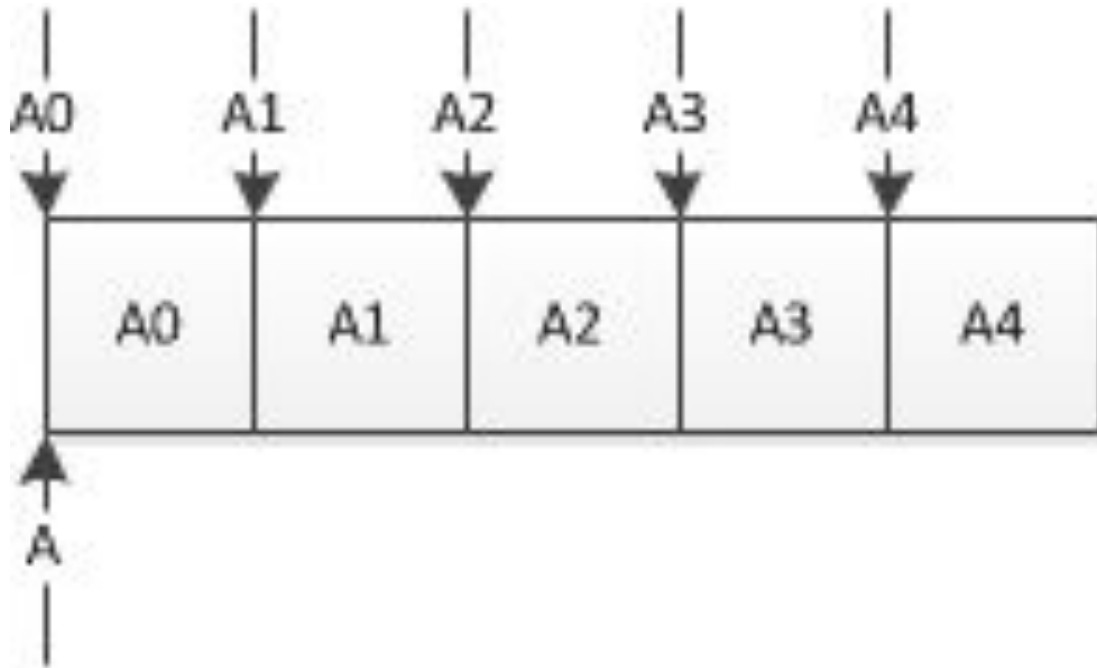
# Односвязные списки

# Массив

- Набор последовательно расположенных в памяти однотипных элементов

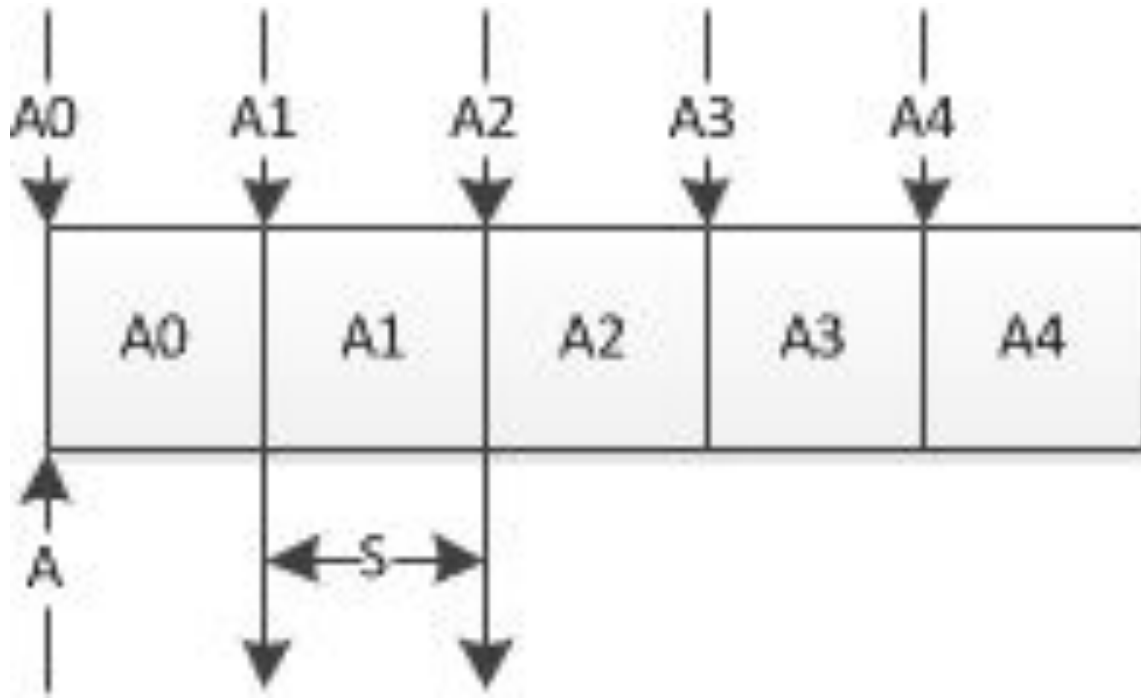
# Свойства массива

- Быстрый доступ к первому элементу



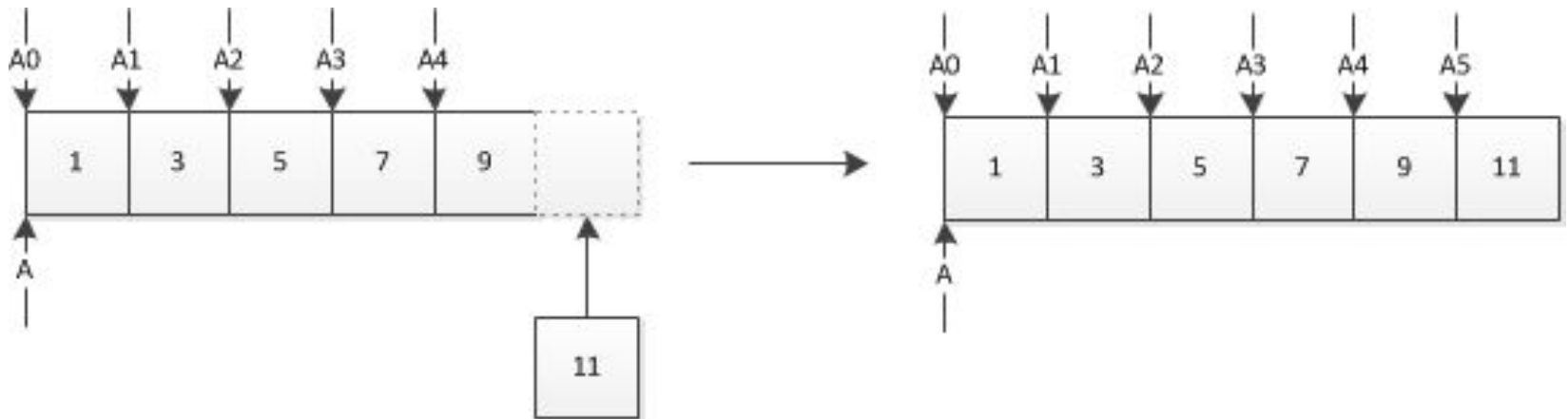
# Свойства массива

- Быстрый доступ к элементу по индексу



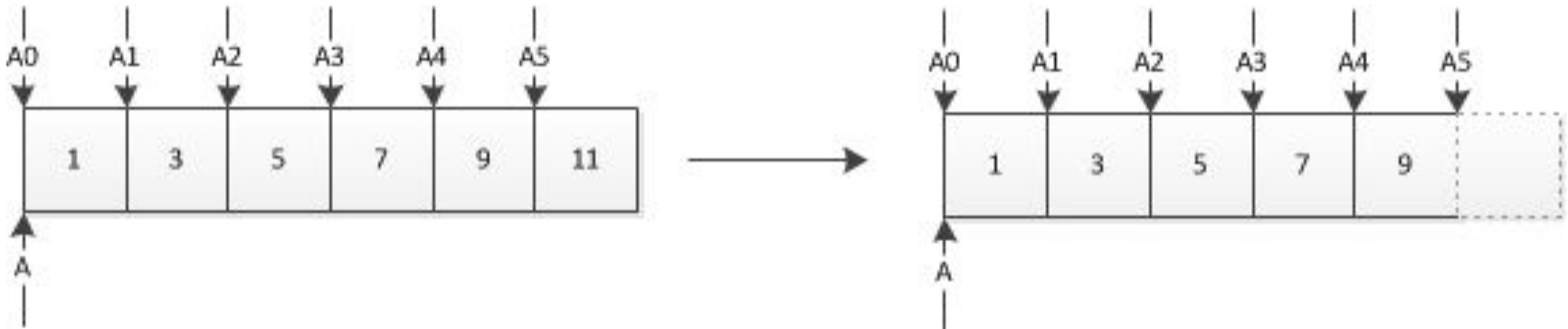
# Свойства массива

- Быстрая вставка элемента в конец



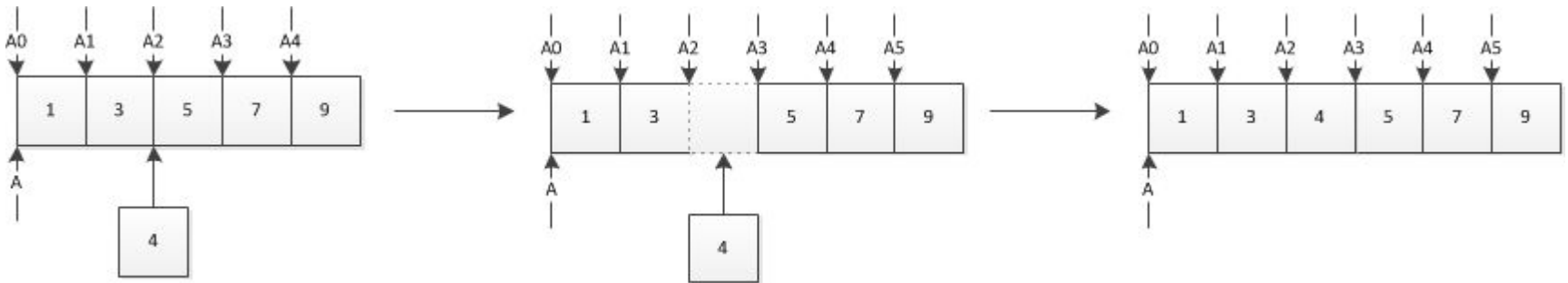
# Свойства массива

- Быстрое удаление последнего элемента



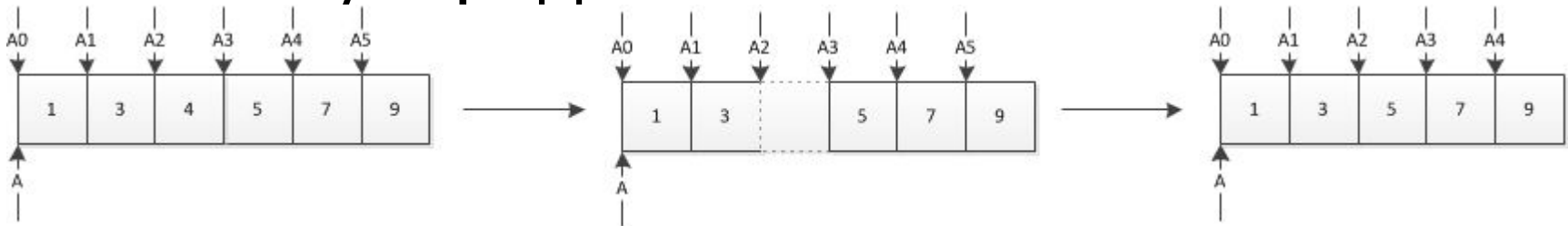
# Свойства массива

- Медленная вставка в начало/середину



# Свойства массива

- Медленное удаление из начала/середины

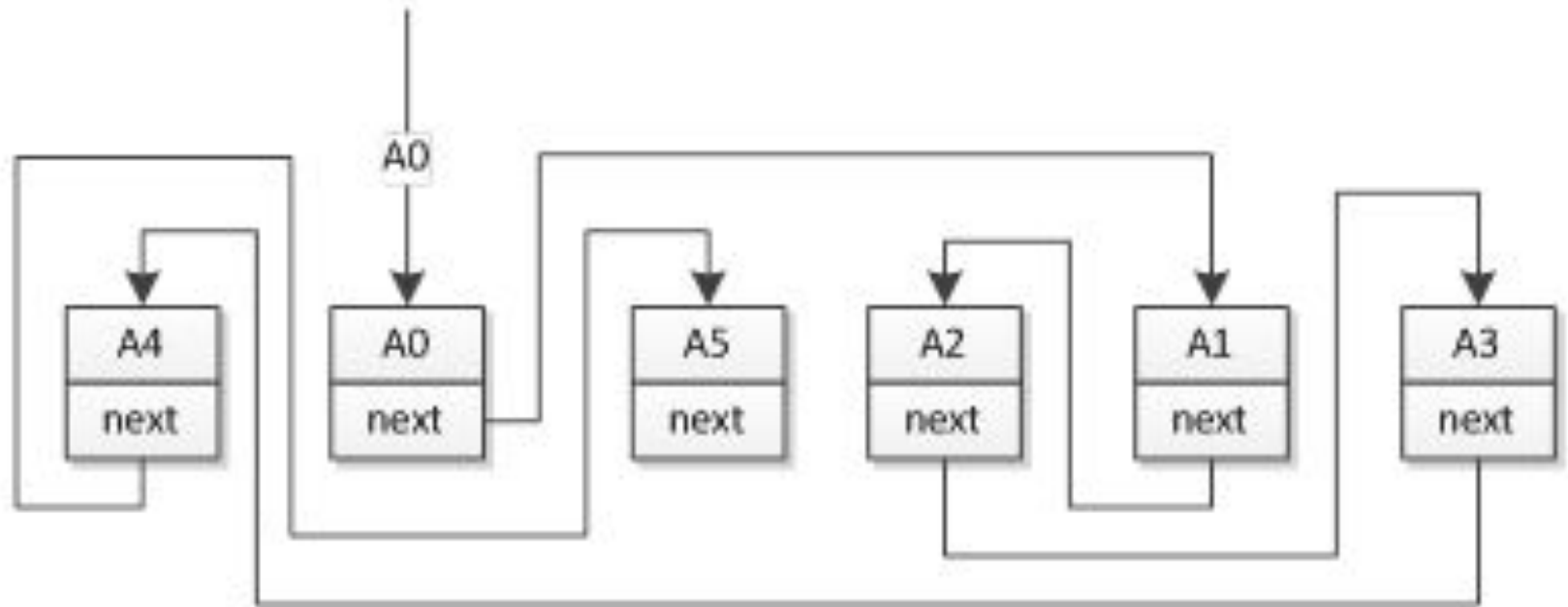




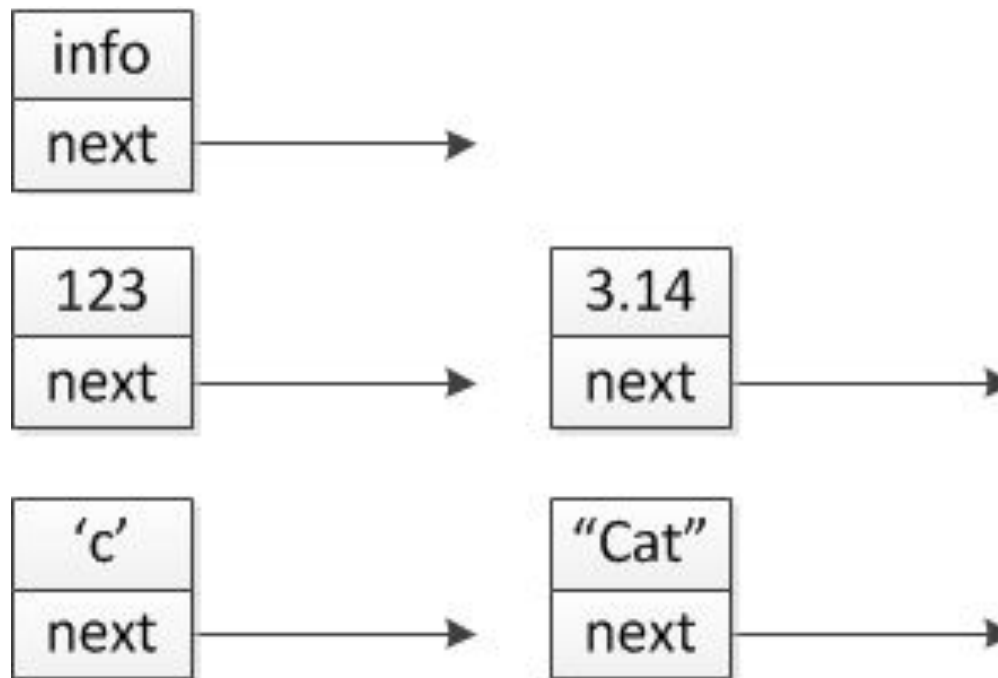
# Резюме

- Быстрый доступ к элементу по индексу
- Медленное добавление в начало и середины
- Медленное удаление из начала и середины
- Трудности с выделением памяти и расширением

# Идея списка



# Узел списка и его содержимое



# Узел списка (код, картинка)

```
struct node{  
    int info;  
    node* next;  
};
```

# Список руками

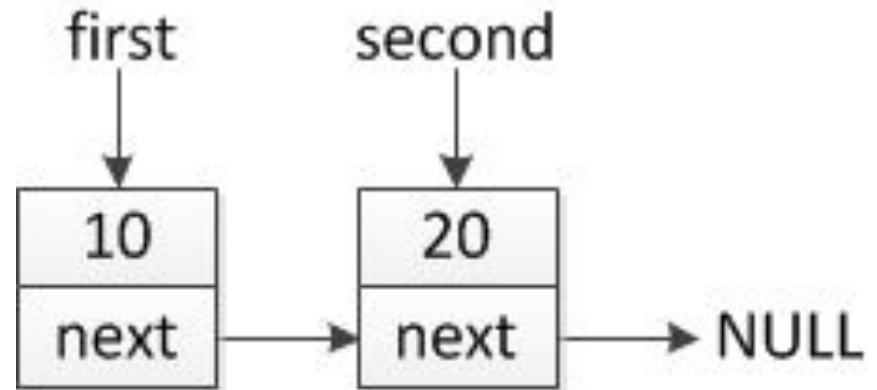
```
struct node{
    int info;
    node *next;
};
int main() {
    node *first, * second;
    first = new node;
    first->info = 10;
    second = new node;
    second->info = 20;
    first->next = second;
    second->next = NULL;
```

```
cout << first->info << endl;
cout << second->info << endl;
cout << first->next->info << endl;
cout << second->next->info << endl;
}
```

# Список руками

```
struct node{
    int info;
    node *next;
};
int main() {
    node *first, * second;
    first = new node;
    first->info = 10;
    second = new node;
    second->info = 20;
    first->next = second;
    second->next = NULL;
```

```
cout << first->info << endl;
cout << second->info << endl;
cout << first->next->info << endl;
cout << second->next->info << endl;
}
```



# Список руками 2

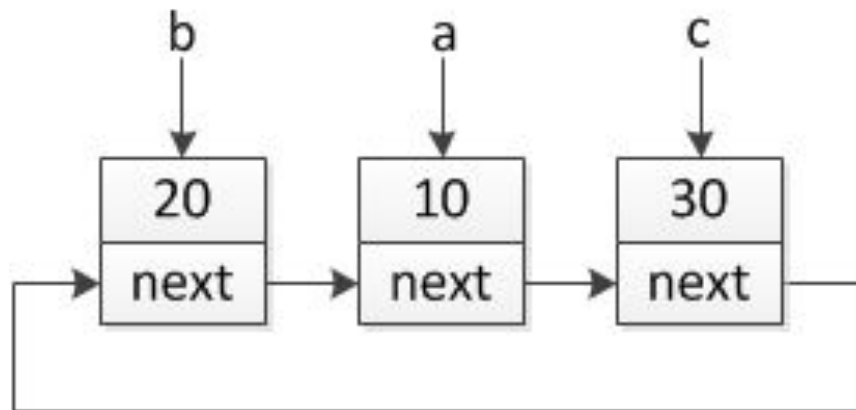
```
node *a, *b, *c;  
a = new node;  
a->info = 10;  
b = new node;  
b->info = 20;  
c = new node;  
c->info = 30;  
a->next = c;  
b->next = a;  
c->next = b;
```

```
cout << a->info << endl;  
cout << b->info << endl;  
cout << c->info << endl;  
cout << a->next->info << endl;  
cout << a->next->next->info << endl;  
cout << b->next->info << endl;  
cout << b->next->next->info << endl;  
cout << c->next->info << endl;  
cout << c->next->next->info << endl;
```

# Список руками 2

```
node *a, *b, *c;
a = new node;
a->info = 10;
b = new node;
b->info = 20;
c = new node;
c->info = 30;
a->next = c;
b->next = a;
c->next = b;
```

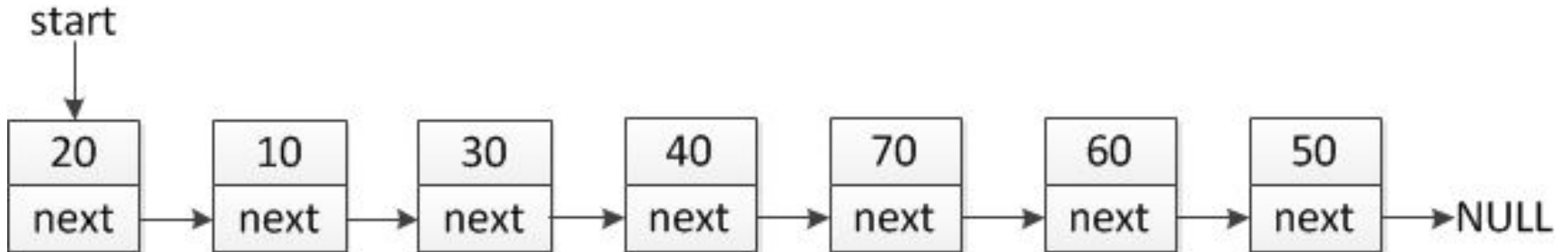
```
cout << a->next->info << endl;
cout << a->next->next->info << endl;
cout << b->next->info << endl;
cout << b->next->next->info << endl;
cout << c->next->info << endl;
cout << c->next->next->info << endl;
```



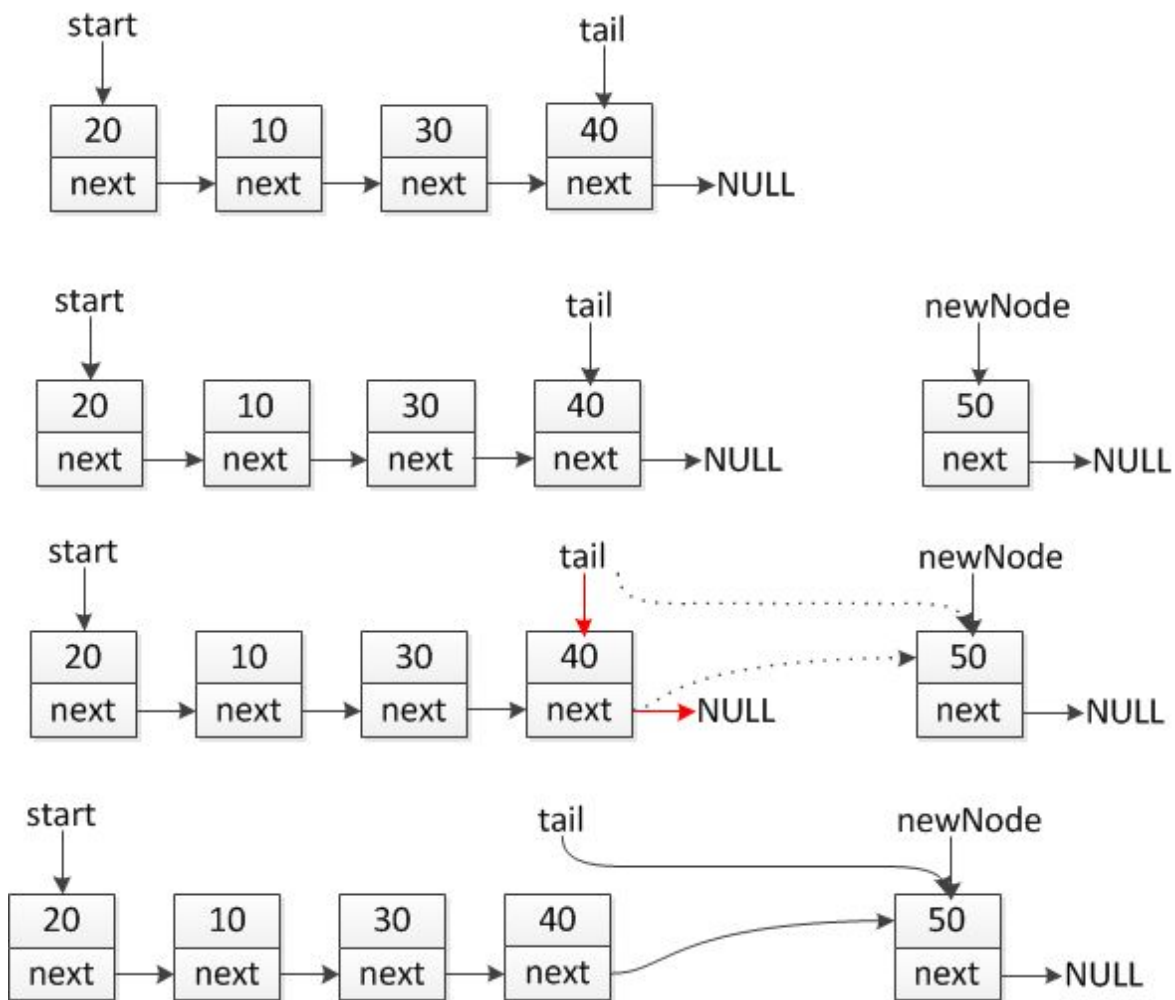


# Вывод списка

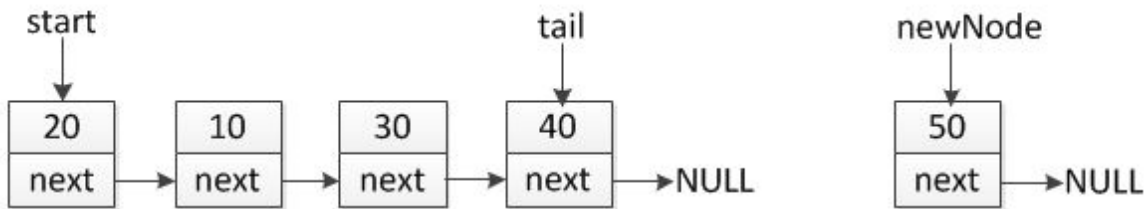
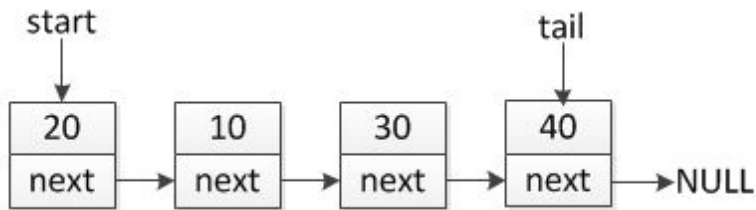
```
for(node* cur = start; cur!=NULL; cur = cur->next){  
    cout << cur->info << endl;  
}
```



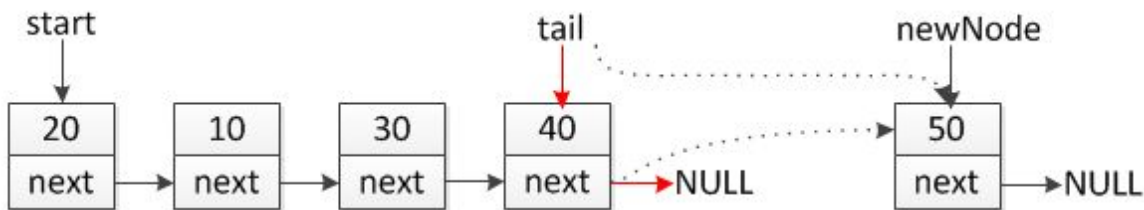
# Дополнение списка



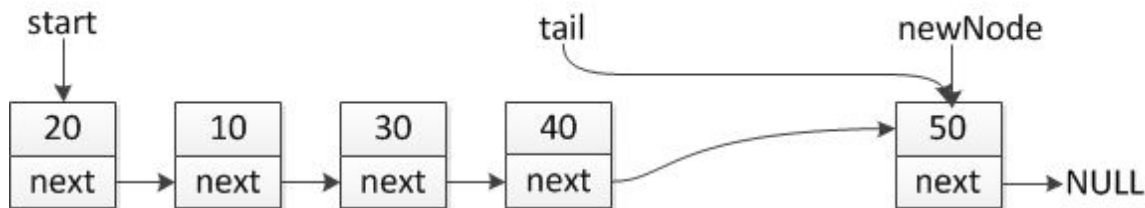
# Дополнение списка



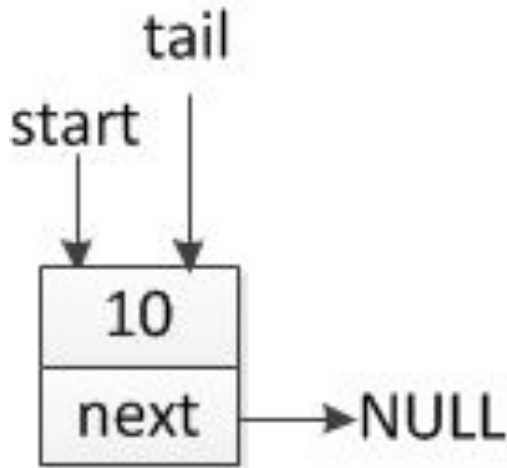
```
newNode = new node;  
newNode->info = 50;  
newNode->next = NULL;
```



```
tail->next = newNode;  
tail = newNode;
```



# Создание списка с нуля



```
node *newNode = new node;  
newNode->info = 10;  
newNode->next = NULL;  
start = newNode;  
tail = newNode;
```

# Ввод-обработка-вывод

```
node *head=NULL, *tail=NULL, *newNode; int x;
while(cin>>x){
    newNode = new node;
    newNode->info = x;
    newNode->next = NULL;
    if(tail==NULL){
        head = newNode;
        tail = newNode;
    } else {
        tail->next = newNode;
        tail = newNode;
    }
}
```

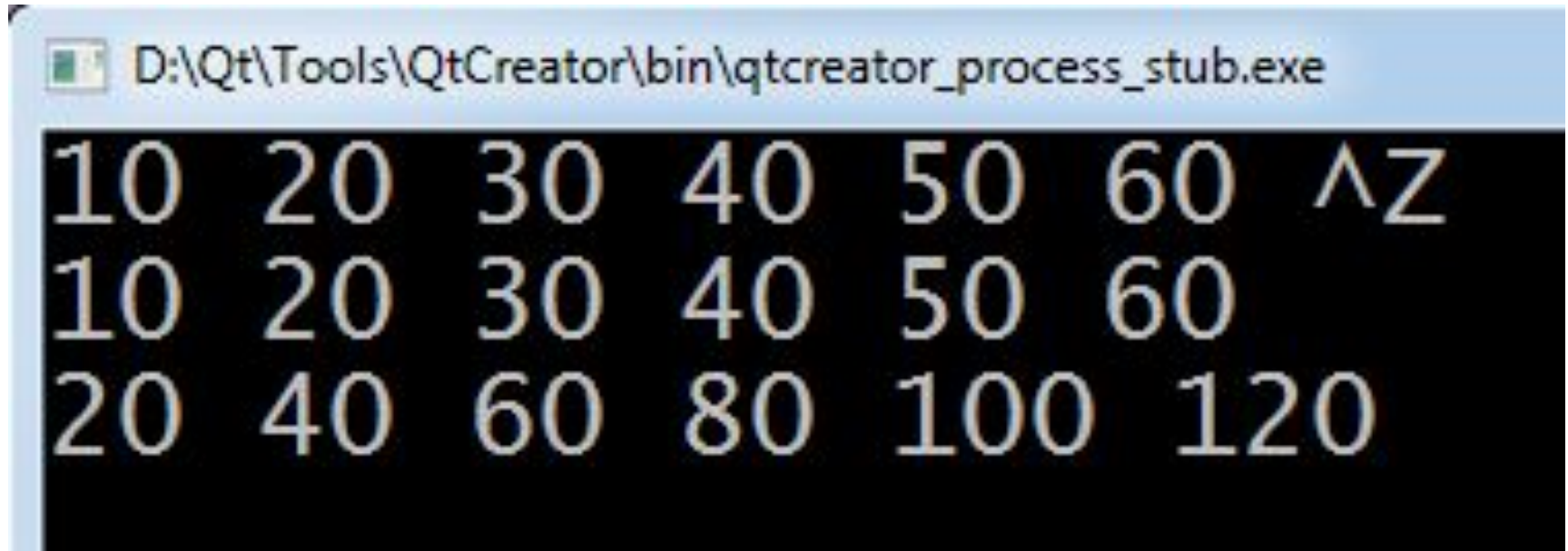
# Ввод-обработка-вывод

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cout << cur->info << " ";  
}  
cout << endl;
```

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cur->info *= 2;  
}
```

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cout << cur->info << " ";  
}  
cout << endl;
```

# Результат работы



```
D:\Qt\Tools\QtCreator\bin\qtcreator_process_stub.exe  
10 20 30 40 50 60 ^Z  
10 20 30 40 50 60  
20 40 60 80 100 120
```

# Стек vs очередь

## Очередь

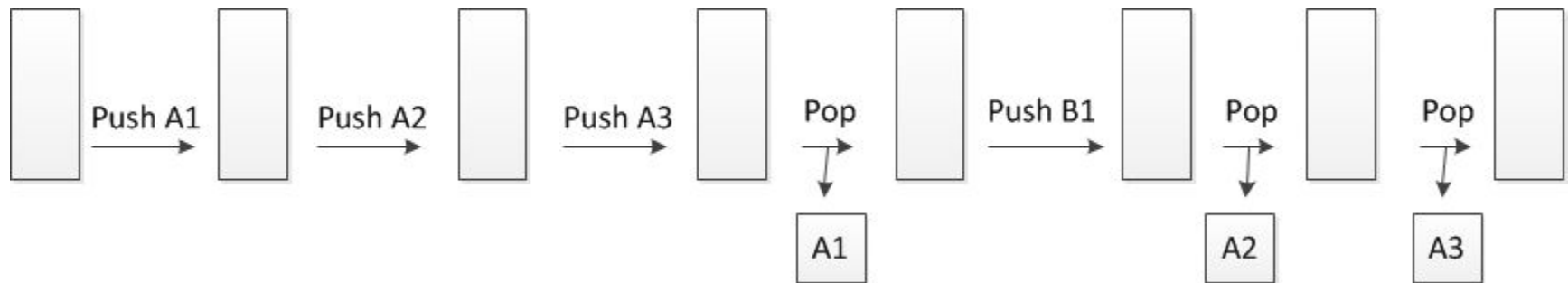
- FIFO (First In – First Out)

## Стек

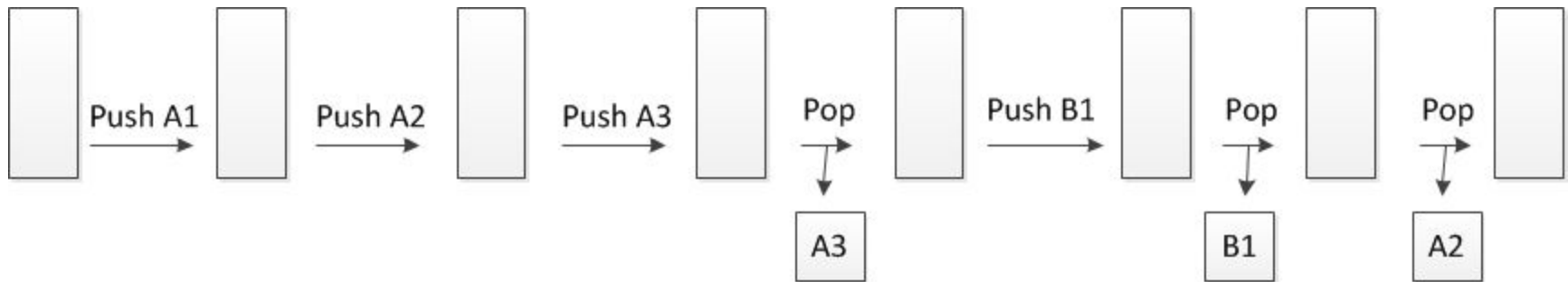
- LIFO (Last In – First Out)



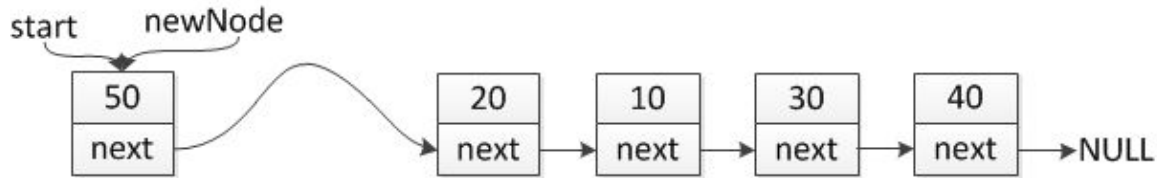
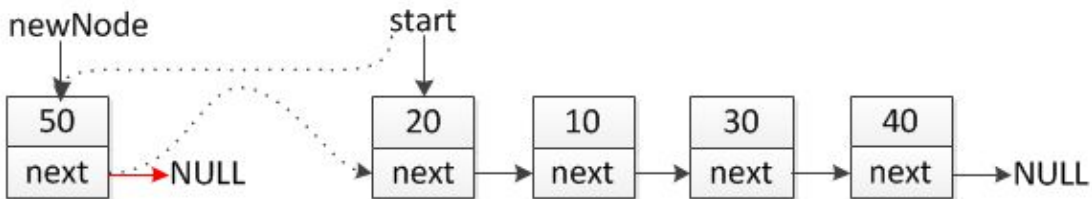
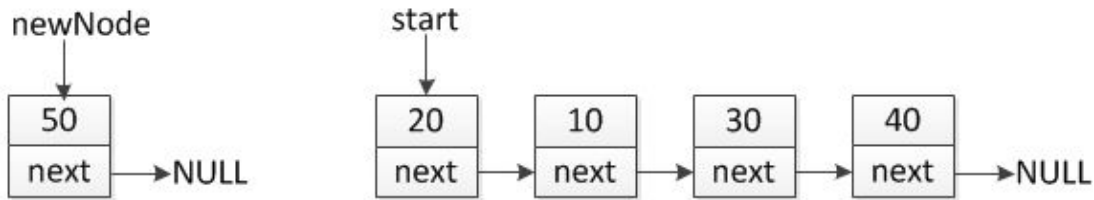
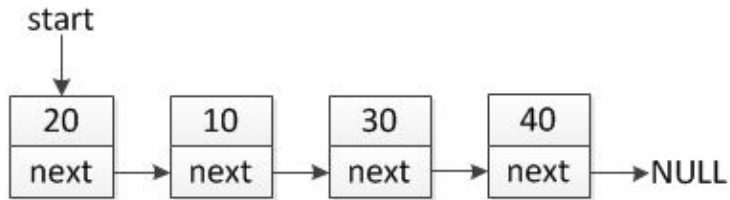
# Очередь как черный ящик



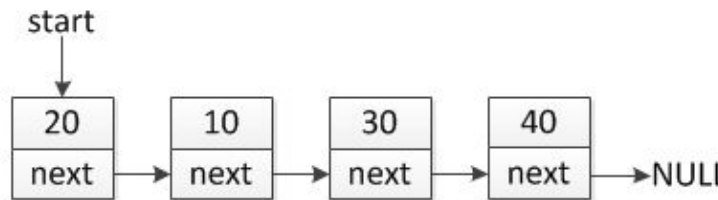
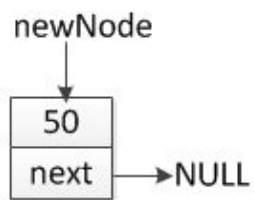
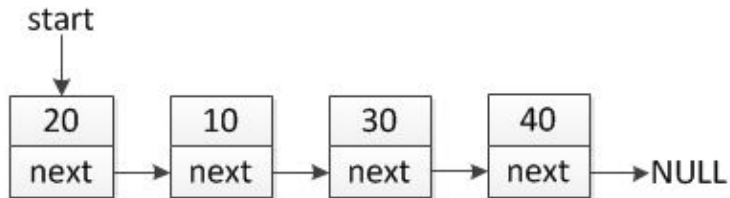
# Стек как черный ящик



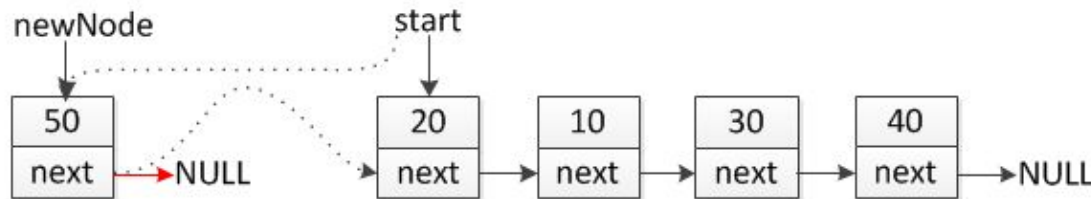
# Дополнение стека



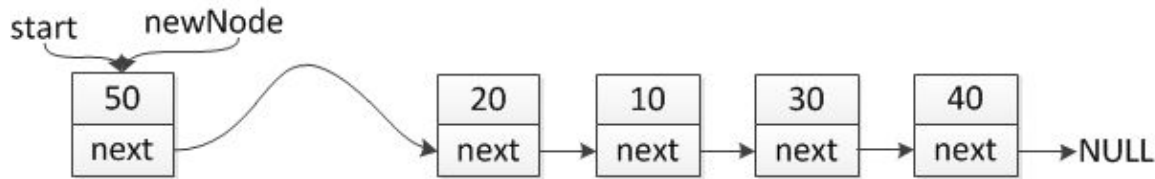
# Дополнение списка



```
newNode = new node;  
newNode->info = 50;  
newNode->next = NULL;
```



```
newNode->next = start;  
start = newNode;
```



# Ввод-обработка-вывод

```
node *head=NULL, *newNode; int x;
while(cin>>x){
    newNode = new node;
    newNode->info = x;
    newNode->next = NULL;
    if(head==NULL){
        head = newNode;
    } else {
        newNode->next = head;
        head = newNode;
    }
}
```

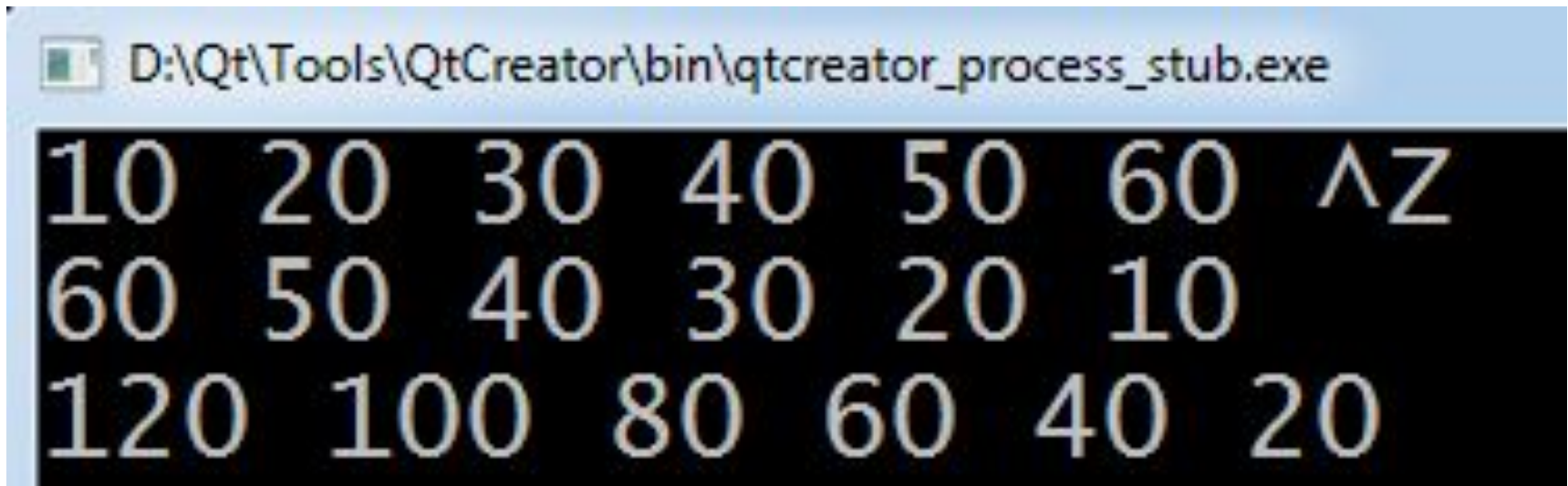
# Ввод-обработка-вывод

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cout << cur->info << " ";  
}  
cout << endl;
```

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cur->info *= 2;  
}
```

```
for(node* cur = head; cur!=NULL; cur=cur->next){  
    cout << cur->info << " ";  
}  
cout << endl;
```

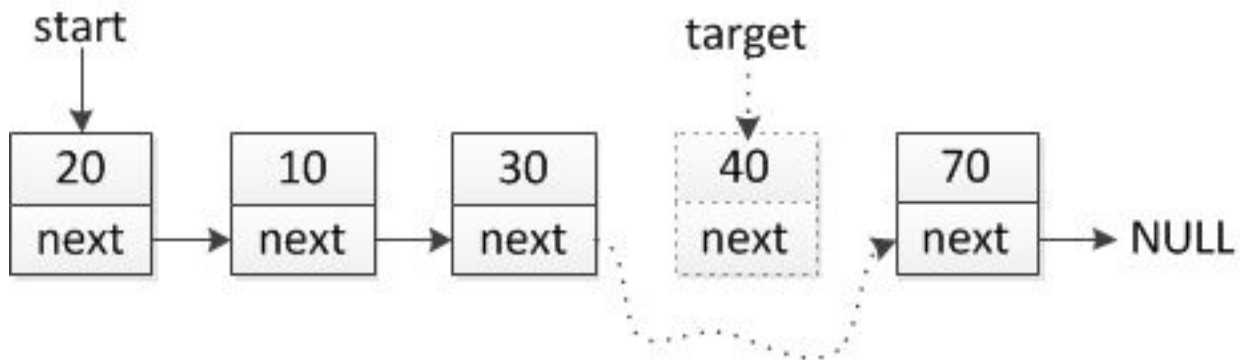
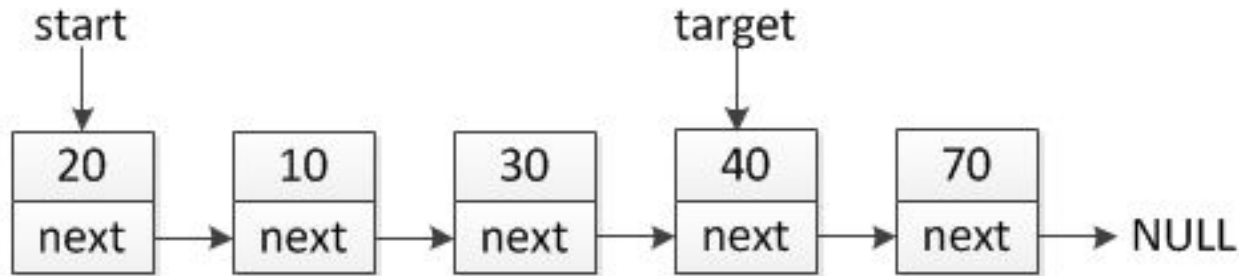
# Результат работы



The screenshot shows a window titled "D:\Qt\Tools\QtCreator\bin\qtcreator\_process\_stub.exe" with a black background and white text. The text is arranged in a 3x7 grid:

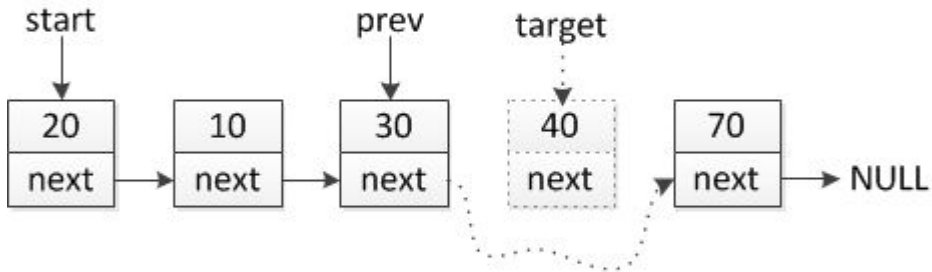
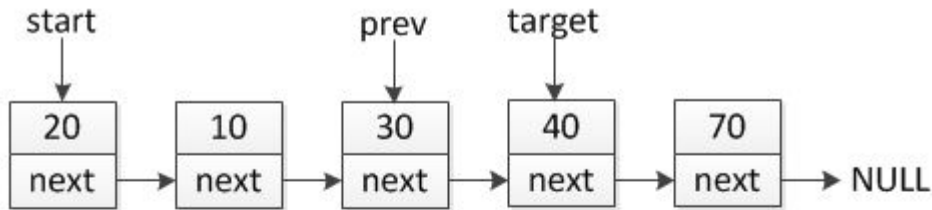
10	20	30	40	50	60	^Z
60	50	40	30	20	10	
120	100	80	60	40	20	

# Удаление

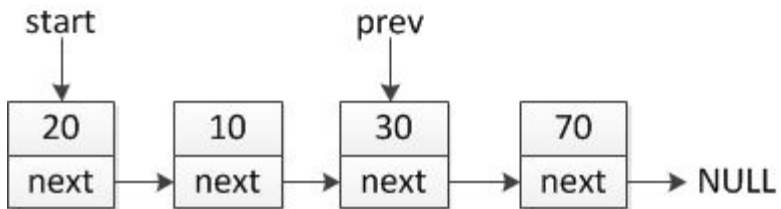




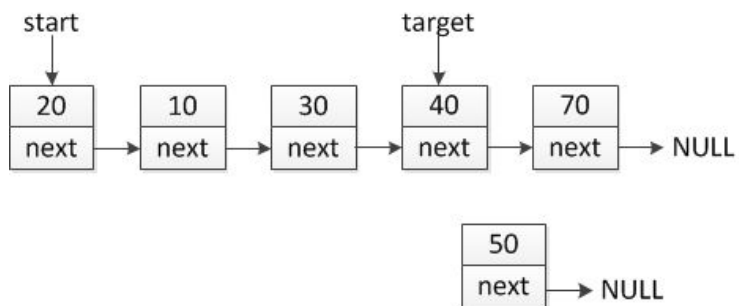
# Удаление



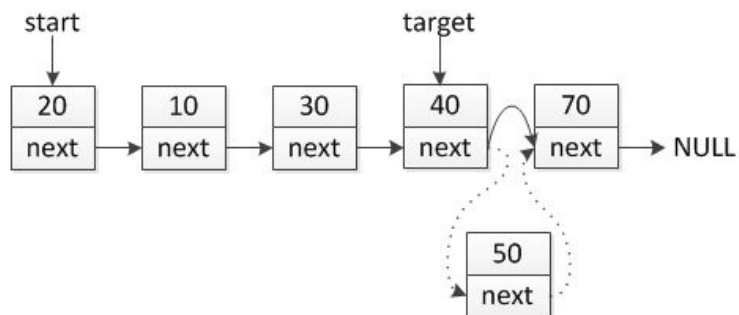
prev->next = target->next;  
delete target;



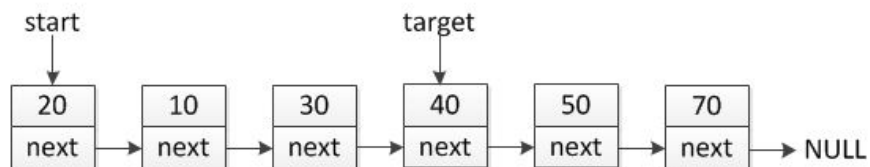
# Вставка в середину



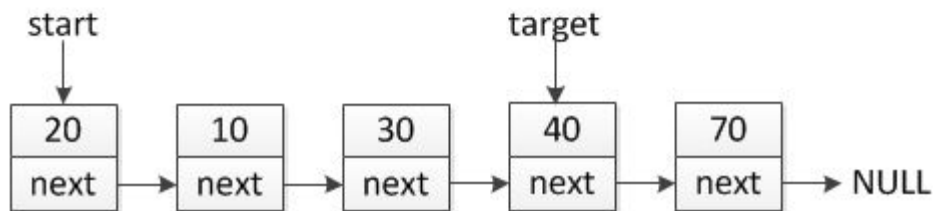
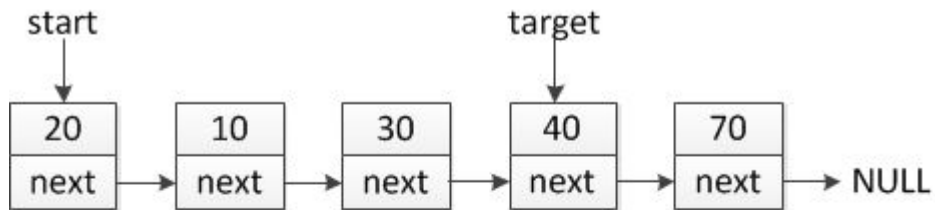
```
node newNode = new node;  
node->info = 50;  
node->next = NULL;
```



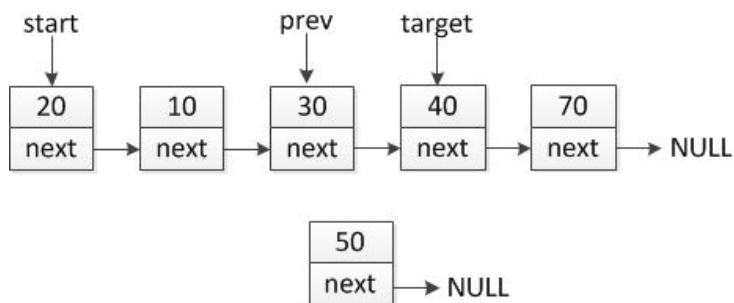
```
newNode->next = target->next;  
target->next = newNode;
```



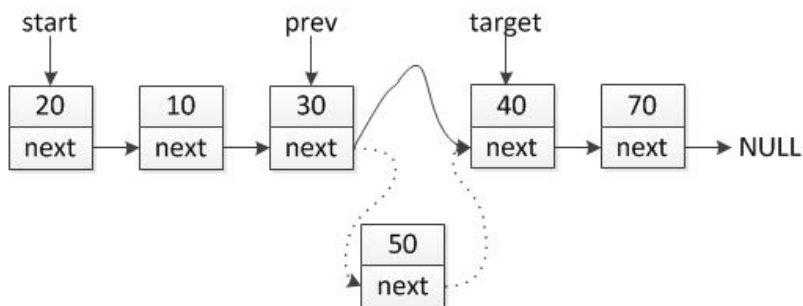
# Вставка в середину



# Вставка в середину



```
node newNode = new node;  
node->info = 50;  
node->next = NULL;
```



```
prev->next = newNode  
newNode->next = target;
```

