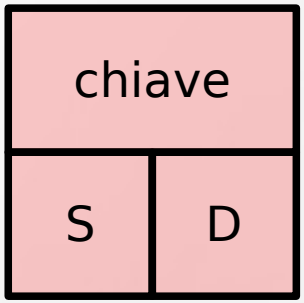
Alberi binari di ricerca

In un albero binario di ricerca ogni nodo:

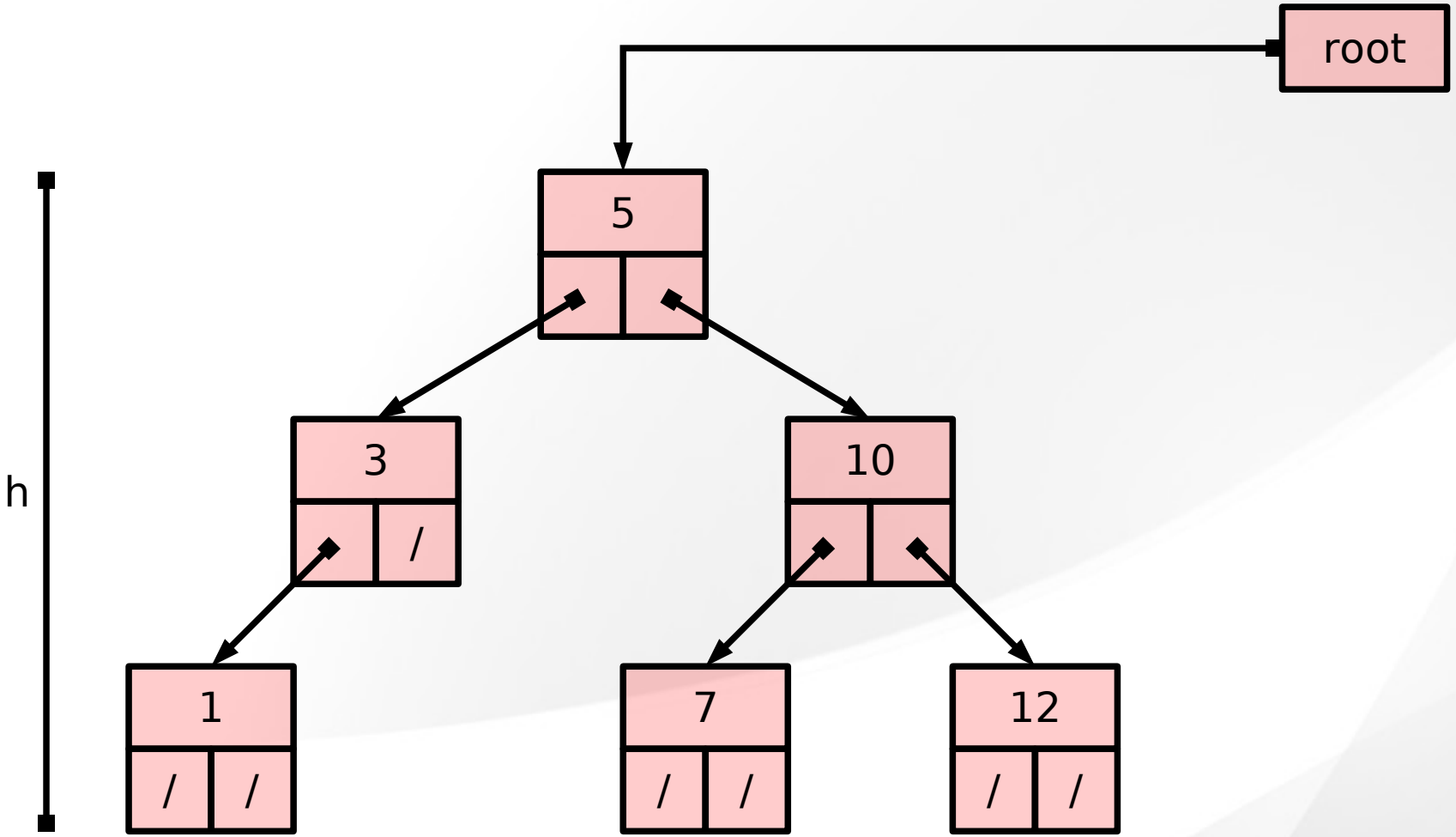
- ha associato un valore
- può avere al più due nodi figli (sinistro e destro)



In un albero binario di ricerca valgono le proprietà:

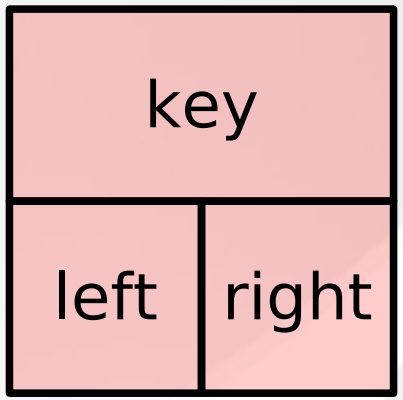
- I nodi del sottoalbero sinistro hanno un valore minore o uguale a quello della radice
- I nodi del sottoalbero destro hanno valori maggiori della radice

Alberi binari di ricerca

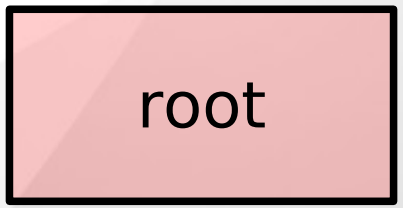


Implementazione

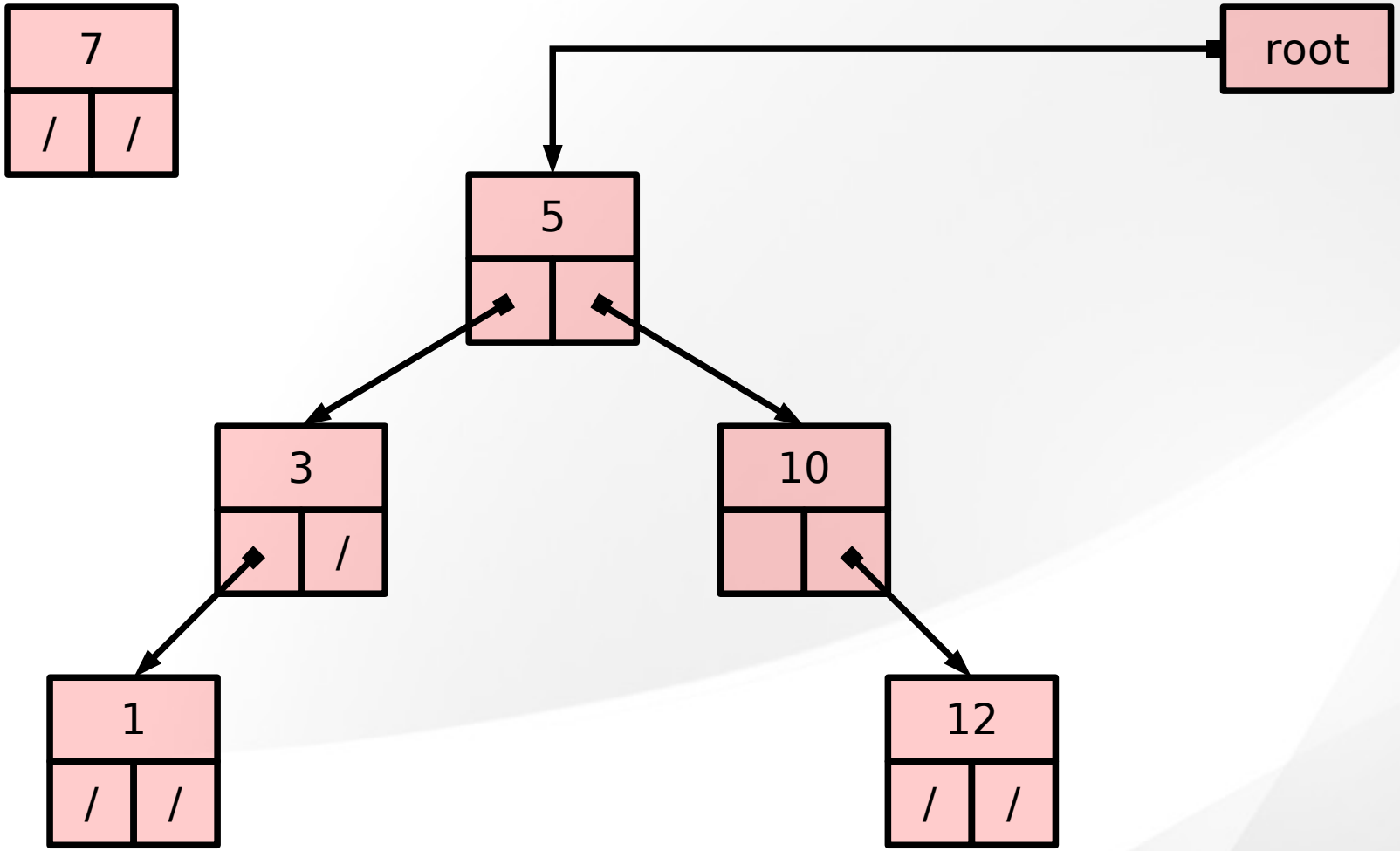
```
struct Nodo{
   int key;
   struct Nodo* left;
   struct Nodo* right;
};
```



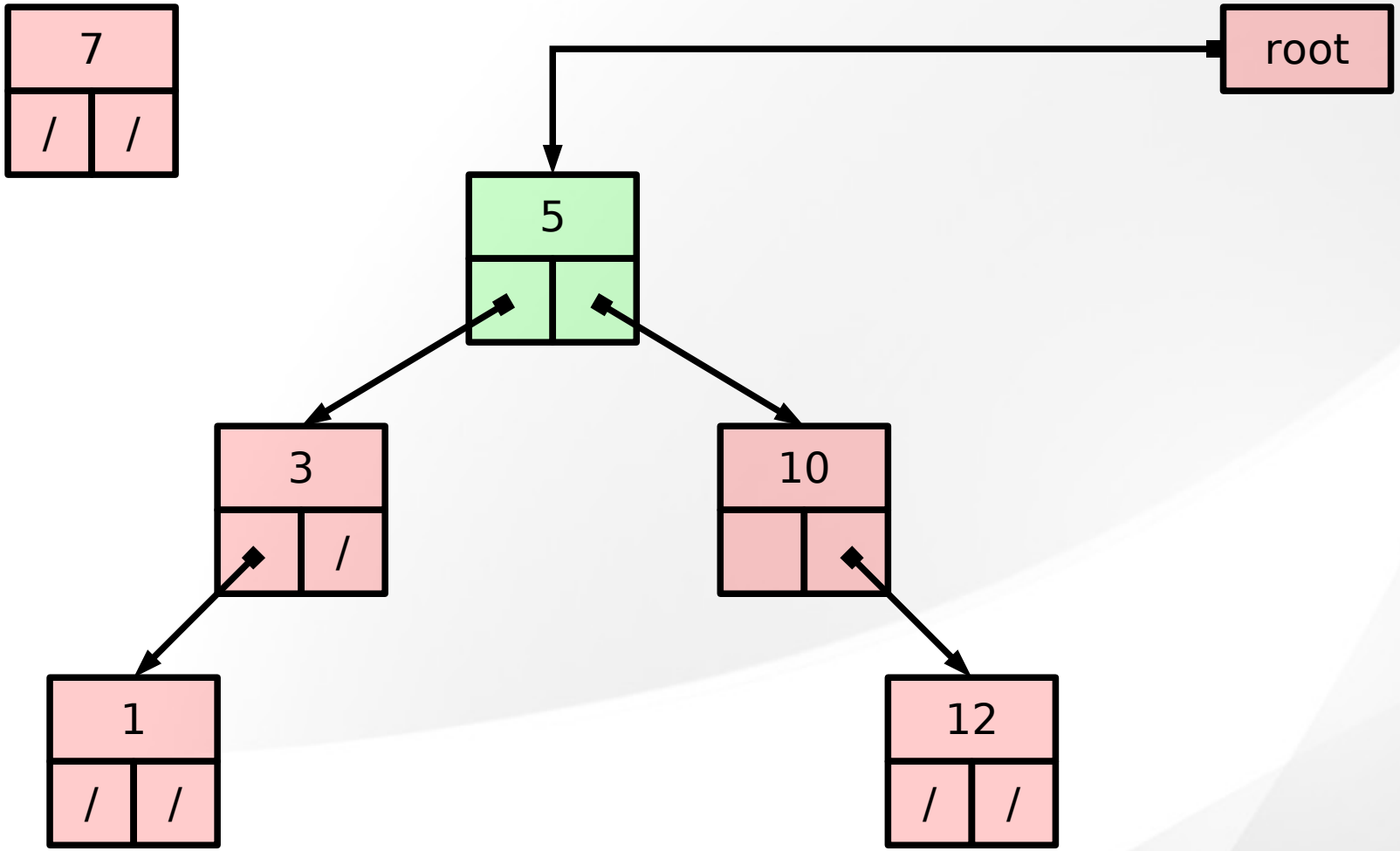

```
typedef Nodo* albero;
```



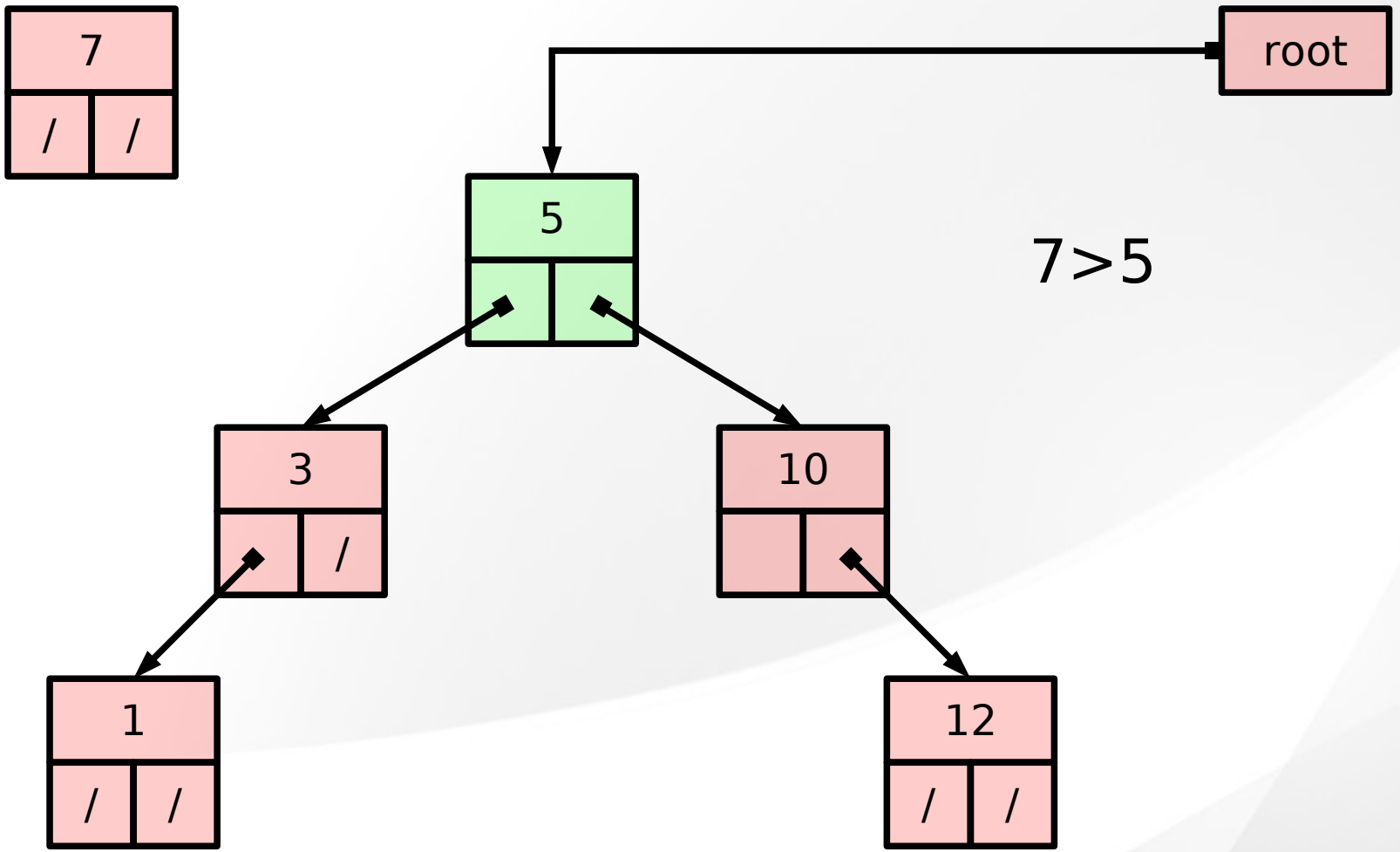
Inserimento



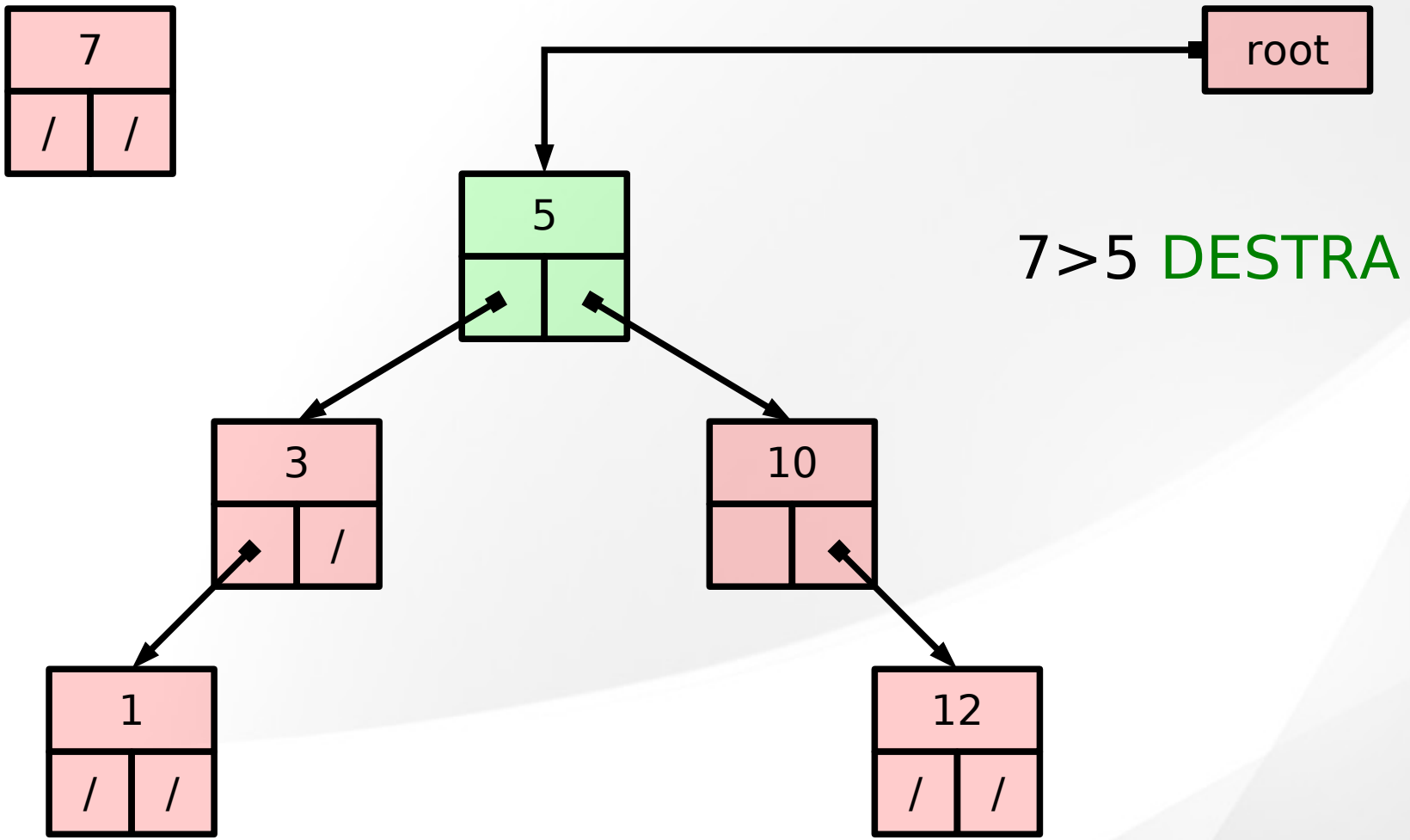
Inserimento



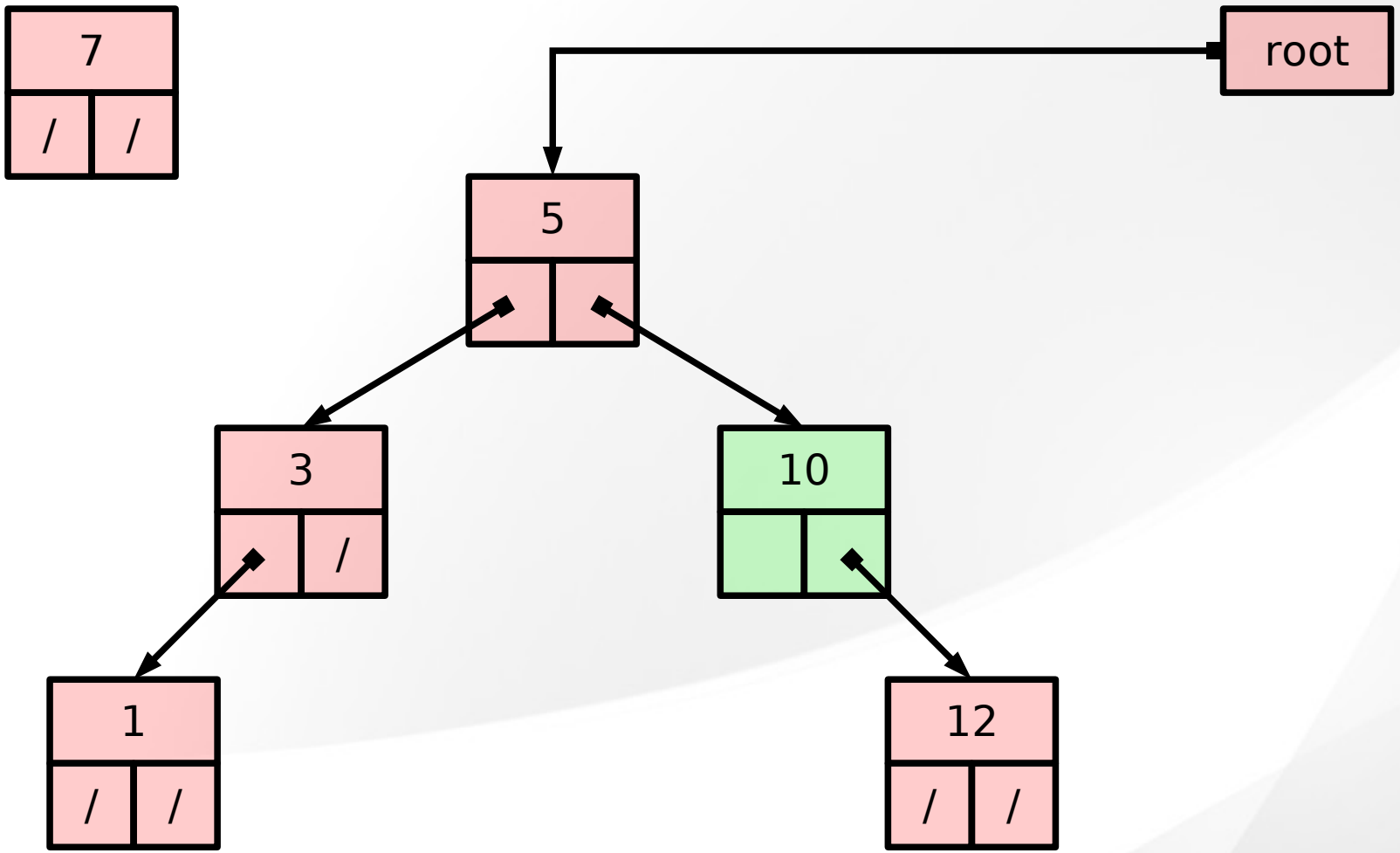
Inserimento



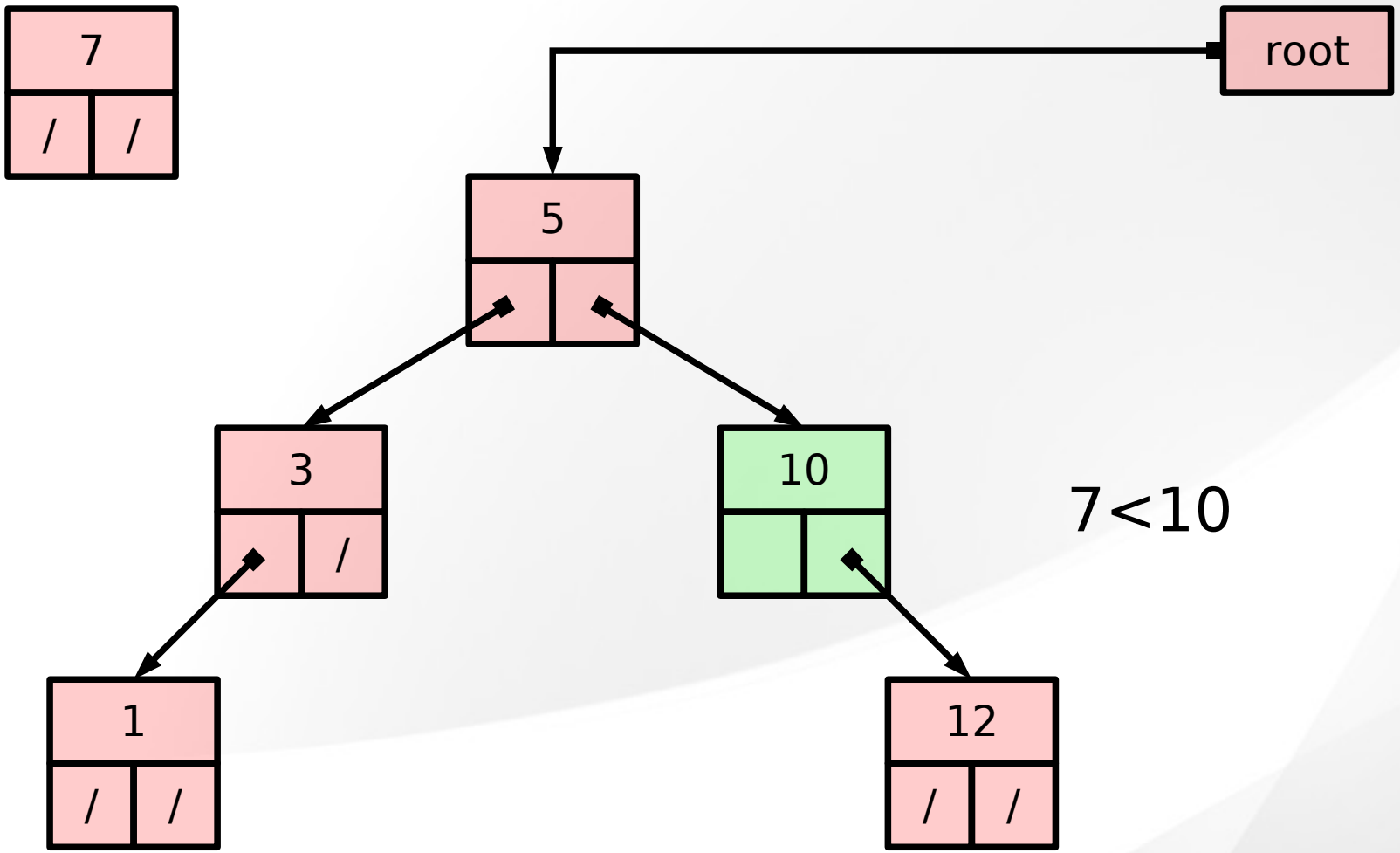
Inserimento



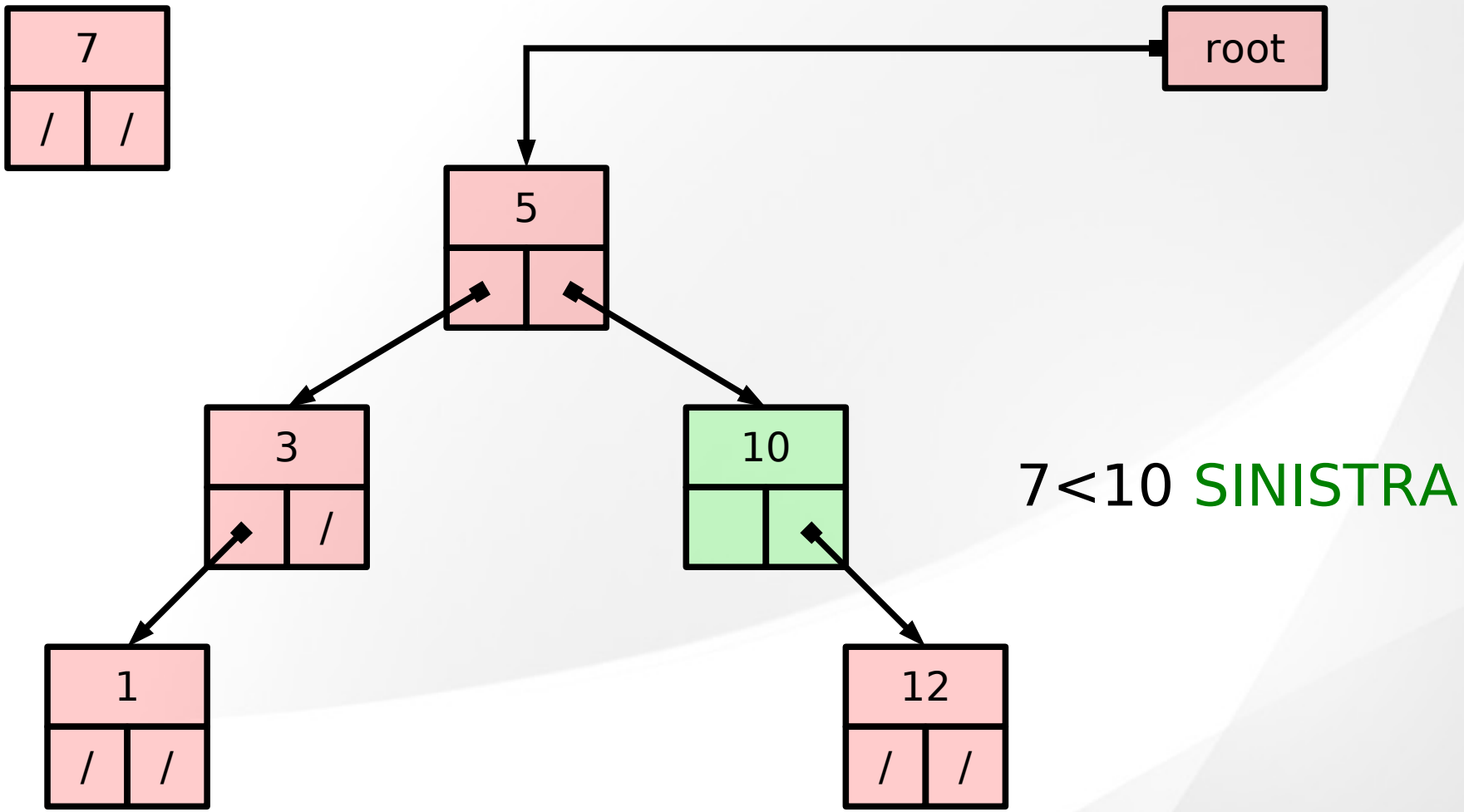
Inserimento



Inserimento

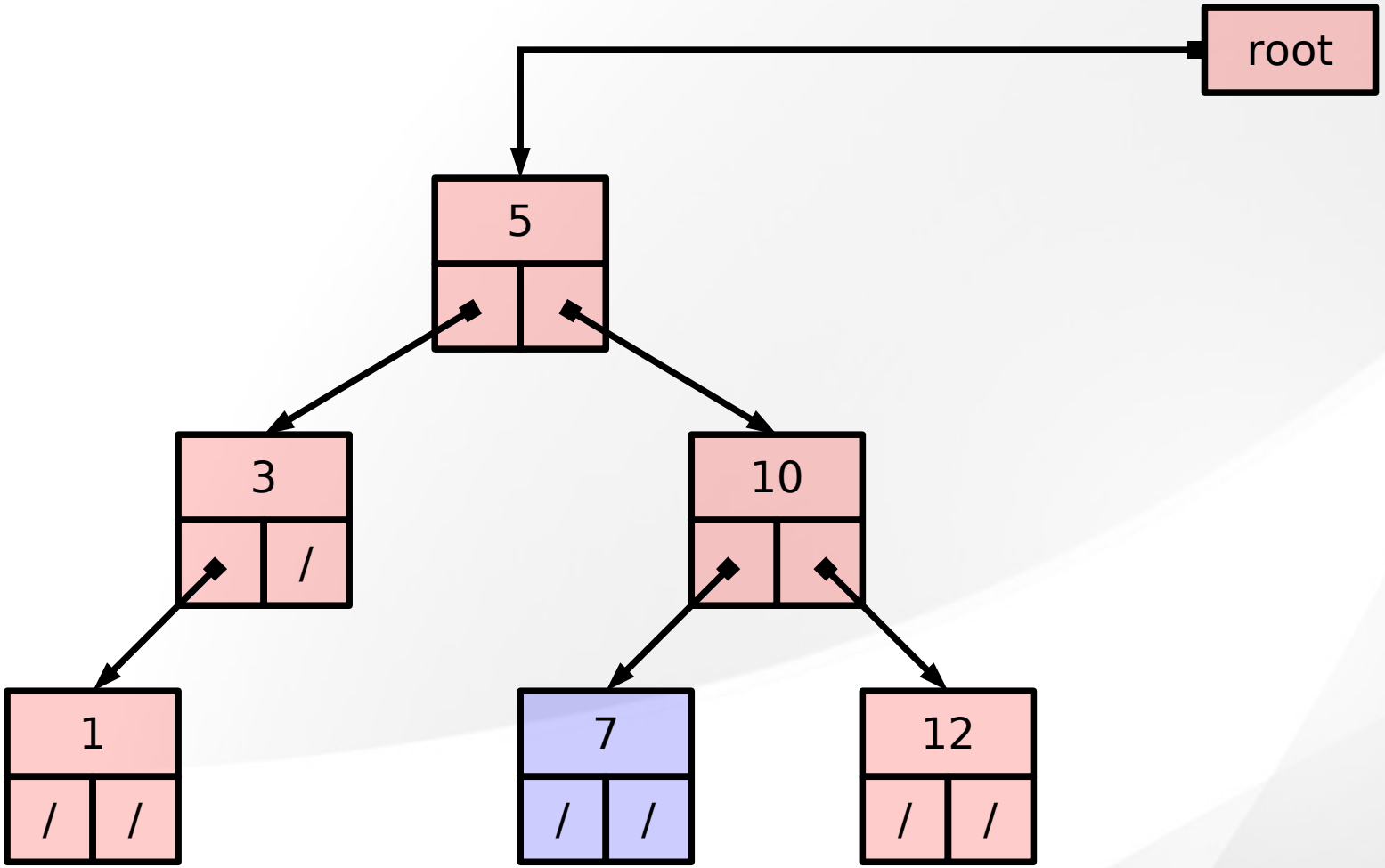


Inserimento

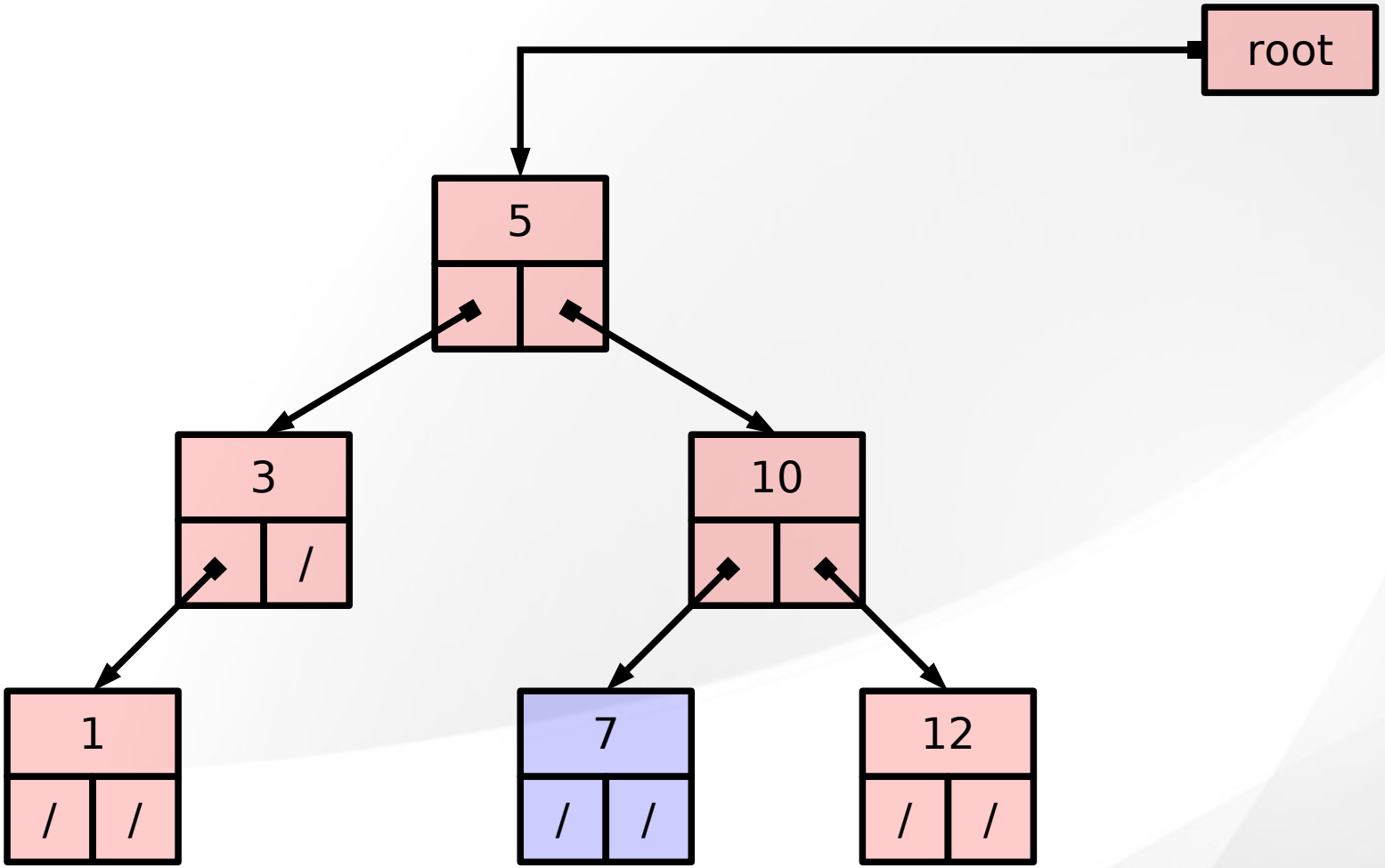


7<10 SINISTRA

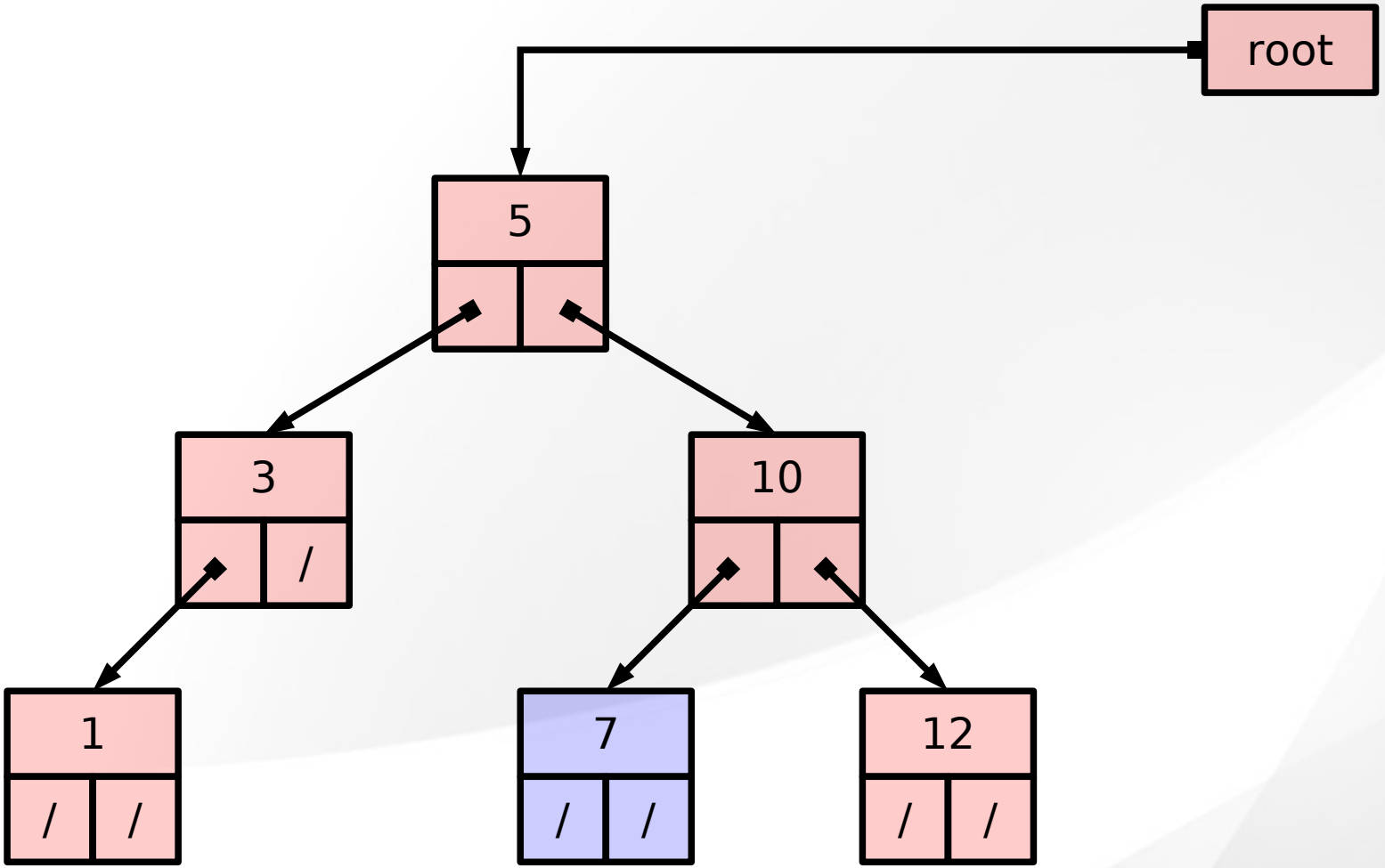
Inserimento



Inserimento

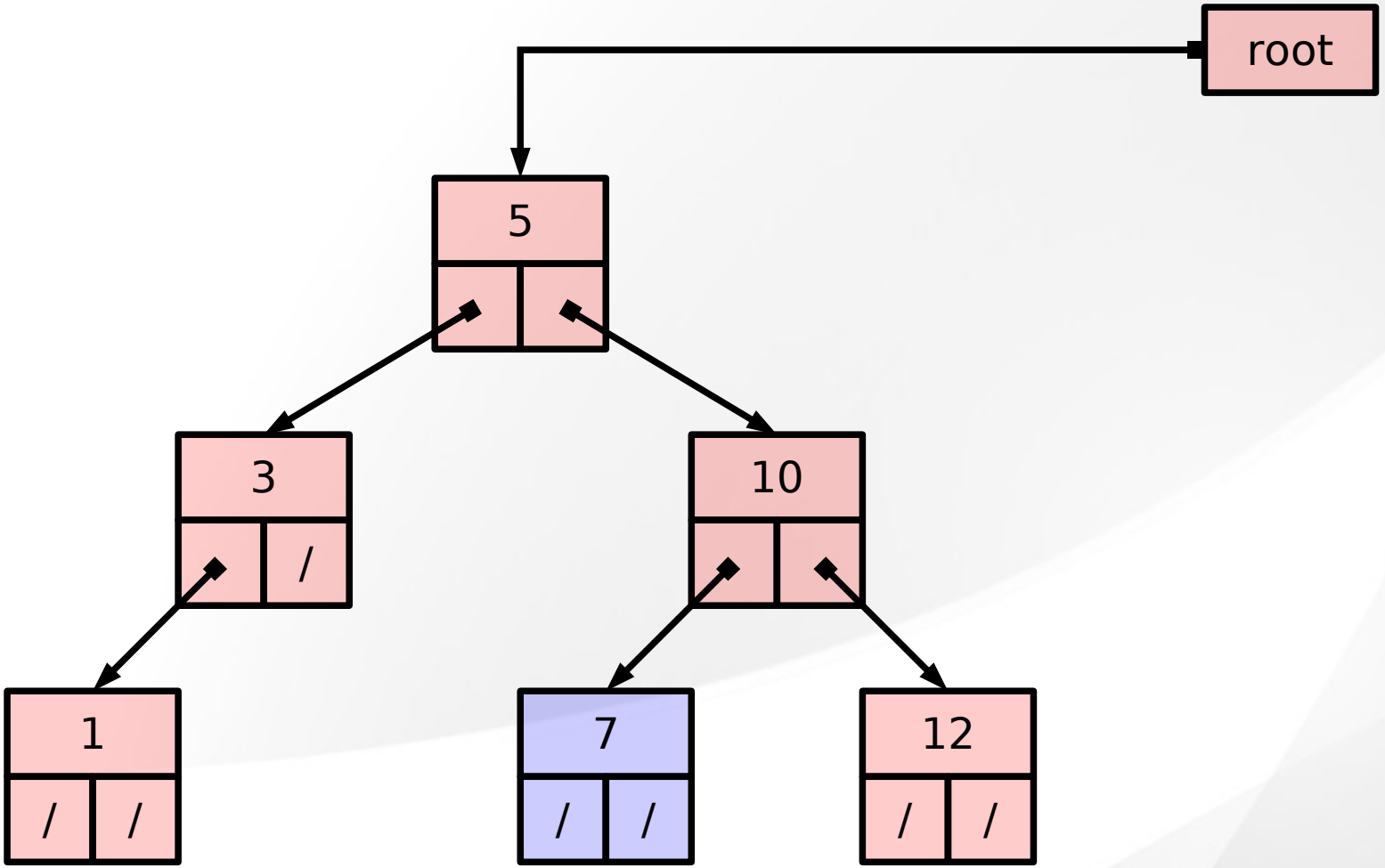


Inserimento



complessità O(h)

Inserimento



complessità O(h)

Inserimento (implementazione)

```
struct Nodo* inserisci(albero t, int key){
   struct Nodo* new = malloc(sizeof(struct Nodo));
    new->key=key;
    new->right=NULL; new->left=NULL;
    if(t==NULL){ return new; }
    struct Nodo* parent;
    struct Nodo* current=t;
    while(current!=NULL){
      parent=current;
      if(current->key<key) current=current->right;
      else current=current->left;
    }
    if(parent->key<key) parent->right=new;
    else parent->left=new;
    return t;
}
```

Inserimento (ricorsiva)

```
struct Nodo* inserisciRic(albero t,int key){
   if(t==NULL){
      struct Nodo* new= malloc(sizeof(struct Nodo));
      new->key=key;
      new->left=NULL;
      new->right=NULL;
      return new;
   }

   if(t->key<key) t->right=inserisciRic(t->right,key);
   else t->left=inserisciRic(t->left,key);

   return t;
}
```

Ricerca (implementazione)

```
int cerca(albero t, int key){
   int depth=0;
   struct Nodo* current=t;
   while(current!=NULL){
      if(key==current->key) return depth;
      if(current->key < key) current=current->right;
      else current=current->left;
      depth++;
  }
  return -1;
}
```

Ricerca (implementazione)

```
int cerca(albero t, int key){
   int depth=0;
   struct Nodo* current=t;
   while(current!=NULL){
      if(key==current->key) return depth;
      if(current->key < key) current=current->right;
      else current=current->left;
      depth++;
  }
  return -1;
}
```

complessità O(h)

Ricerca (ricorsiva)

```
int cercaRic(albero t,int key){

   if(t==NULL) return -1;

   if(t->key==key) return 0;

   int found=-1;

   if(t->key < key) found=cercaRic(t->right,key);
   else found=cercaRic(t->left,key);

   if(found>=0)return 1+found;
}
```