Implementing fast initialization and reviewing induction and trees

9/11/24

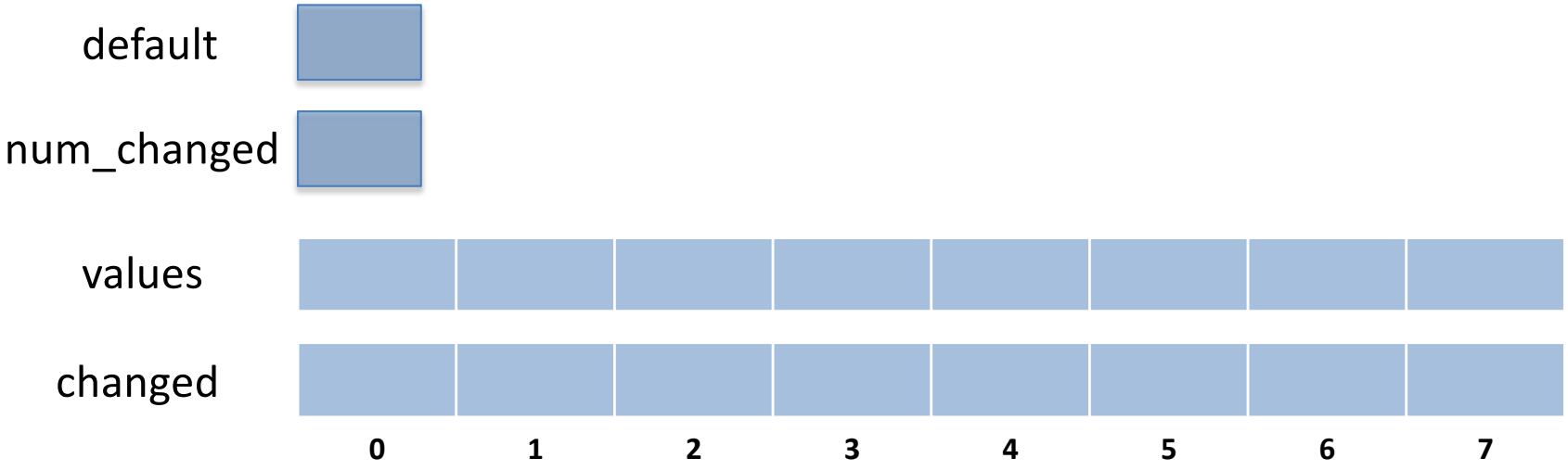
Administrivia

- Remember to review BSTs and take reading quiz BEFORE CLASS tomorrow

What we're trying to do

	Java arrays	**C arrays**	**Arrays w/ initialization**
Constructor	O(n)	O(1)	O(1)
Access	O(1)	O(1)	O(1)
Assign	O(1)	O(1)	O(1)
Initialize	O(n)	O(n)	O(1)

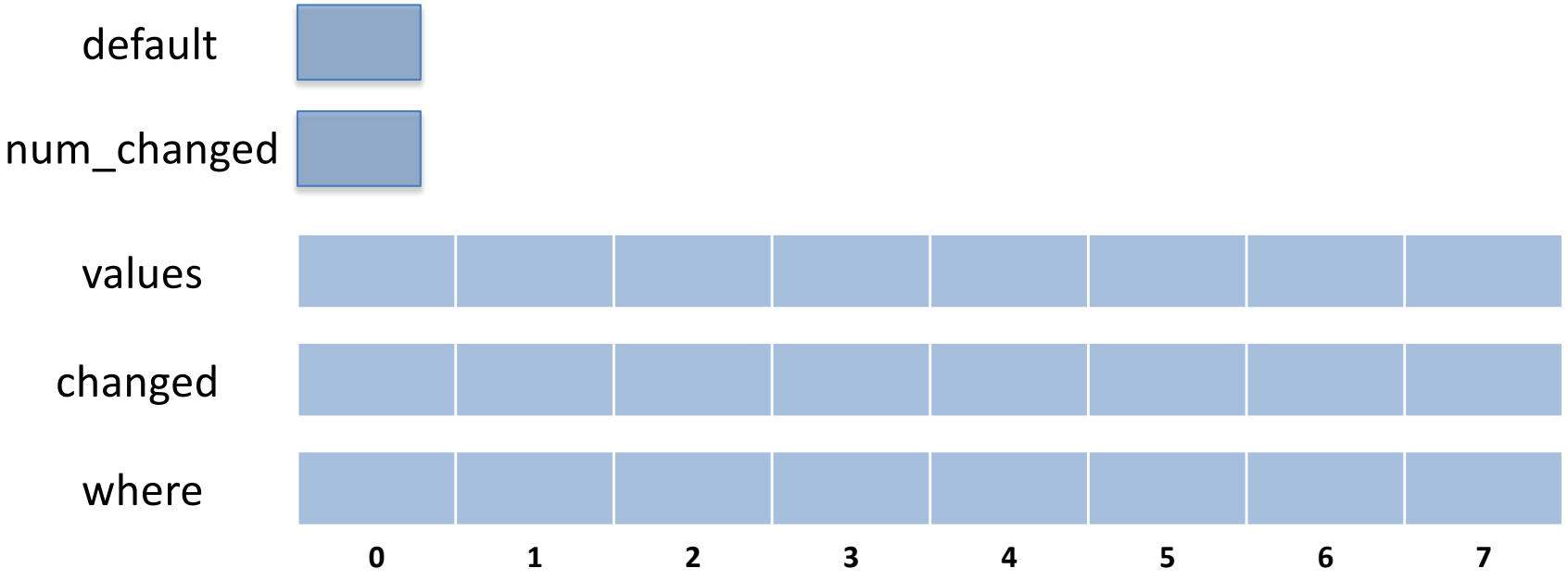
Where we were…



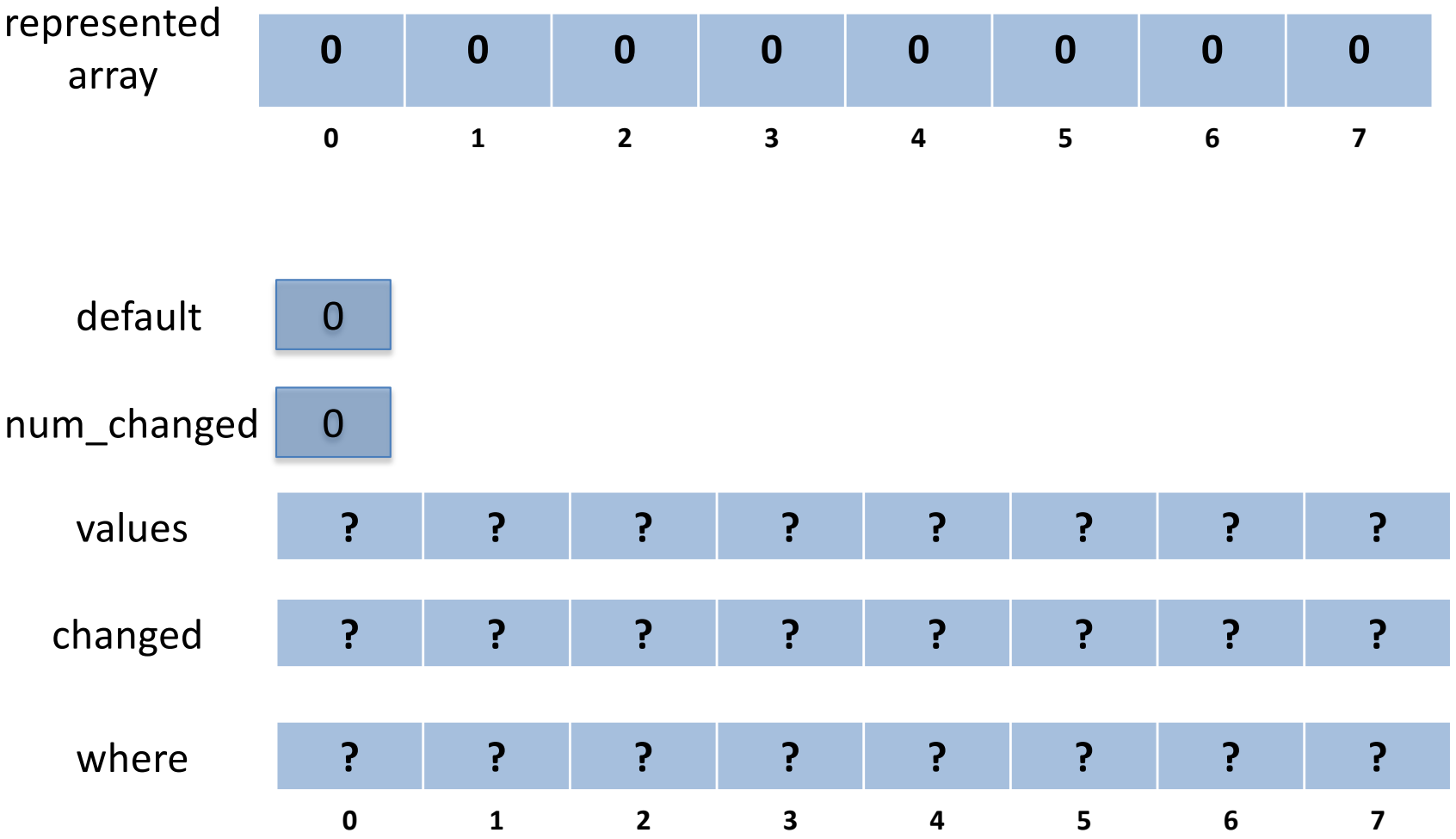
Idea 3: Store index locations

- Stores where in list each index occurs

(hint how to find the index)

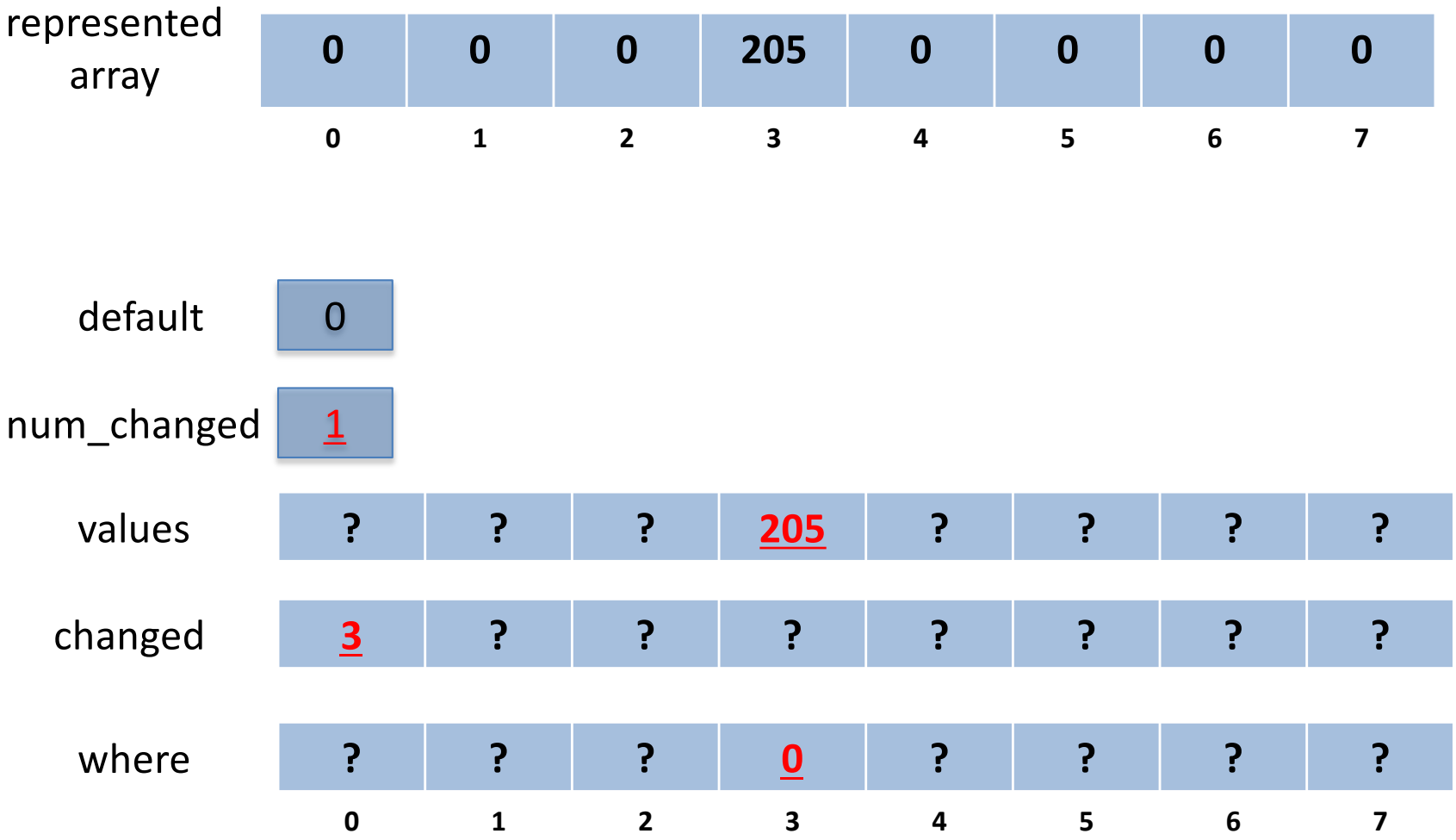


initialize(0)

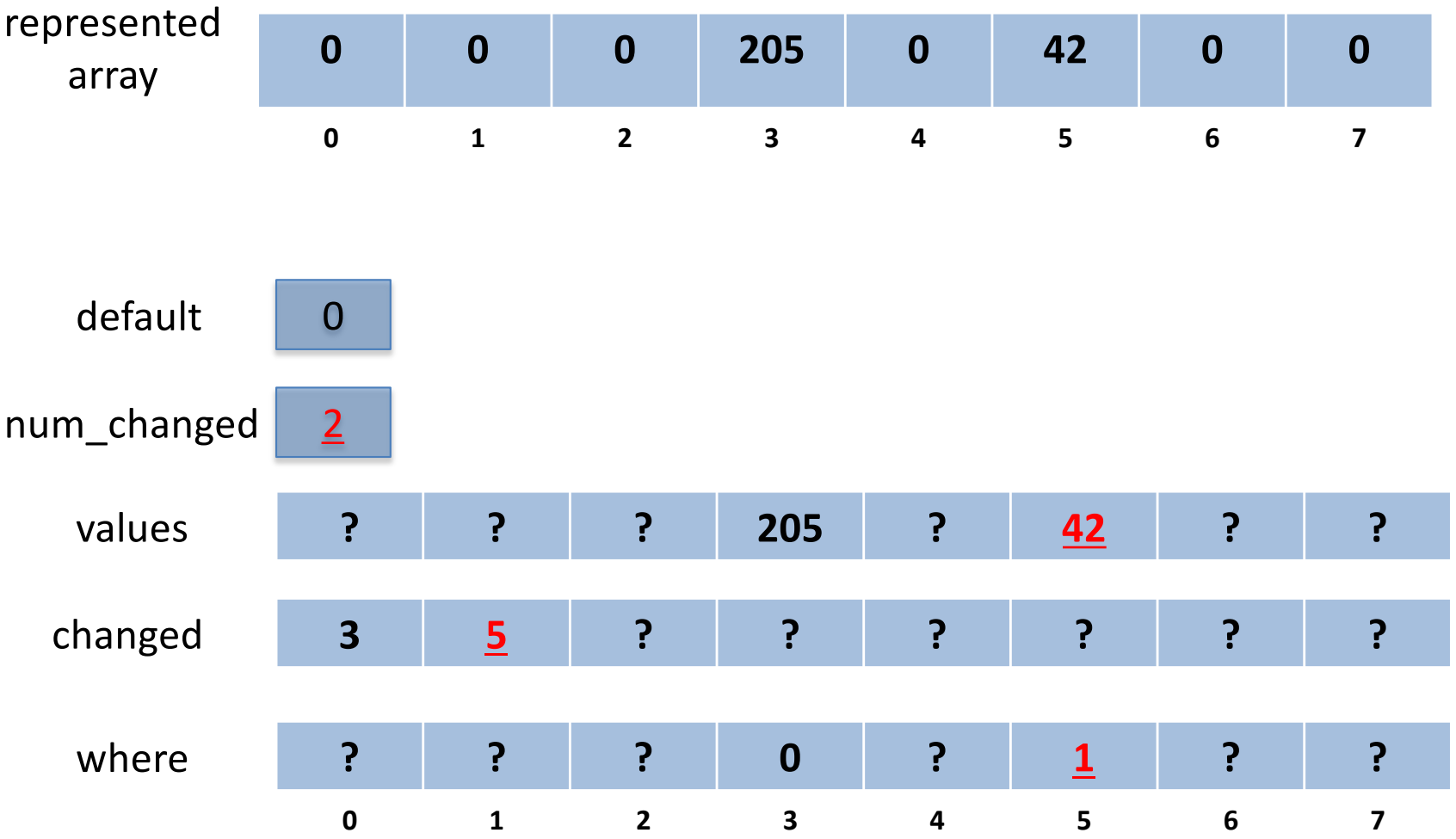


```
void initialize(value v) {
    default = v;
    num_changed = 0;
}
```

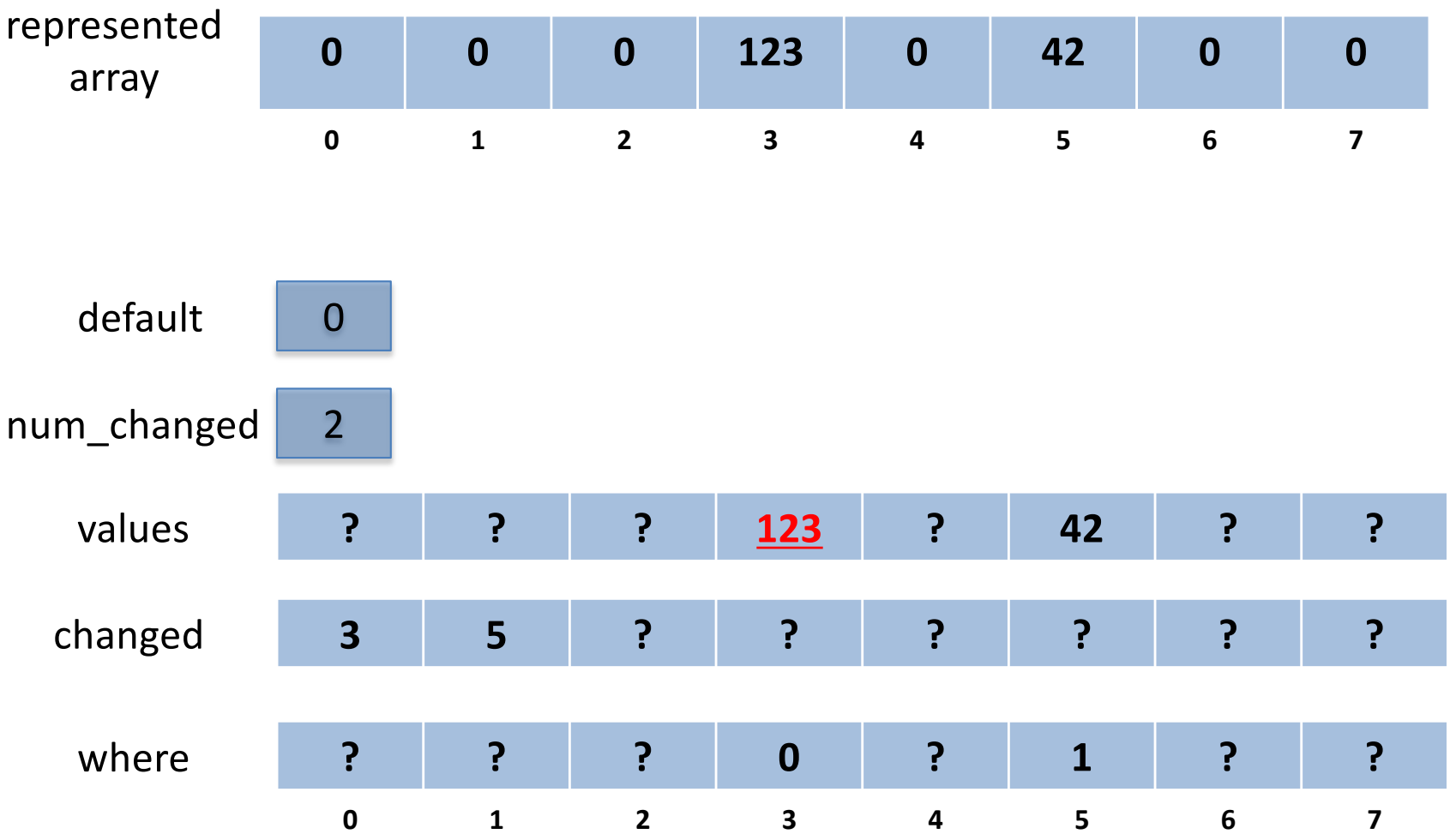
assign(index=3, value=205)



assign(index=5, value=42)



assign(index=3, value=123)

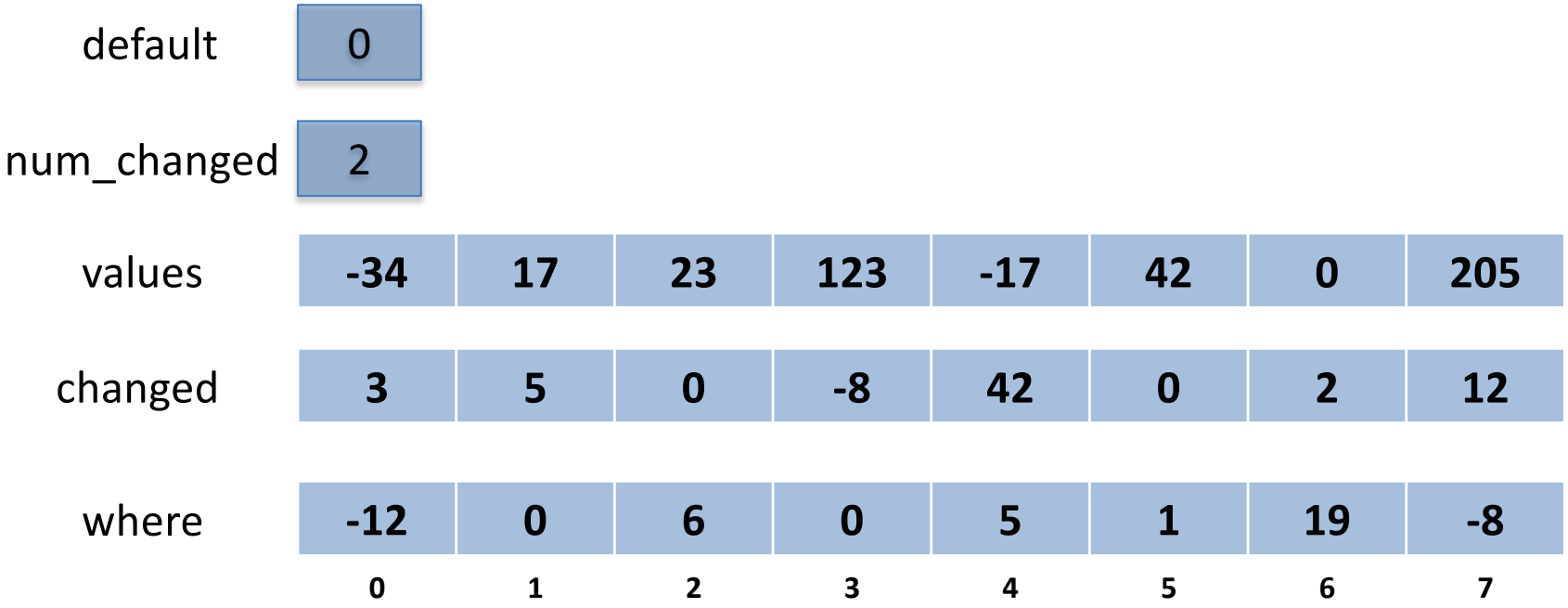


```
void assign(int index, value v) {    //set index^th cell to v
    values[index] = v;
    if(!valid(index)) {
        where[index] = num_changed;    //set hint
        changed[num_changed] = index;//add index to list
        num_changed++;
    }
}
```

valid(index): whether indexth cell updated since initialize

```
value access(int index) {
    //return contents of index^th cell
    if(valid(index))
        return values[index];
    else
        return default;
}
```

No such thing as an empty cell!



What does valid(0) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

What does valid(0) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

What does valid(2) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

What does valid(2) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

What does valid(1) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

What does valid(1) return?

A. True
B. False
C. Cannot be determined

default	0							
num_changed	2							
values	-34	17	23	123	-17	42	0	205
changed	3	5	0	-8	42	0	2	12
where	-12	0	6	0	5	1	19	-8
	0	1	2	3	4	5	6	7

```
boolean valid(int index) {
    //return whether index^th cell changed since last initialize

    return
        (where[index] >= 0) &&
        (where[index] < num_changed) &&
        (changed[where[index]] == index);
}
```

These three conditions suffice:

- First 2 mean that changed[where[index]] is an index changed since last initialize
- Third confirms that it is desired index