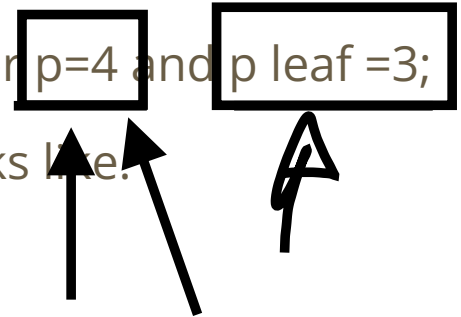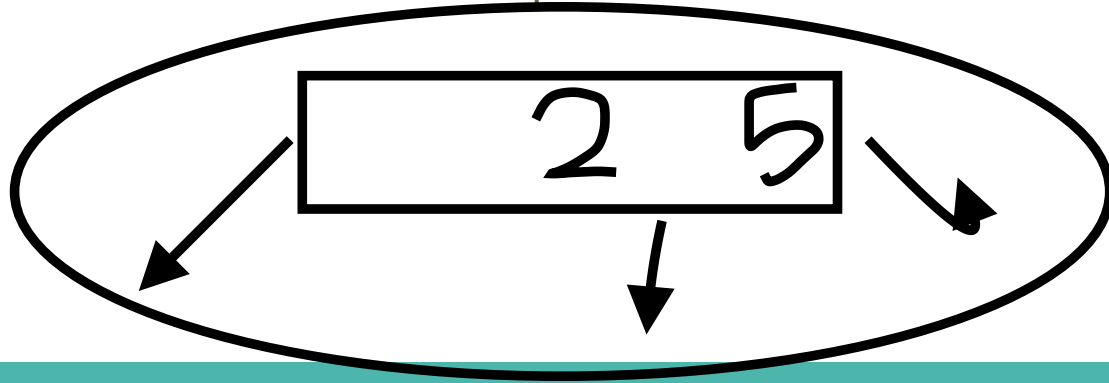# Sheet 02

B+-tree Question

Question 14.15

14.15 A PARTS file with Part# as key field includes records with the following Part# values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50, 69,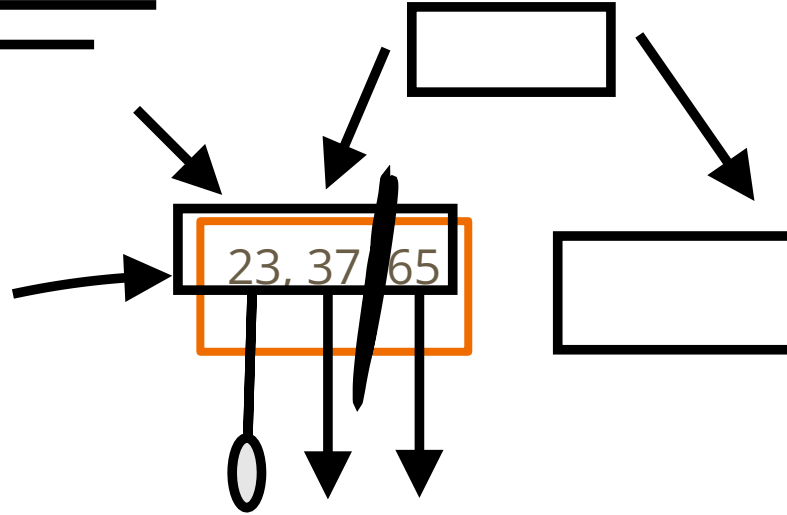 75, 8, 49, 33, 38. Suppose the search field values are inserted in the given order in a B + -tree of order p=4 and p leaf =3; show how the tree will expand and what the final tree looks like.
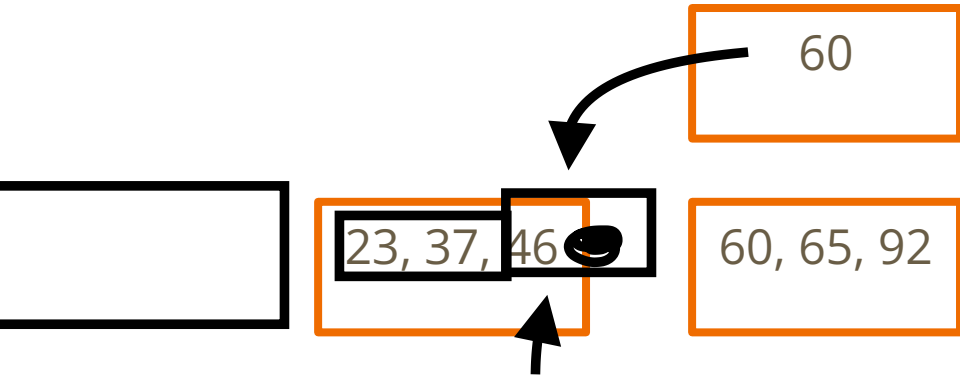
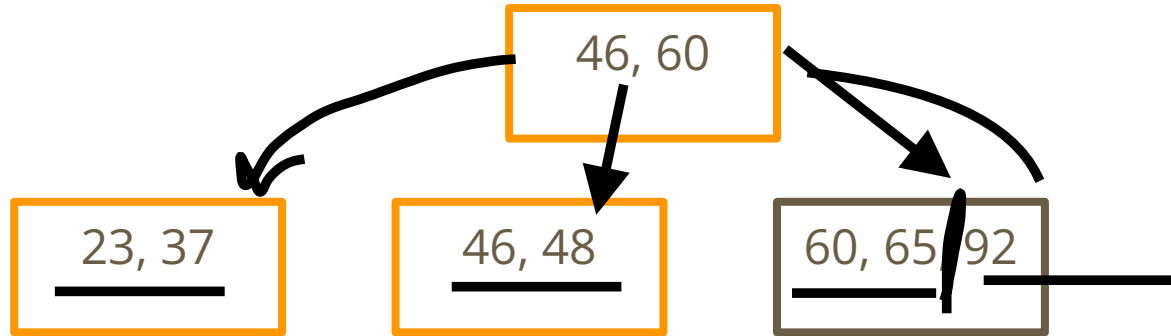# Insertion 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21

23, 65, 37

23, 37, 65

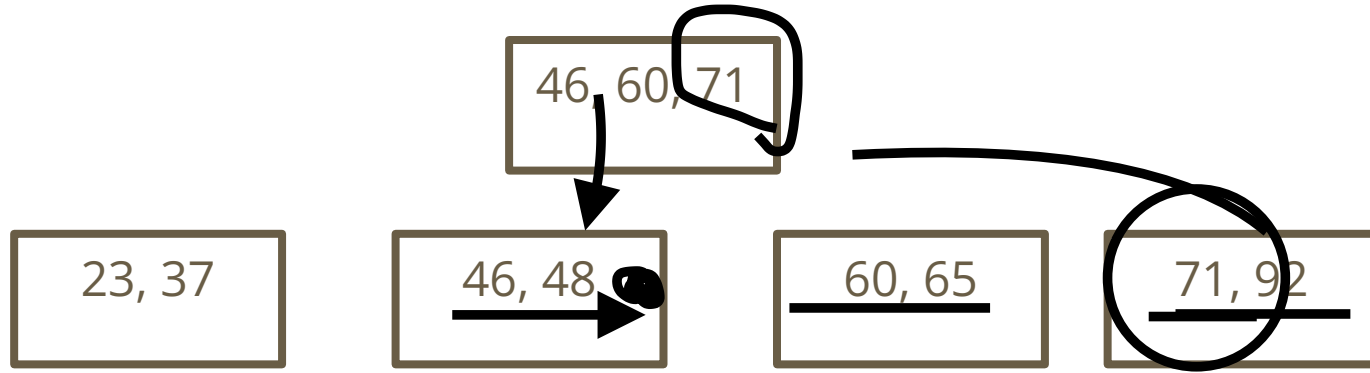# Insertion 60, 46, 92, 48, 71, 56, 59, 18, 21

60, 46, 92

Insertion 48, 71, 56, 59, 18, 21

48

Insertion 71, 56, 59, 18, 21

71

46, 60, 71

23, 37

46, 48

60, 65

71, 92

Insertion 71, 56, 59, 18, 21

71, 56

46, 60, 71

23, 37

46, 48, 56

60, 65

71, 92

Insertion 59, 18, 21

59

		46, 56, 60, 71			

23, 37	46, 48	56, 59	60, 65	71, 92

Insertion 59, 18, 21

59

56

46

60, 71

23, 37

46, 48

56, 59

60, 65

71, 92

Insertion 18, 21

18, 21

56

23, 46

60, 71

18, 21

23, 37

46, 48

56, 59

60, 65

71, 92
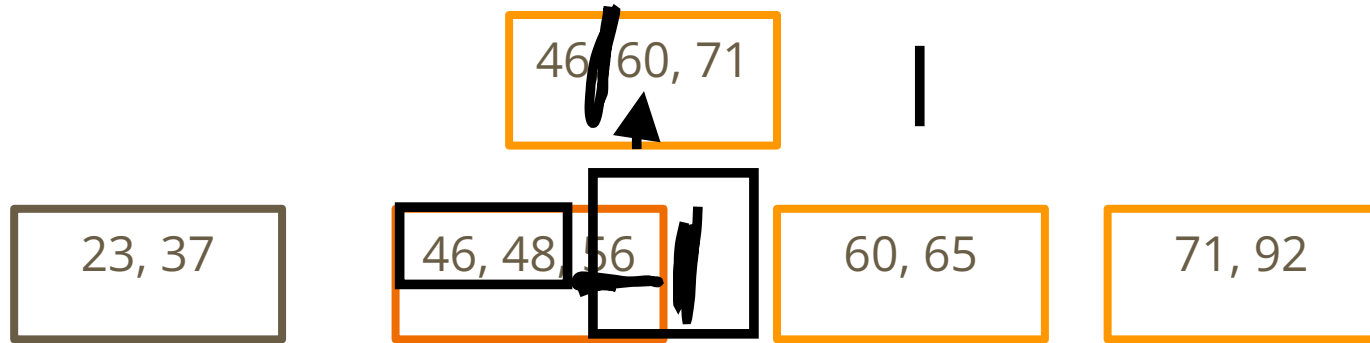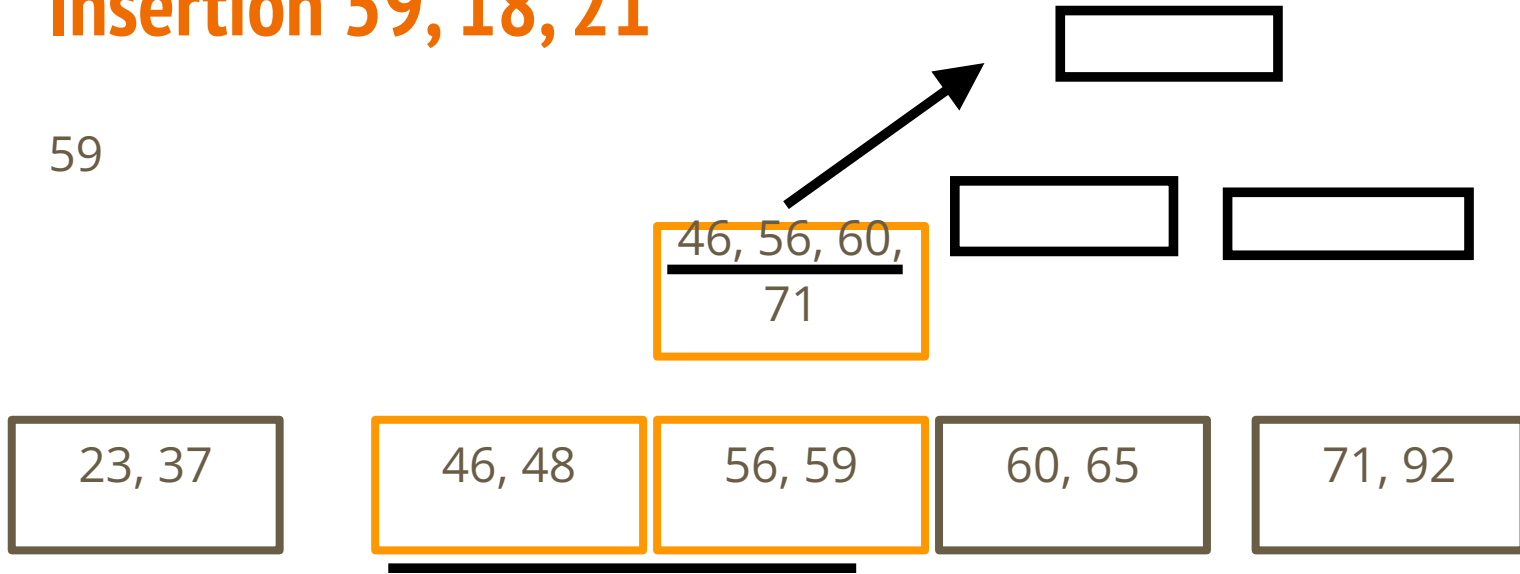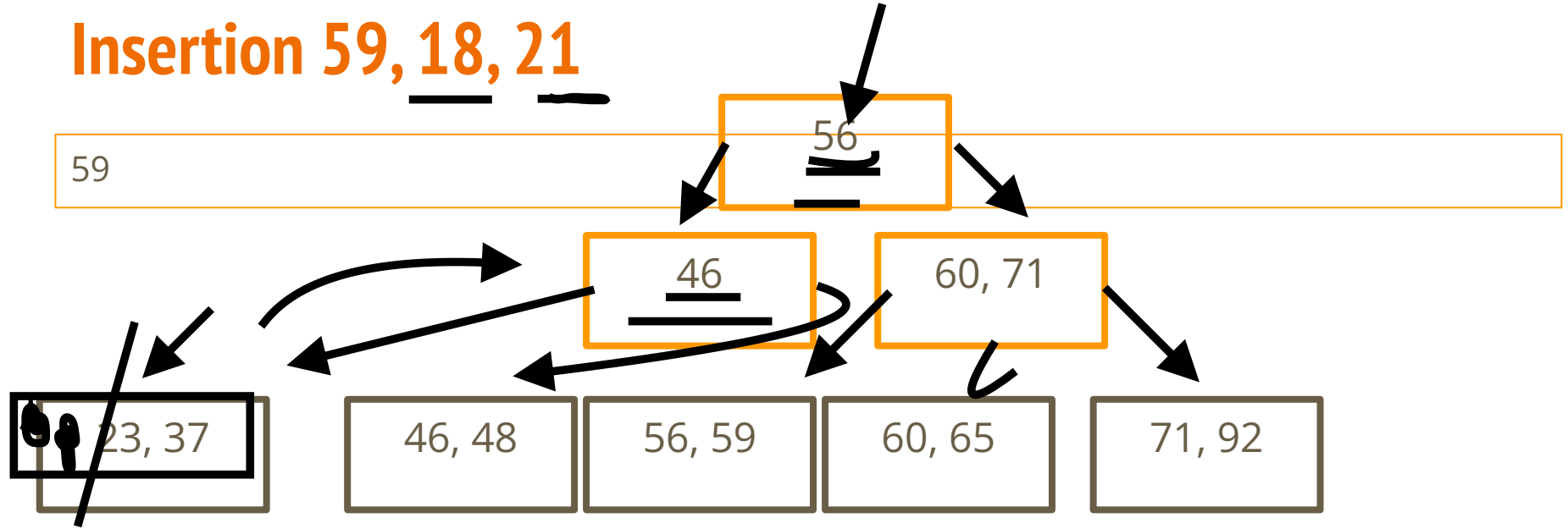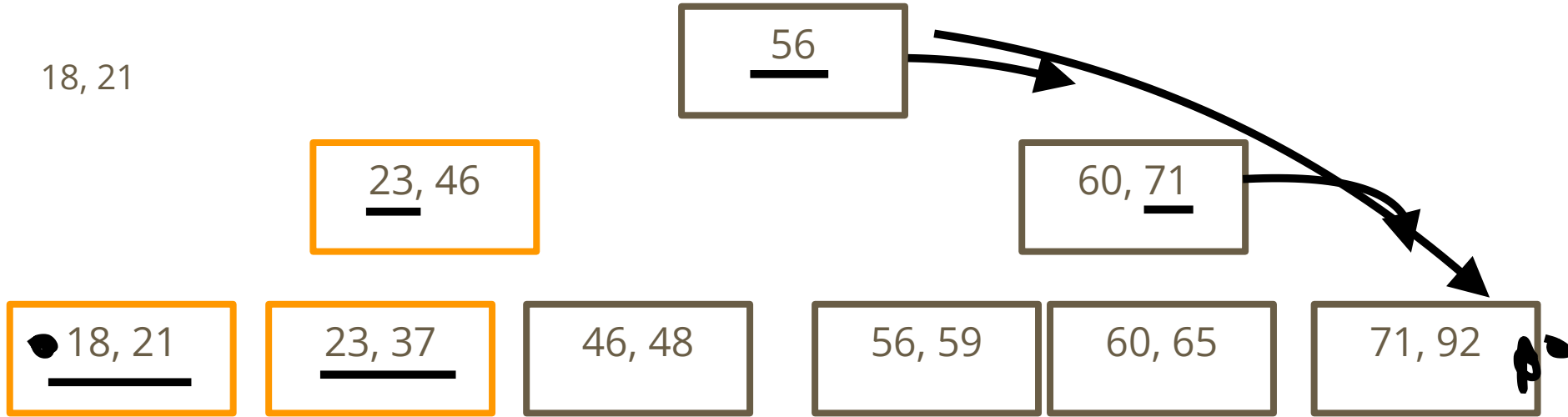
Insertion 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50

10, 74

56

| 23, 46 | | 60, 71 |

| 10 18, 21 | 23, 37 | 46, 48 | 56, 59 | 60, 65 | 71 74 92 |
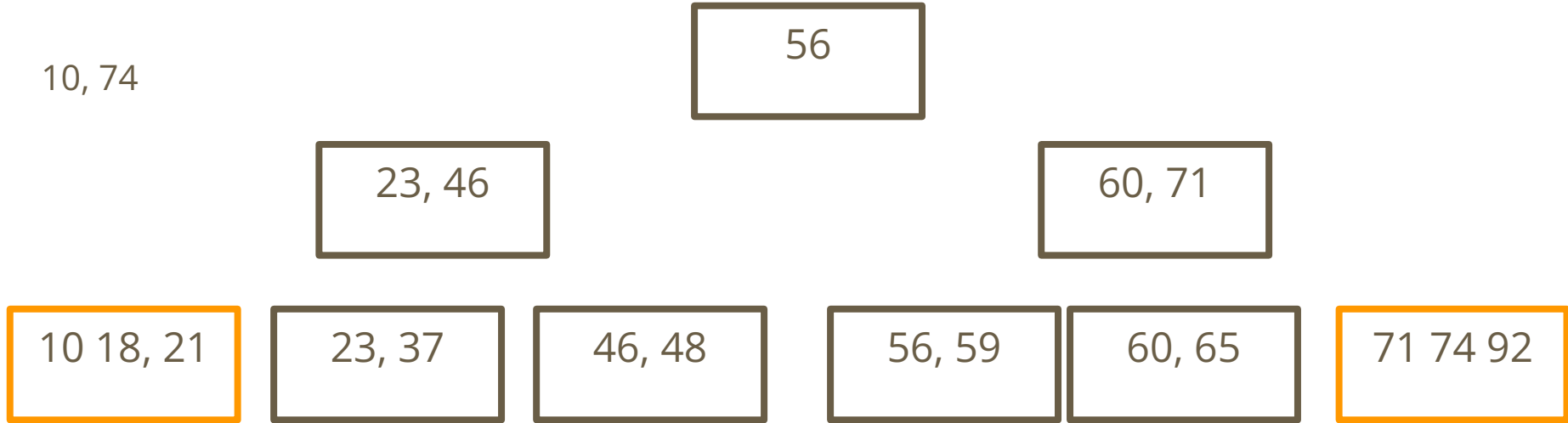
Insertion 78, 15, 16, 20, 24, 28, 39, 43, 47, 50

78

56

23, 46		60, 71 78

10 18, 21	23, 37	46, 48	56, 59	60, 65	71 74

78 92

Continue By Yourself

Question 14.17

14.17 Suppose the following search field values are deleted in the given order from the B + -tree of Exercise 14.15, show how the tree will shrink and show the final tree. The deleted values are: 65, 75, 43, 18, 20, 92, 59, 37, 10.

Question 14.17

14.17 Suppose the following search field values are deleted in the given order from the B + -tree of Exercise 14.15, show how the tree will shrink and show the final tree. The deleted values are: 18, 78, 56, 23, 21, 60, 65, 10, 46
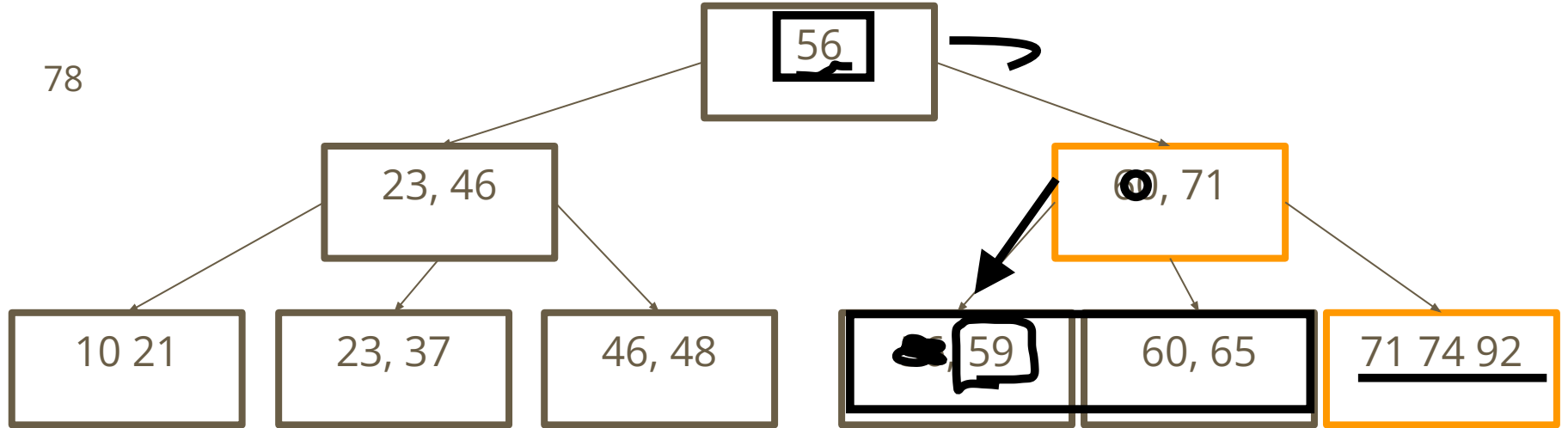
Delete 18, 78, 56, 23, 21, 60, 65, 10, 46

```
                                    56

            23, 46                                      60, 71 78

  10   , 21      23, 37     46, 48        56, 59     60, 65      71 74


                                                              78 92
```
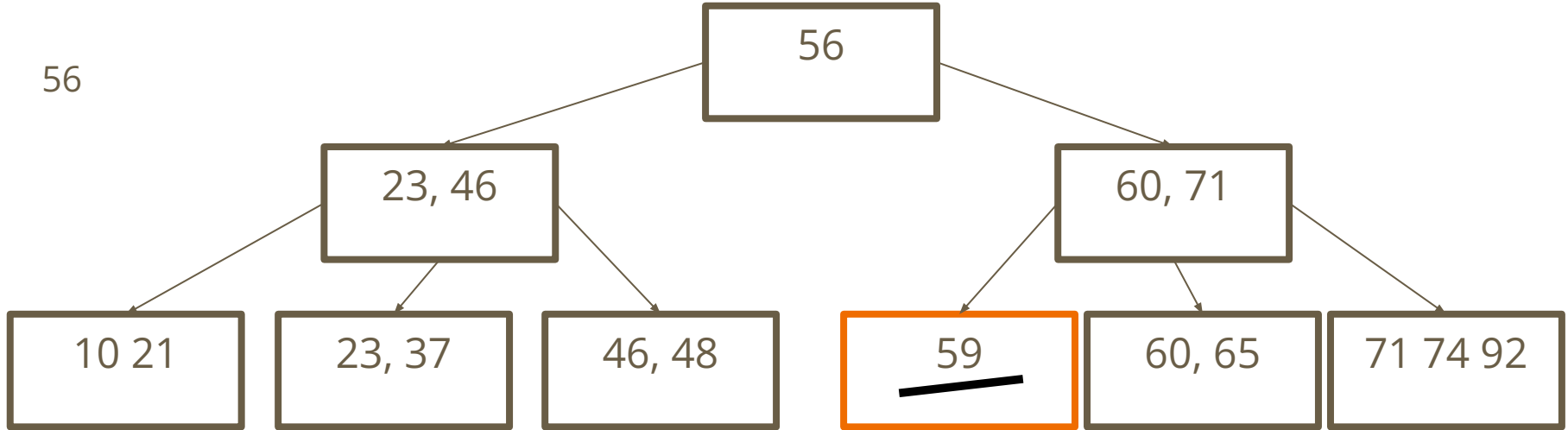
Delete 18, 78, 56, 23, 21, 60, 65, 10, 46

18 78

```
                                    56

        23, 46                              60, 71 78

10 21      23, 37    46, 48      56, 59    60, 65    71 74

                                                          92
```
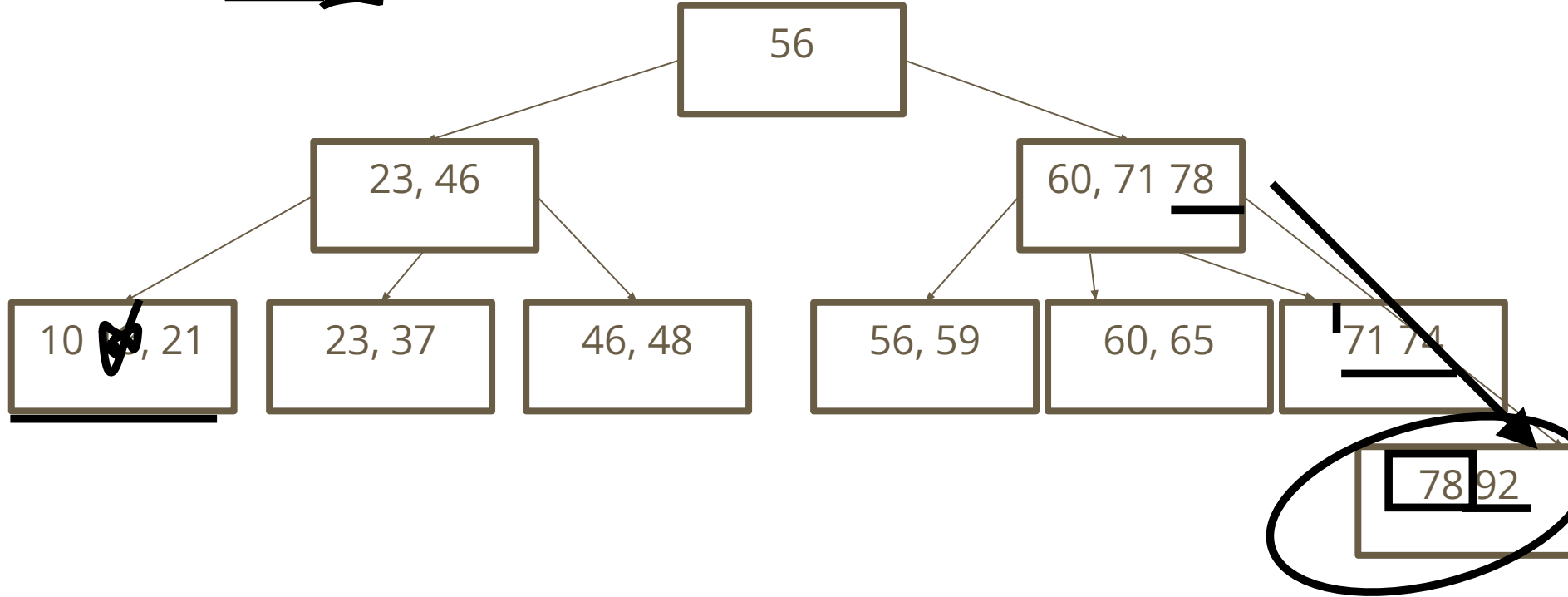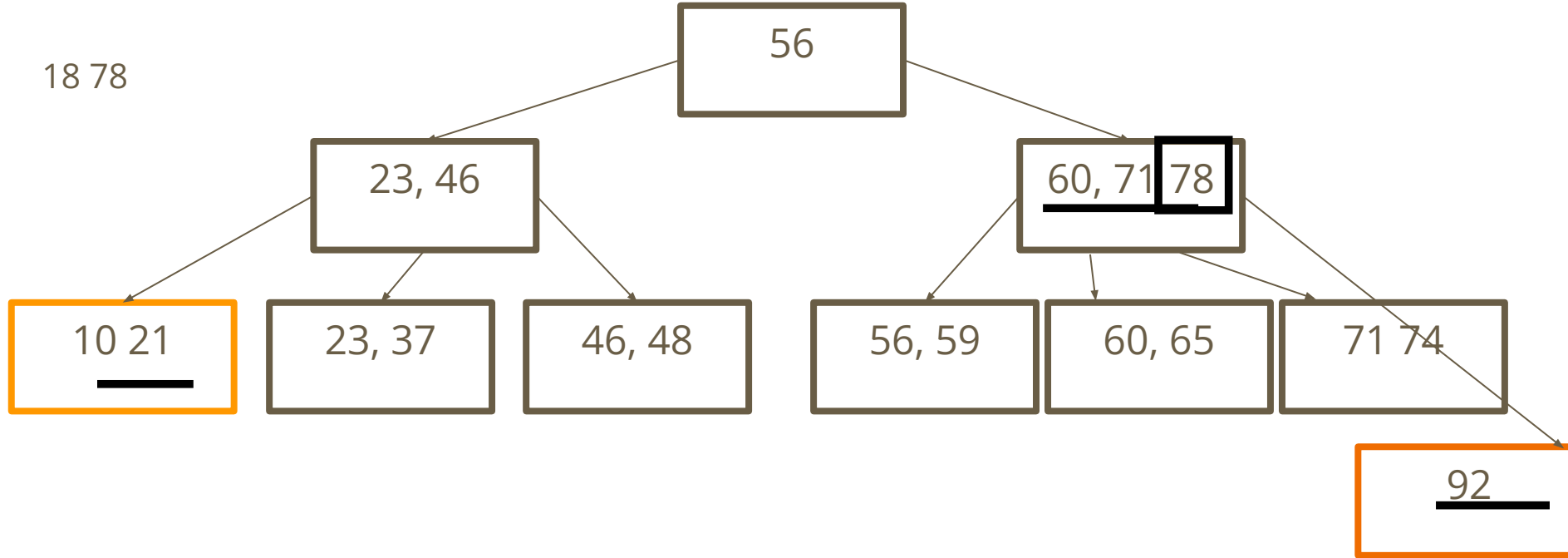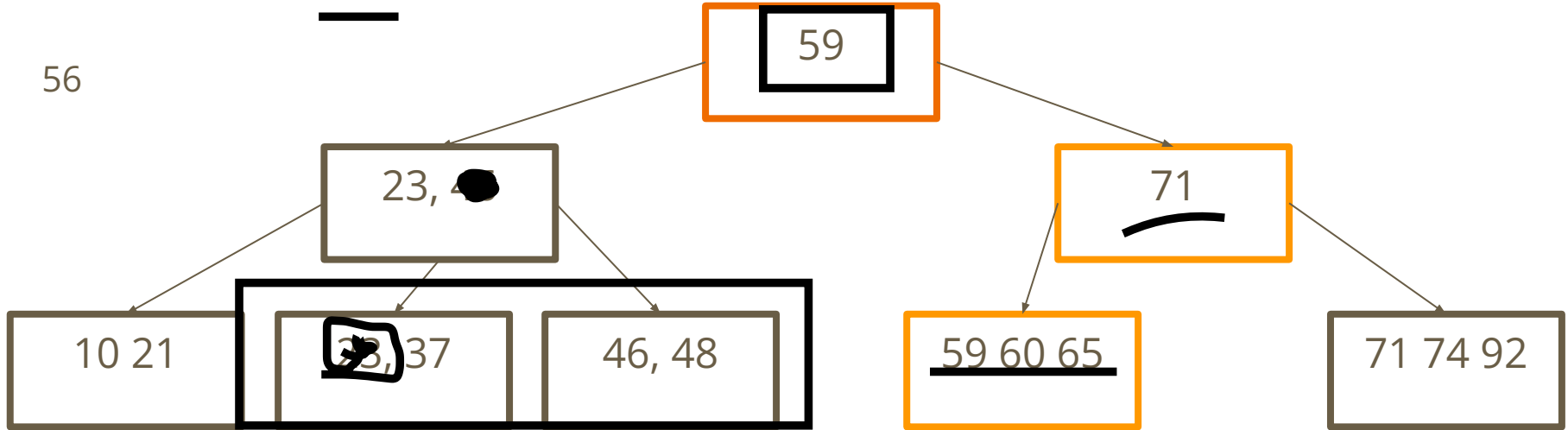
Delete 78, 56, 23, 21, 60, 65, 10, 46

78

Delete 56, 23, 21, 60, 65, 10, 46

56

```
                              ┌──────────┐
                              │    56    │
                              └──────────┘
                   ┌─────────────┐     ┌─────────────┐
                   │   23, 46    │     │   60, 71    │
                   └─────────────┘     └─────────────┘
        ┌────────┐  ┌────────┐  ┌────────┐   ┌────────┐  ┌────────┐  ┌──────────┐
        │ 10 21  │  │ 23, 37 │  │ 46, 48 │   │   59   │  │ 60, 65 │  │ 71 74 92 │
        └────────┘  └────────┘  └────────┘   └────────┘  └────────┘  └──────────┘
```

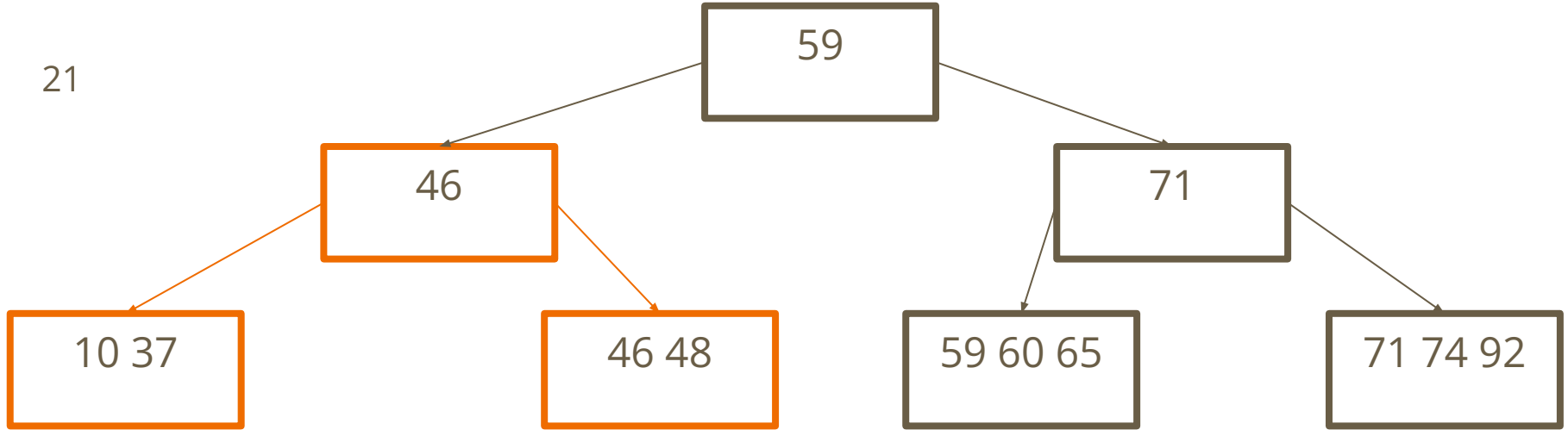# Delete 56, 23, 21, 60, 65, 10, 46
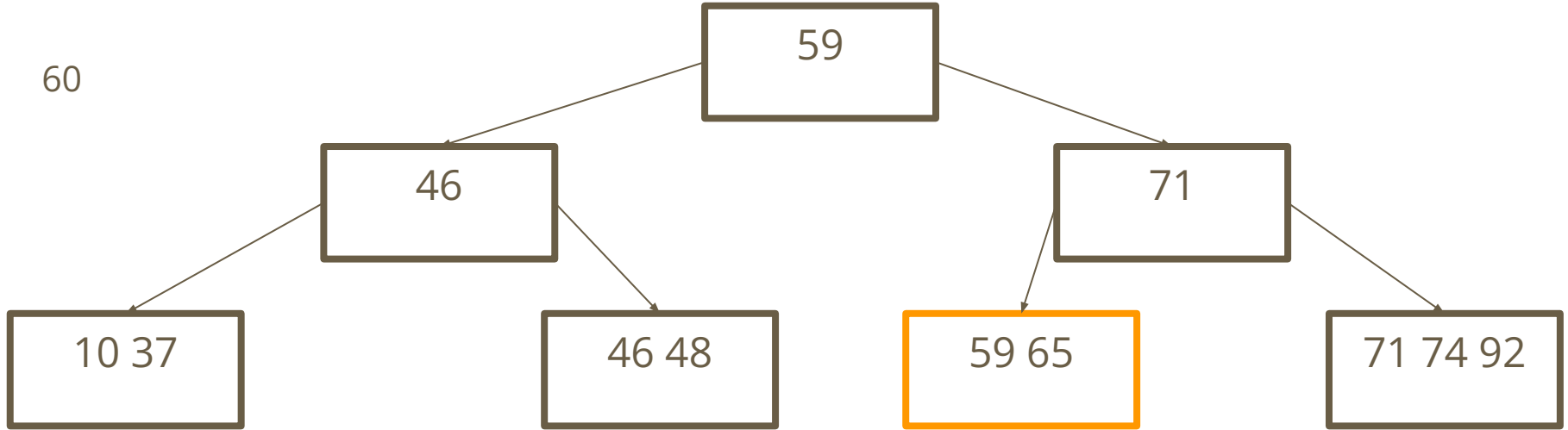
56

Delete 23, 21, 60, 65, 10, 46
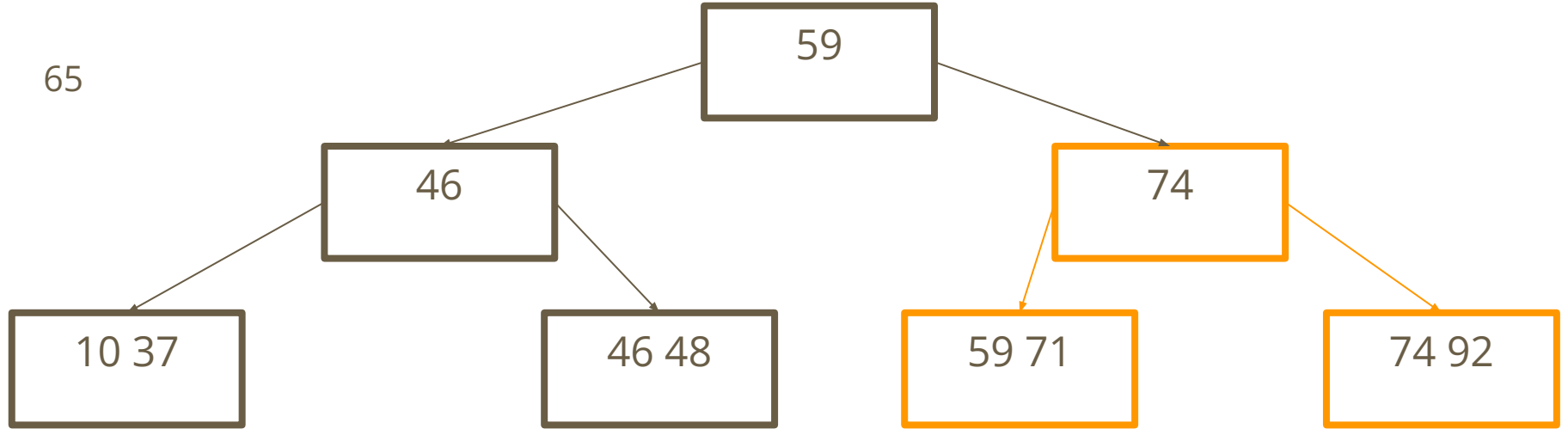
23
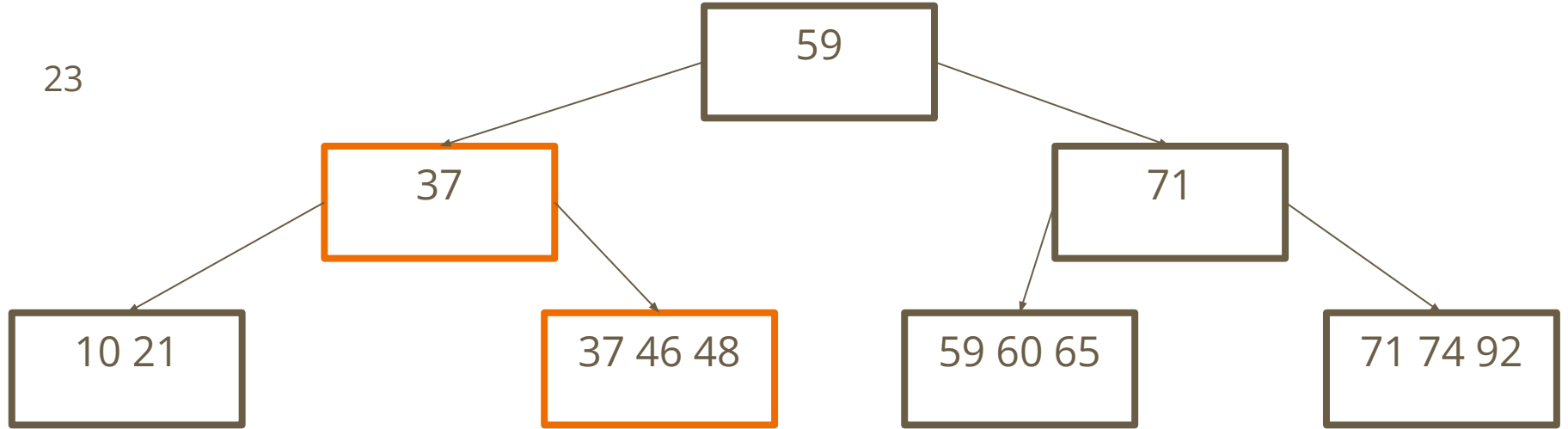
Delete 21, 60, 65, 10, 46

21

Delete 60, 65, 10, 46

60

Delete 65, 10, 46

65

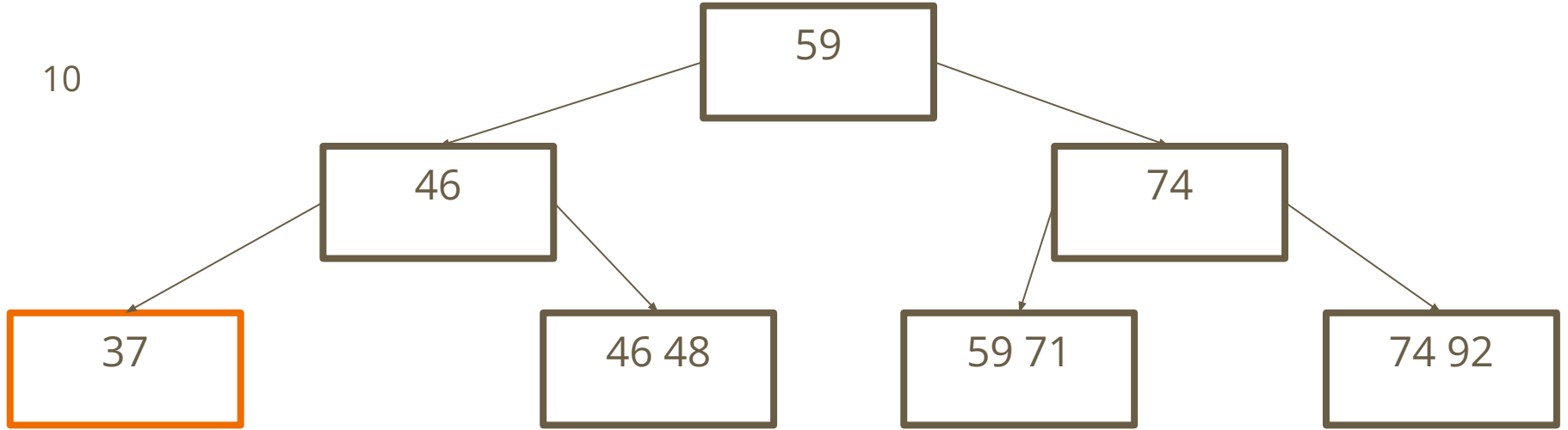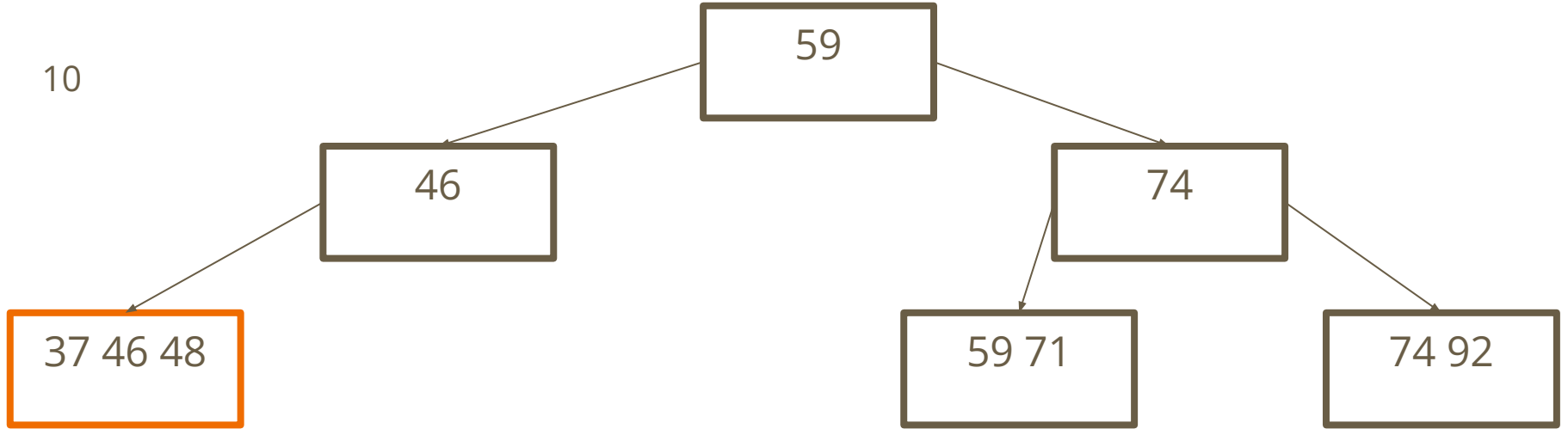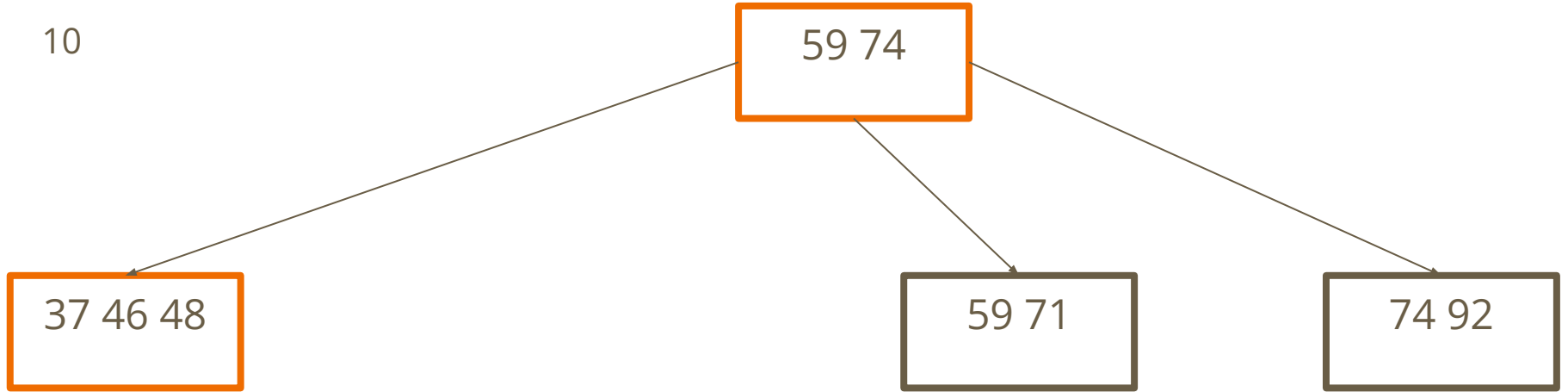# Delete 10, 46

10

Delete 10, 46

10

Delete 10, 46

10

Delete 46

46