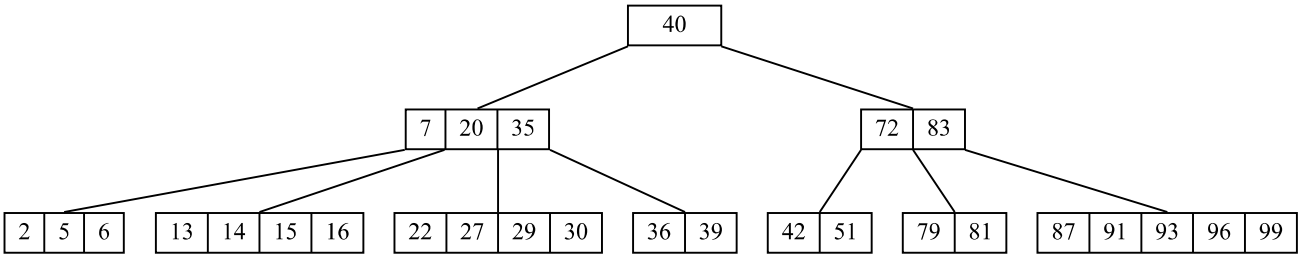
Deletions in B-Trees

Deletes a B-tree of degree (order) = 3

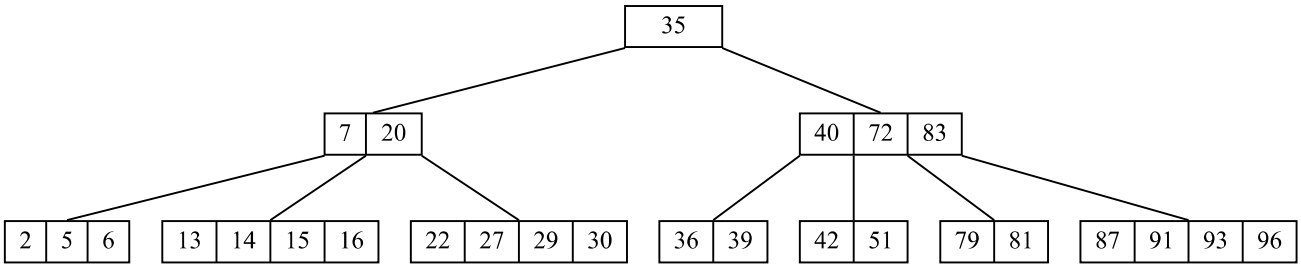
Method used: deletions with transformations in going down (precaution principle)

In [1]:
```
from btrees_classics import delete
from algopy.btree import BTree, display2, fromlist
BTree.degree = 3
```

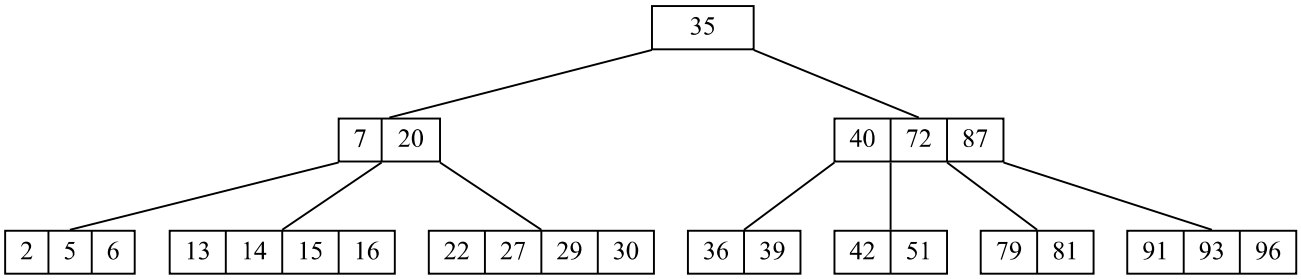
In [2]:
```
B = fromlist('(<40>(<7,20,35>(<2,5,6>)(<13,14,15,16>)(<22,27,29,30>)(<36,39>))(<72,83
>(<42,51>)(<79,81>)(<87,91,93,96,99>)))', 3)
display2(B)
```



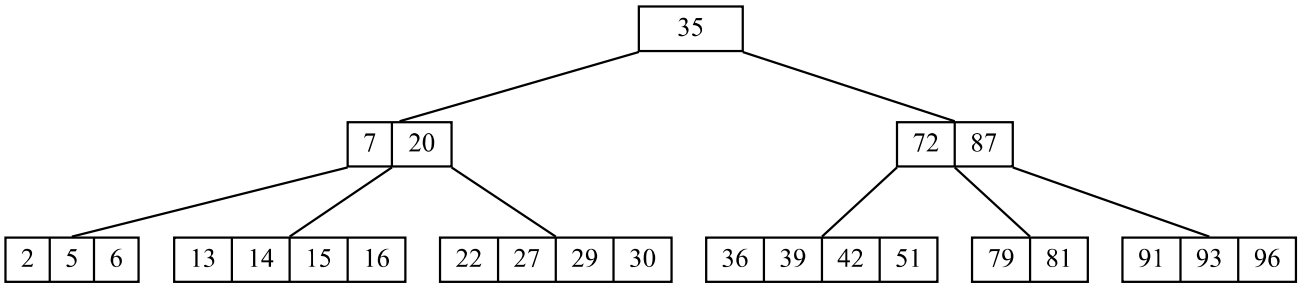
In [3]:
```
B = delete(B, 99)  # simple leaf deletion (precaution principle: right rotation child
0 -> 1)
display2(B)
```



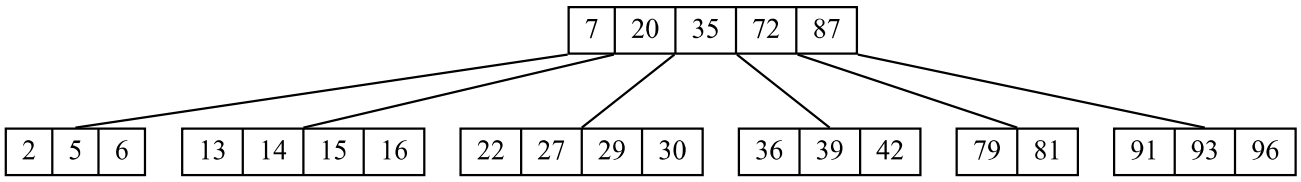
In [4]:
```
B = delete(B, 83)  # 83 replaced by 87 -> 87 in leaf deleted
display2(B)
```



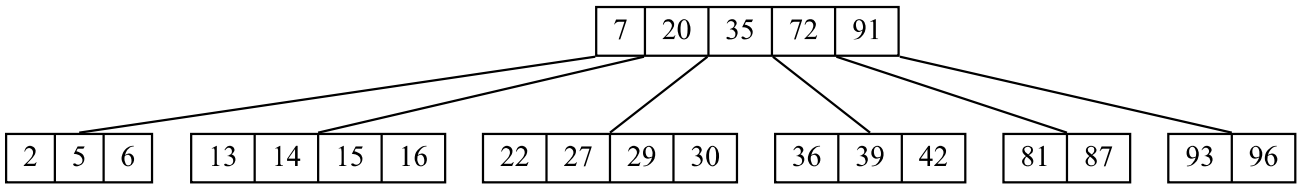
In [5]:
```
B = delete(B, 40)  # 40 in internal node: its children 0 and 1 are merged, 40 deleted in the result
display2(B)
```



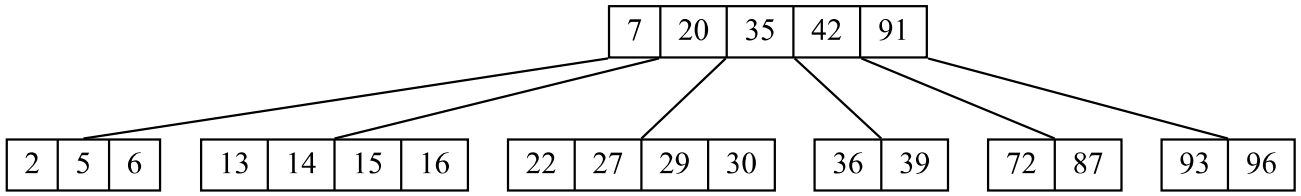
In [6]:
```
B = delete(B, 51)  # children 0 and 1 merged, the root is now the result
display2(B)
```



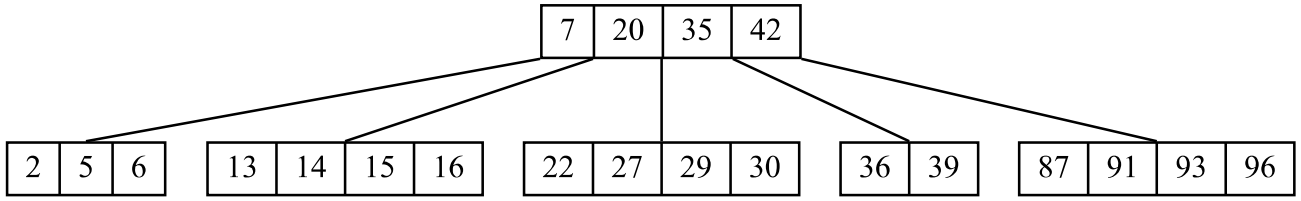
In [7]:
```
B = delete(B, 79)  # left rotation
display2(B)
```



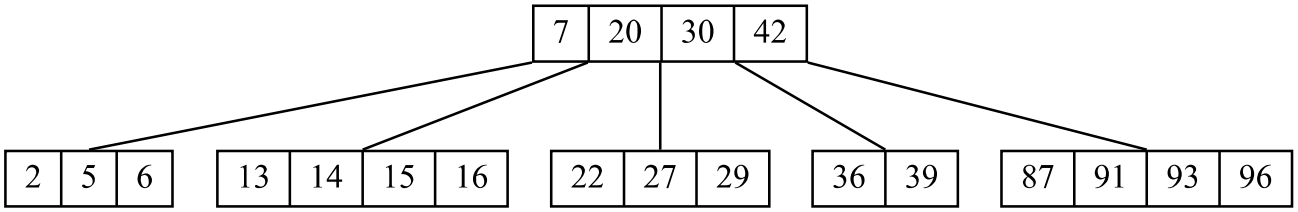
In [8]:
```
B = delete(B, 81)  # right rotation
display2(B)
```



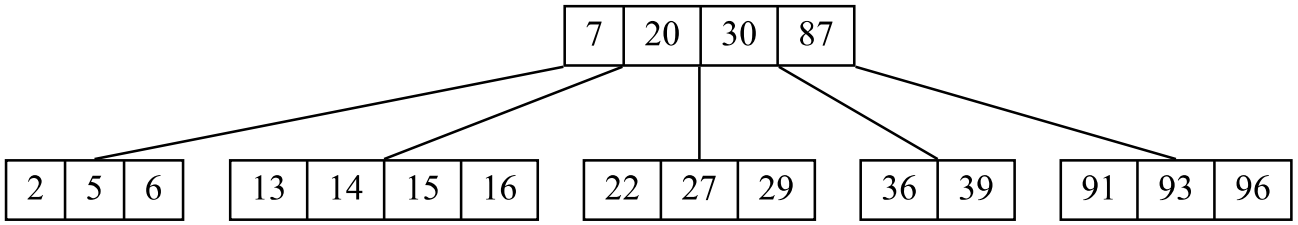
In [9]:
```
B = delete(B, 72)  # merge
display2(B)
```



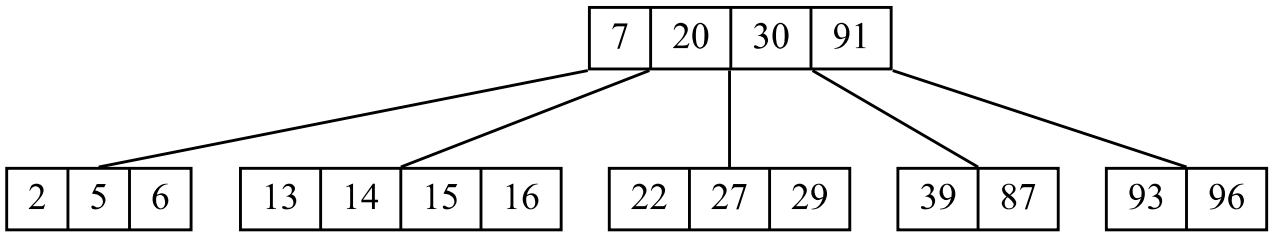
In [10]:
```
B = delete(B, 35)  # 35 replaced by 30, 30 in leaf deleted
display2(B)
```



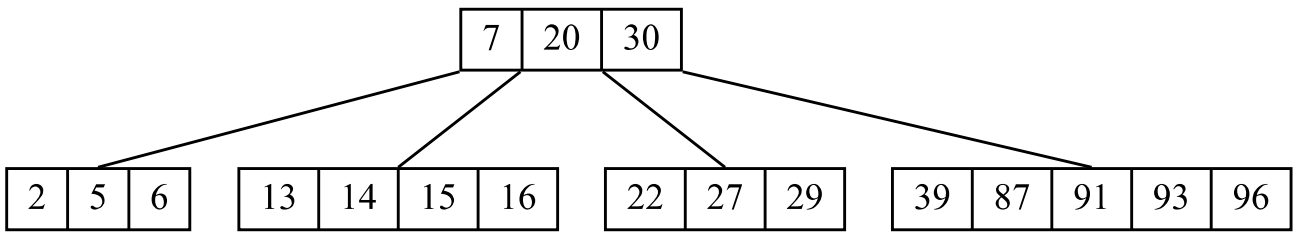
In [11]:
```
B = delete(B, 42)  # 42 replaced by 87, 87 in leaf deleted
display2(B)
```



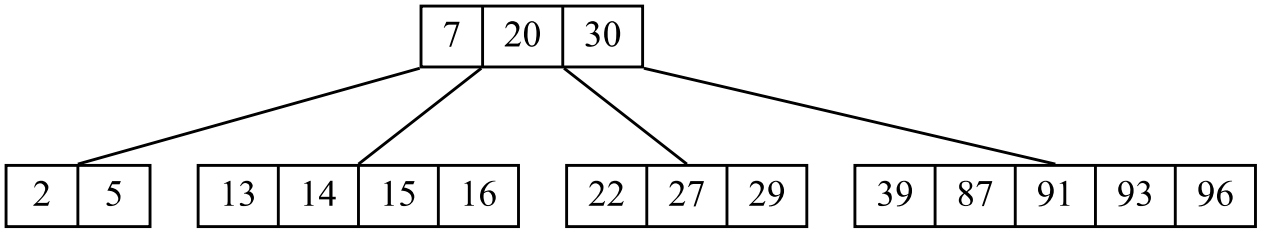
In [12]:
```
B = delete(B, 36)  # left rotation
display2(B)
```



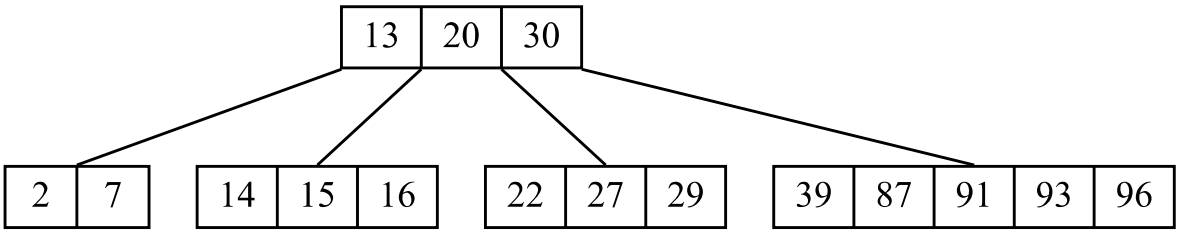
In [13]:
```
B = delete(B, 99)  # non-existant key deletion, children 3 and 4 are merged
display2(B)
```



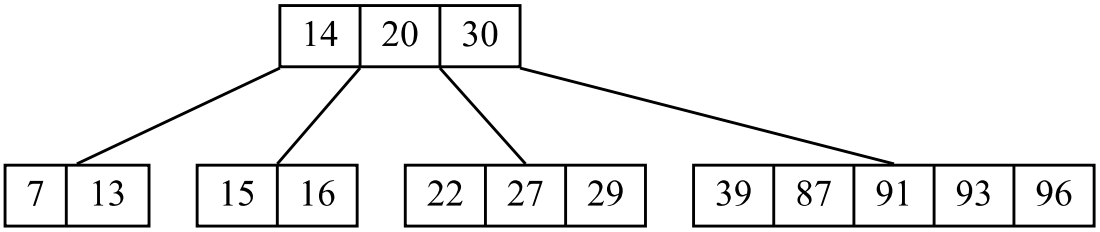
In [14]:
```
B = delete(B, 6)
display2(B)
```



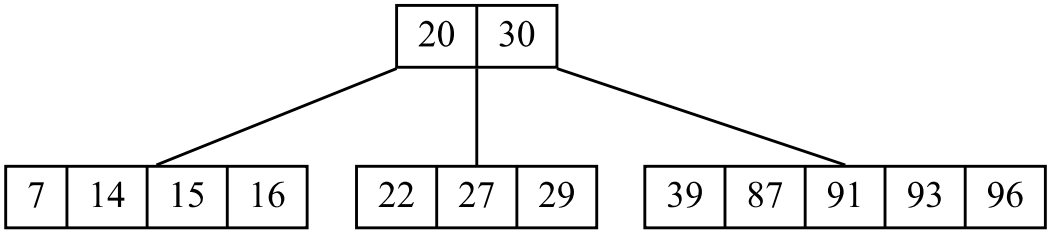
In [15]:
```
B = delete(B, 5)  # left rotation
display2(B)
```



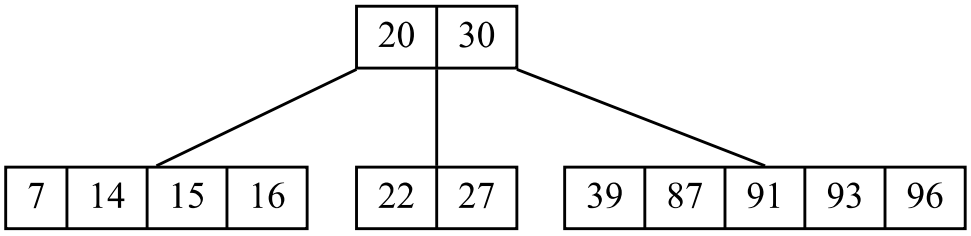
In [16]:
```
B = delete(B, 2)  # left rotation
display2(B)
```



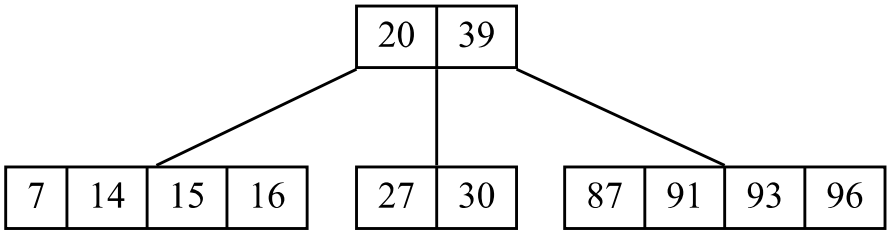
In [17]:
```
B = delete(B, 13)  # merge
display2(B)
```



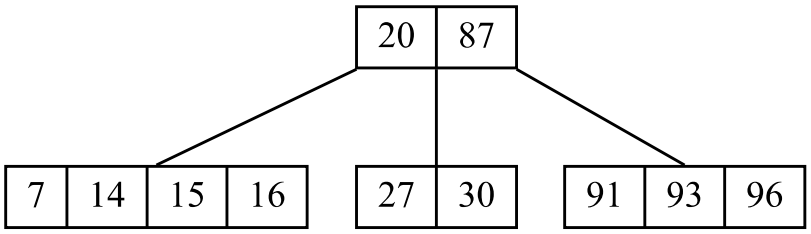
In [18]:
```
B = delete(B, 29)
display2(B)
```



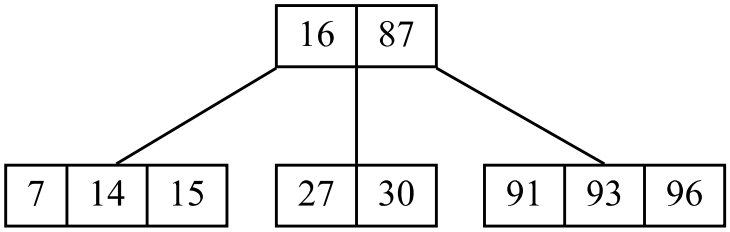
In [19]:
```
B = delete(B, 22)  # left rotation
display2(B)
```



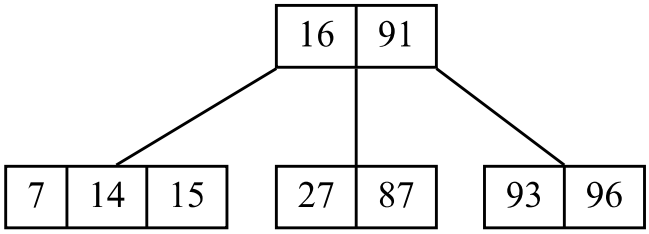
In [20]:
```
B = delete(B, 39)  # 39 replaced by 87, 87 in, leaf deleted
display2(B)
```



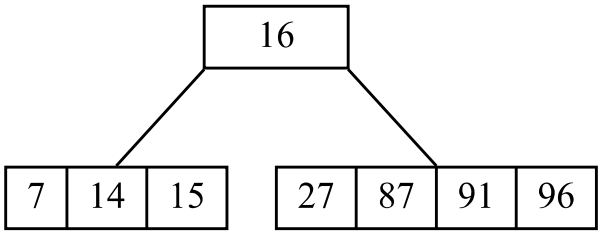
In [21]:
```
B = delete(B, 20)  # 20 replaced by 16, 16 in leaf deleted
display2(B)
```



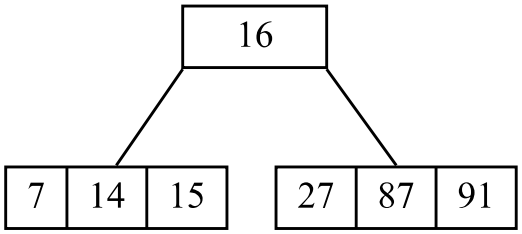
In [22]:
```
B = delete(B, 30)  # left-rotation
display2(B)
```



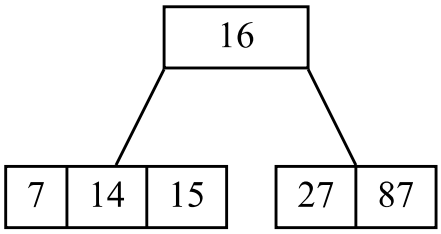
In [23]:
```
B = delete(B, 93)  # merge
display2(B)
```



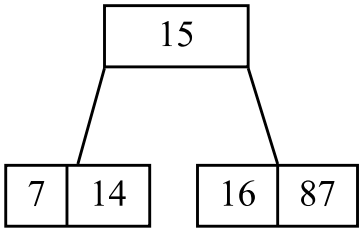
In [24]:
```
B = delete(B, 96)
display2(B)
```



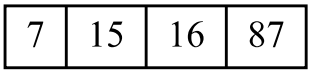
In [25]:
```
B = delete(B, 91)
display2(B)
```



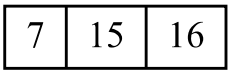
In [26]:
```
B = delete(B, 27) # right rotation
display2(B)
```



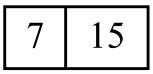
In [27]:
```
B = delete(B, 14) # merge -> new root
display2(B)
```



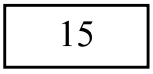
In [28]:
```
B = delete(B, 87)
display2(B)
```



In [29]:
```
B = delete(B, 16)
display2(B)
```



In [30]:
```
B = delete(B, 7)
display2(B)
```



In [31]:
```
B = delete(B, 15)
print(B)
```

```
None
```

In [ ]: