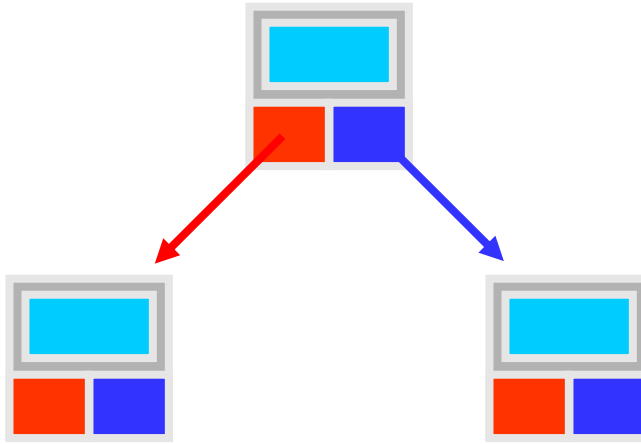


# **PRE-ORDER TRAVERSAL**

# Outline of Pre-Order Traversal

---

- **Three principle steps:**
  - Do work (**Current**)
  - Traverse **Left**
  - Traverse **Right**
- **Work can be anything**
- **Separate work from traversal**



- Traverse the tree "Pre-order":
  - Visit the current and do work
  - Visit the tree's **left sub-tree**
  - Visit **right sub-tree**

# Pre-Order Traversal Procedure

---

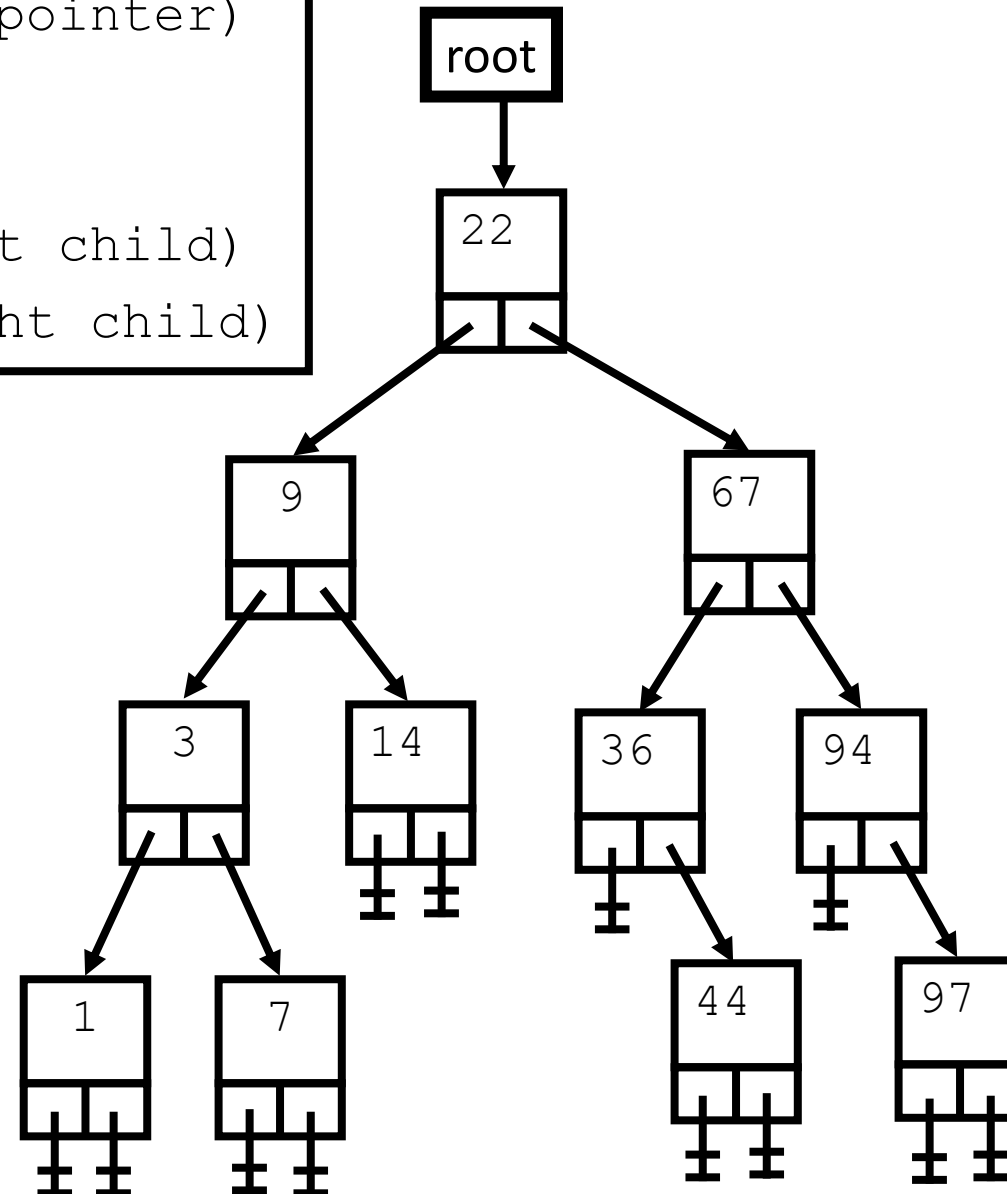
```
procedure Pre_Order(cur iot in Ptr toa Tree_Node)
  // Purpose: perform pre-order traversal, call
  //           DoWhatever for each node
  // Preconditions: cur points to a binary tree
  // Postcondition: DoWhatever will be performed
  // on each tree node in "pre-order" order
  if( cur <> NIL ) then
    Do_Whatever( cur^.data )
    Pre_Order( cur^.left_child )
    Pre_Order( cur^.right_child )
  endif
endprocedure    // Pre_Order
```

```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
```

Ⓟ print(data)

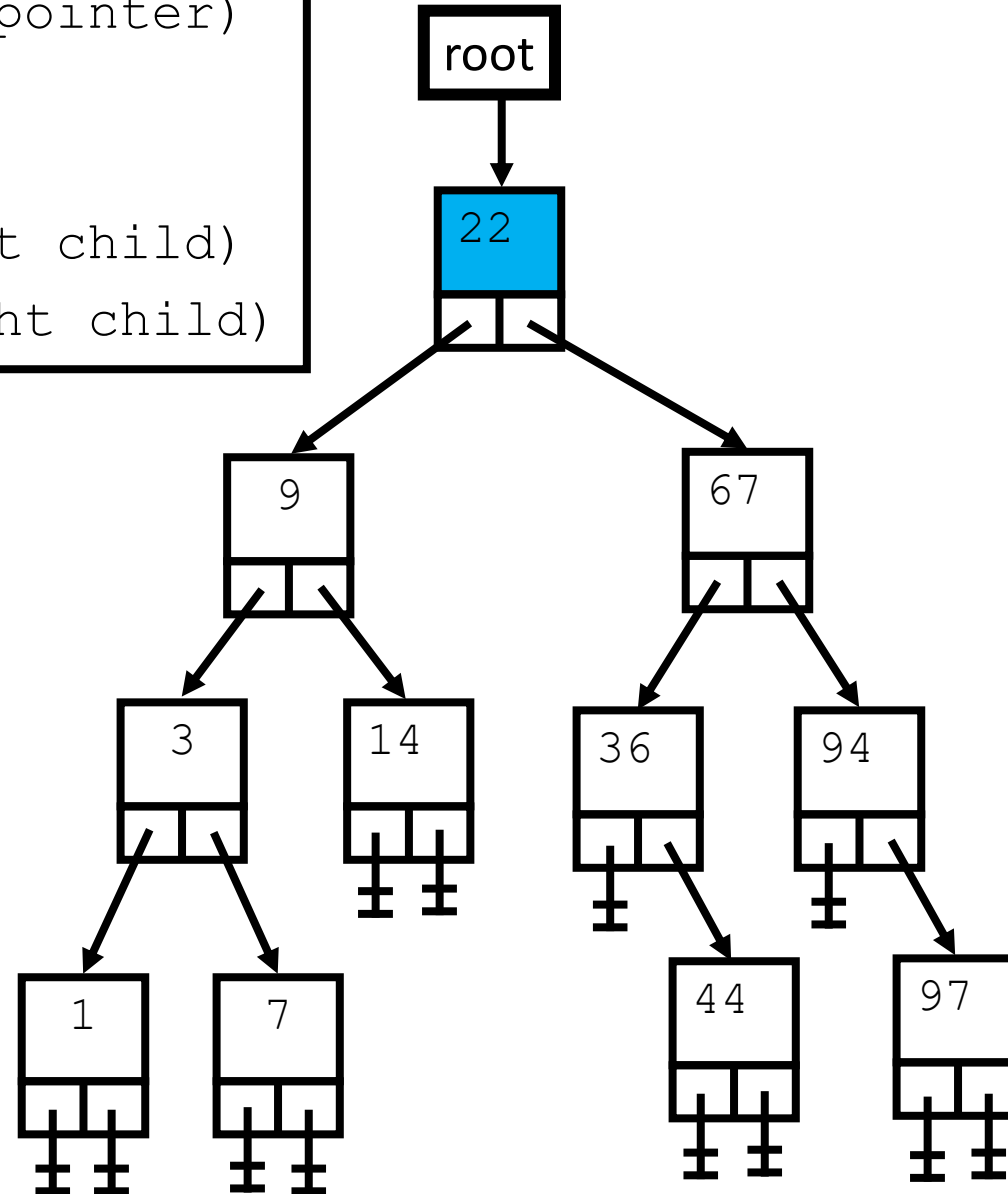
Ⓛ PreOrderPrint(left child)

Ⓡ PreOrderPrint(right child)



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output:



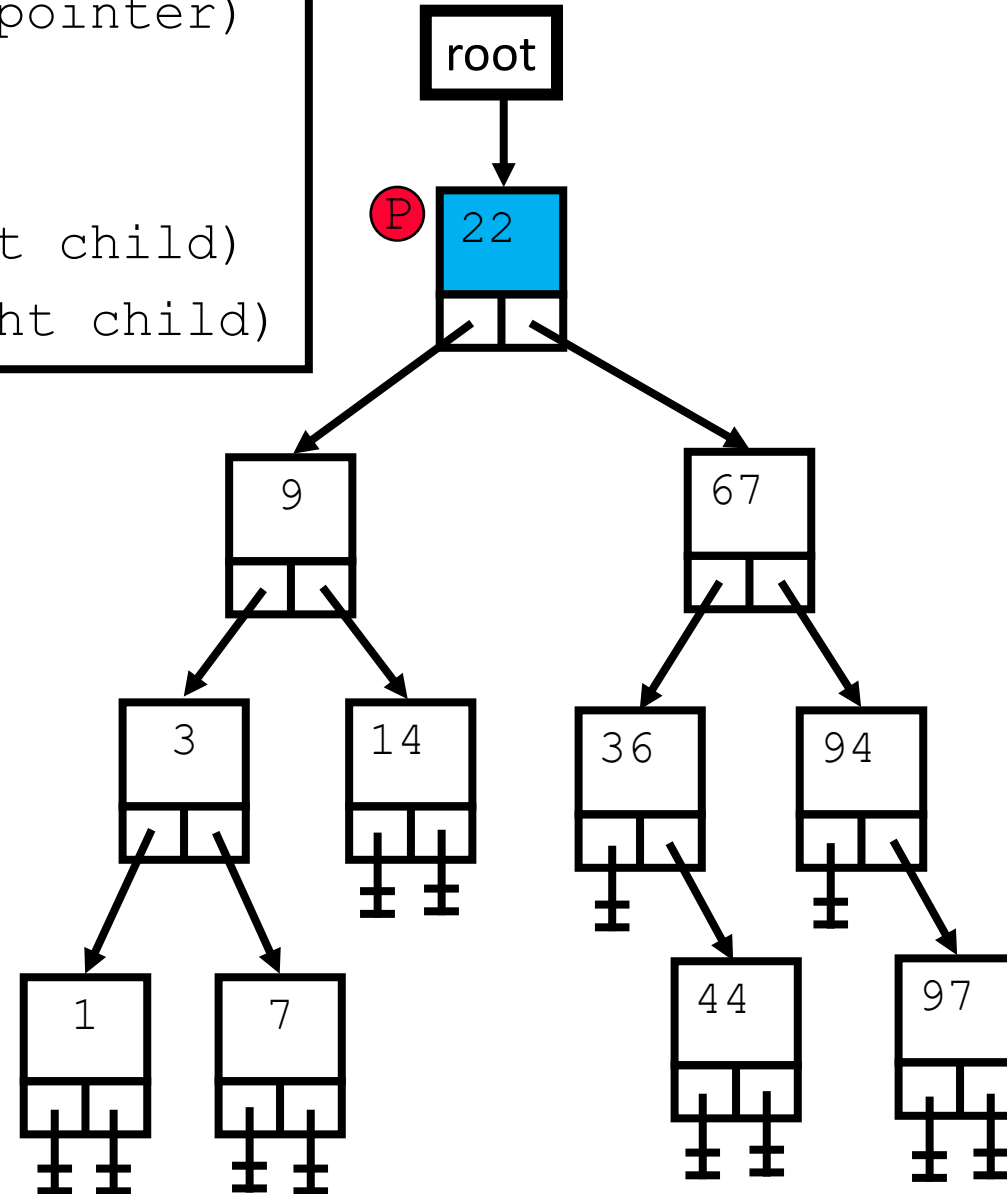
```
Proc PreOrderPrint(pointer)  
  pointer NOT NIL?
```

Ⓟ `print(data)`

Ⓛ `PreOrderPrint(left child)`

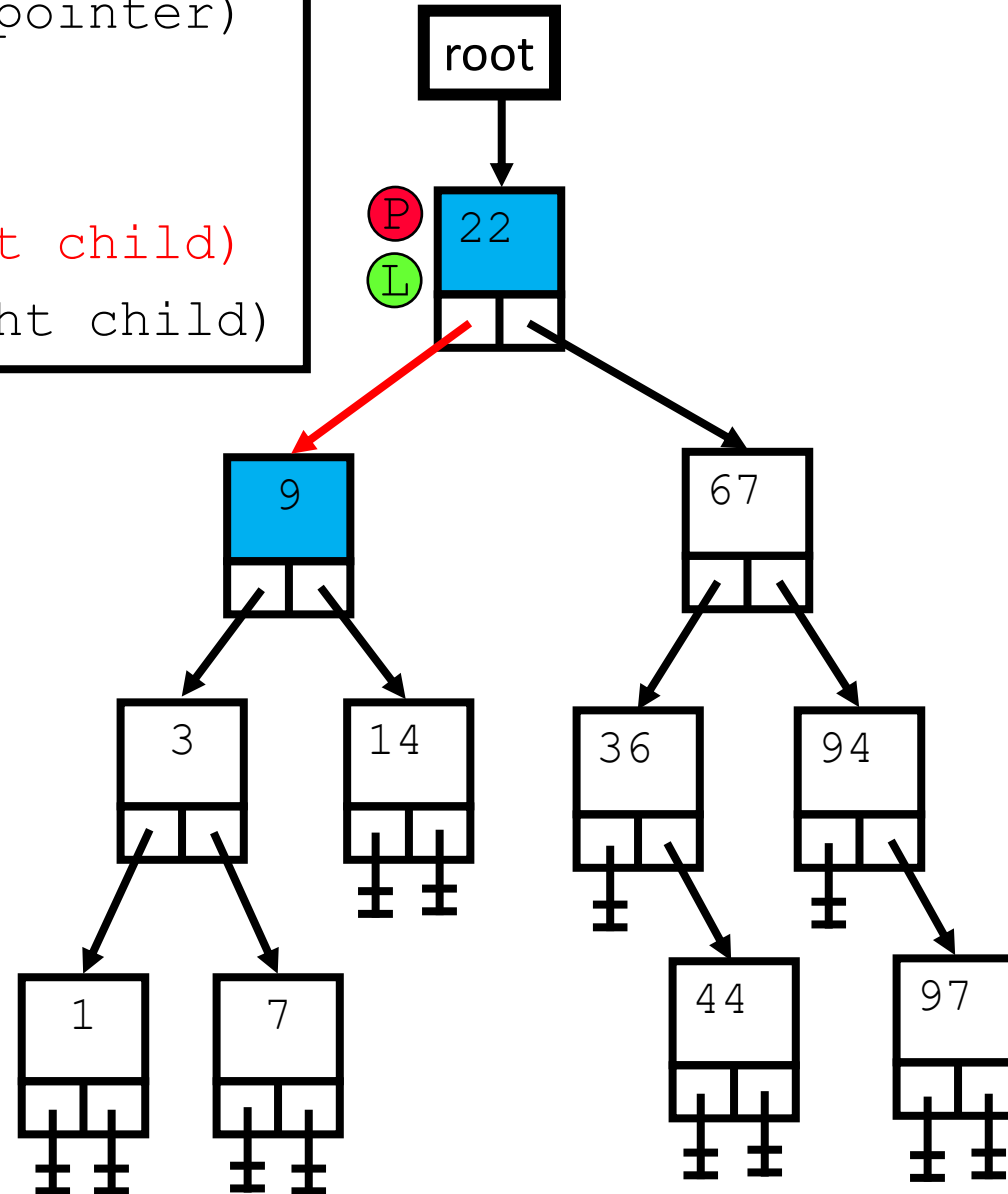
Ⓡ `PreOrderPrint(right child)`

Output: 22



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22





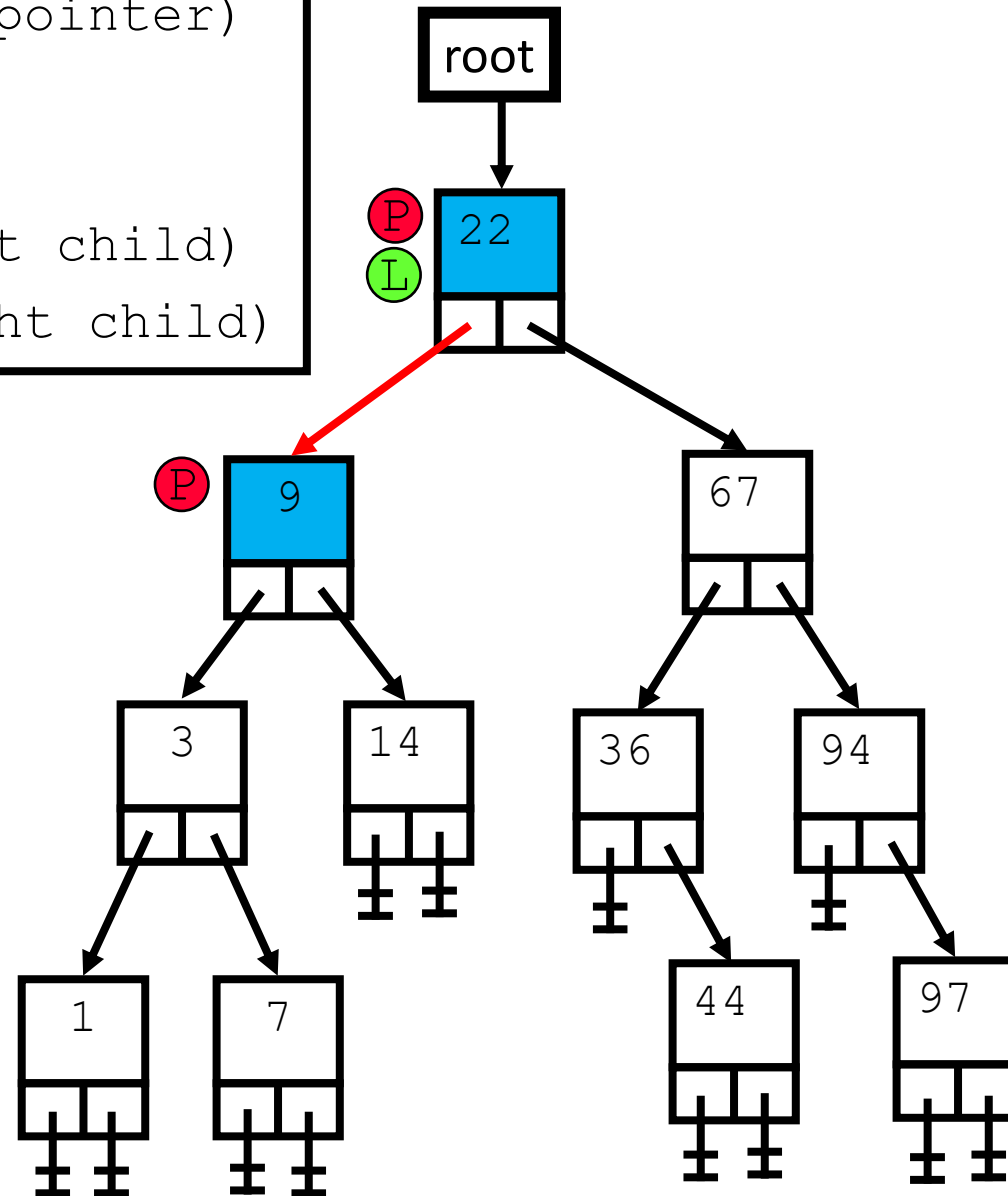
```
Proc PreOrderPrint(pointer)  
  pointer NOT NIL?
```

Ⓟ print(data)

Ⓛ PreOrderPrint(left child)

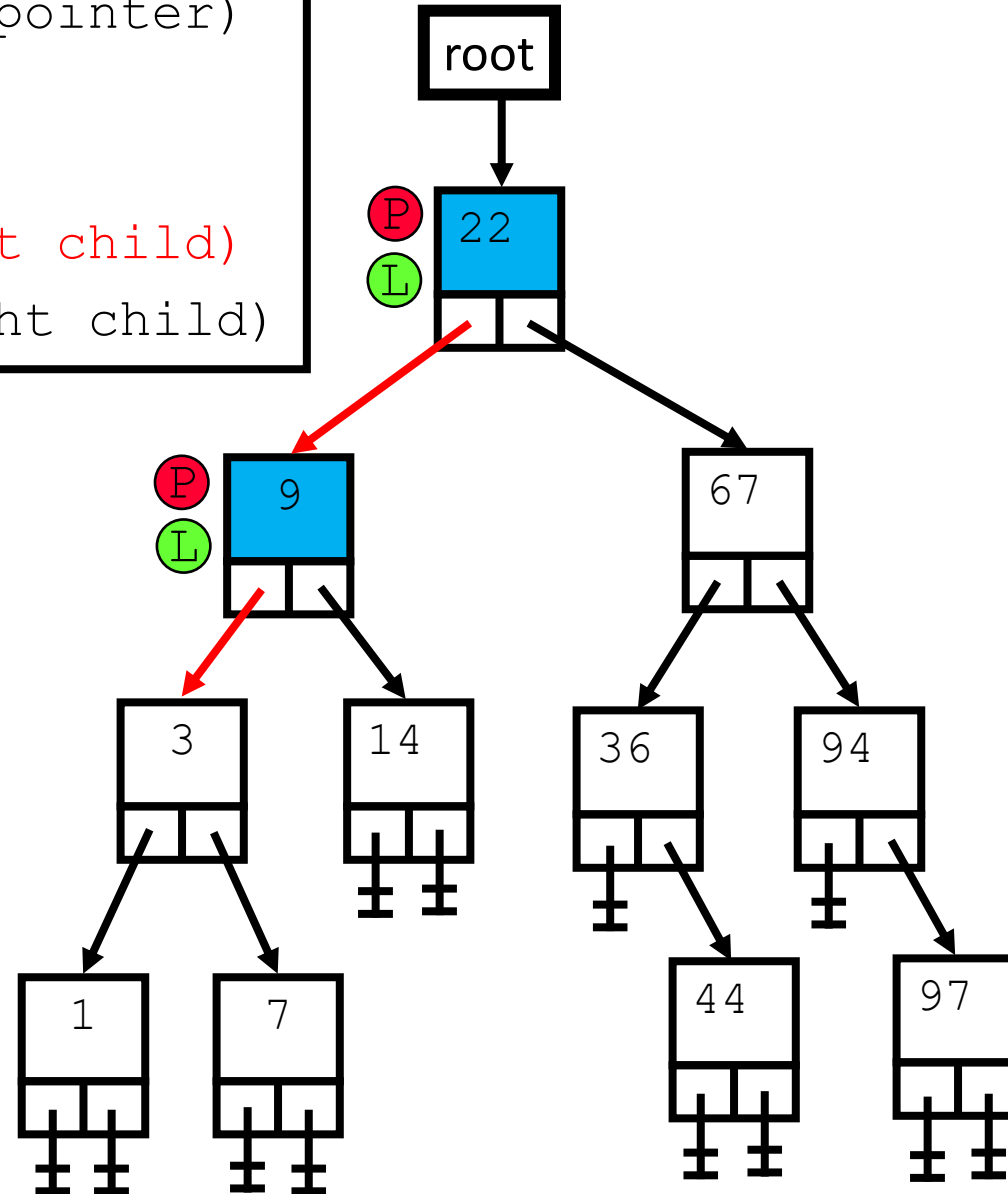
Ⓡ PreOrderPrint(right child)

Output: 22 9



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9



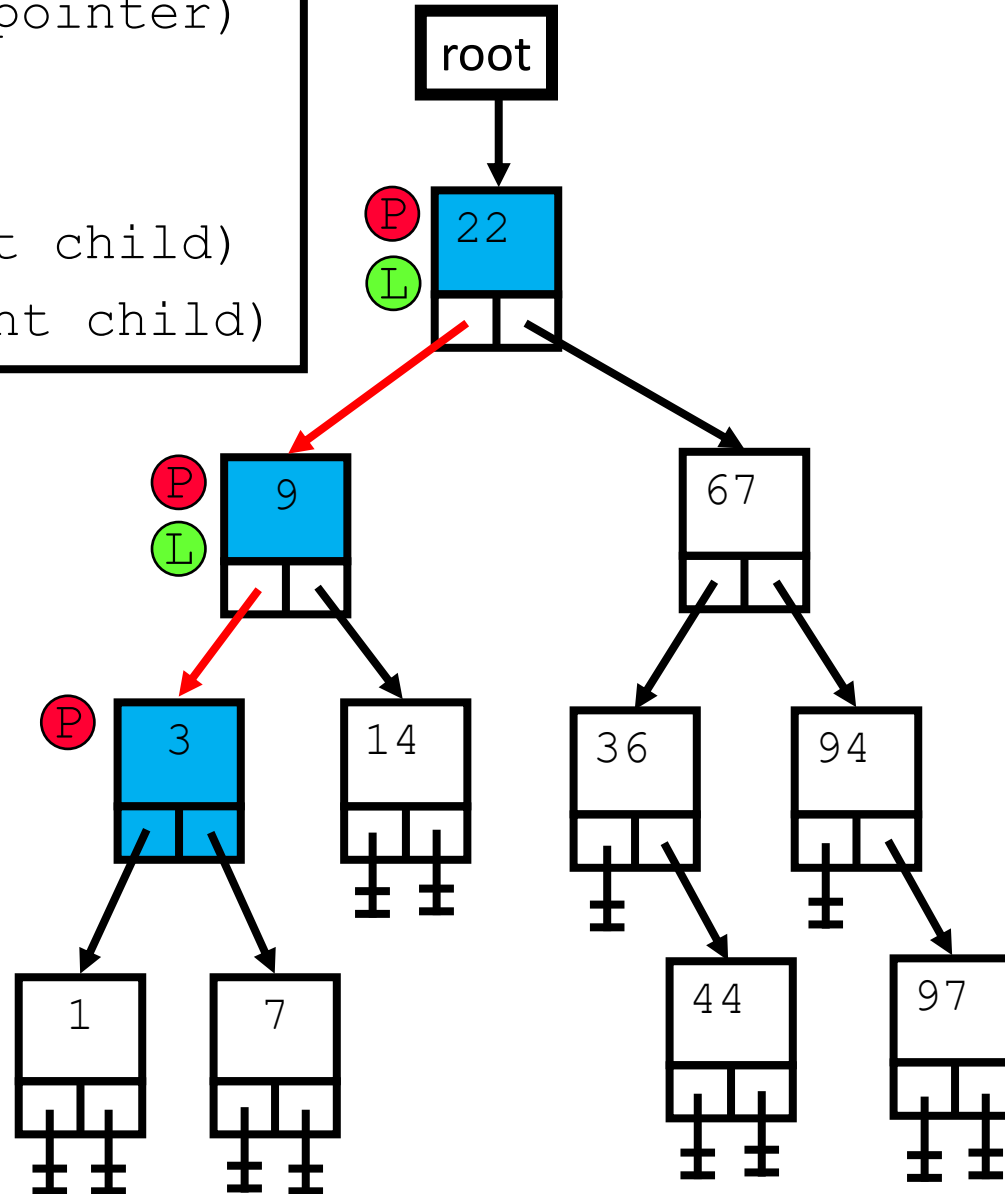
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
```

Ⓟ print(data)

Ⓛ PreOrderPrint(left child)

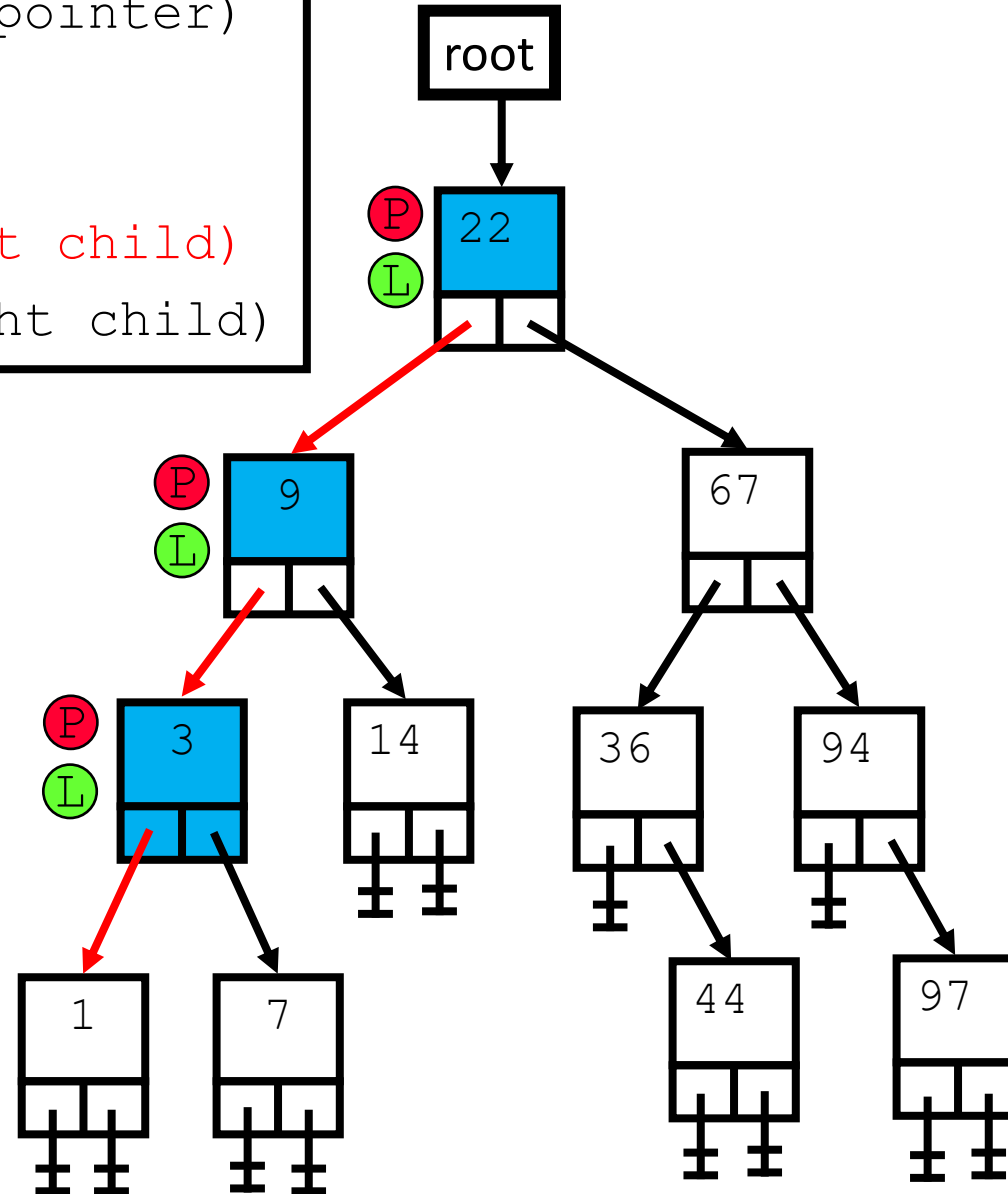
Ⓡ PreOrderPrint(right child)

Output: 22 9 3



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3



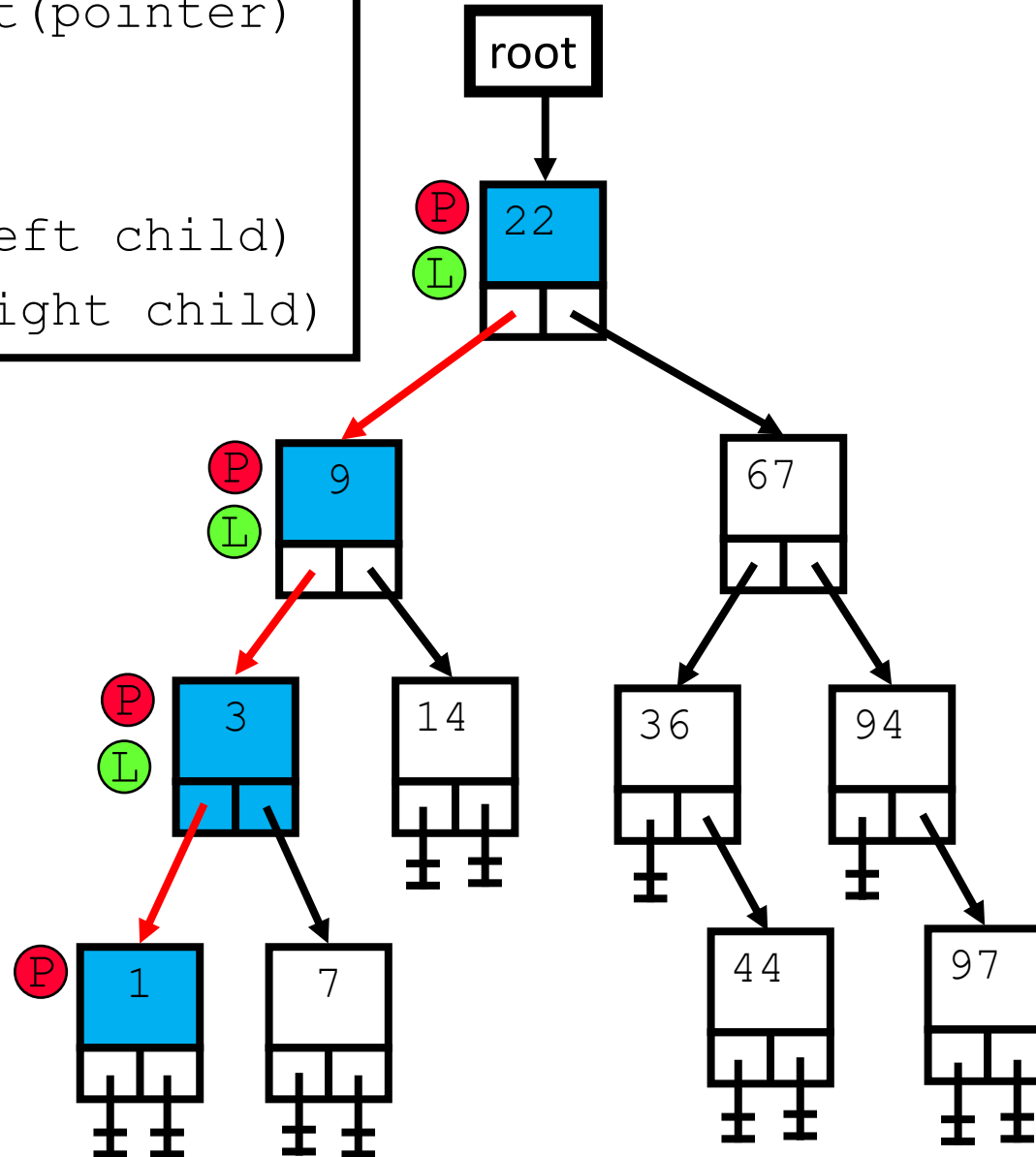
```
Proc PreOrderPrint(pointer)  
  pointer NOT NIL?
```

Ⓟ print(data)

Ⓛ PreOrderPrint(left child)

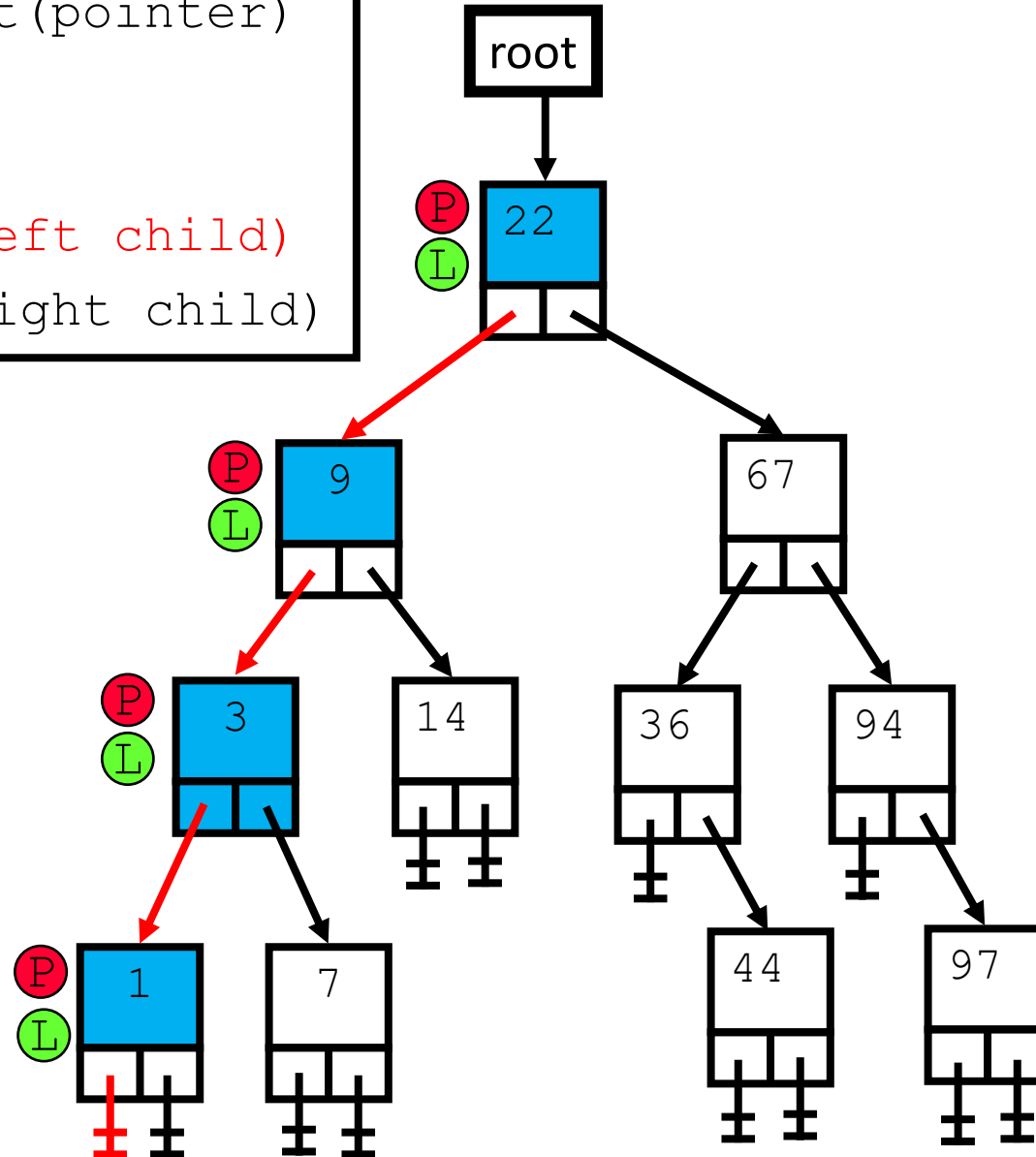
Ⓡ PreOrderPrint(right child)

Output: 22 9 3 1



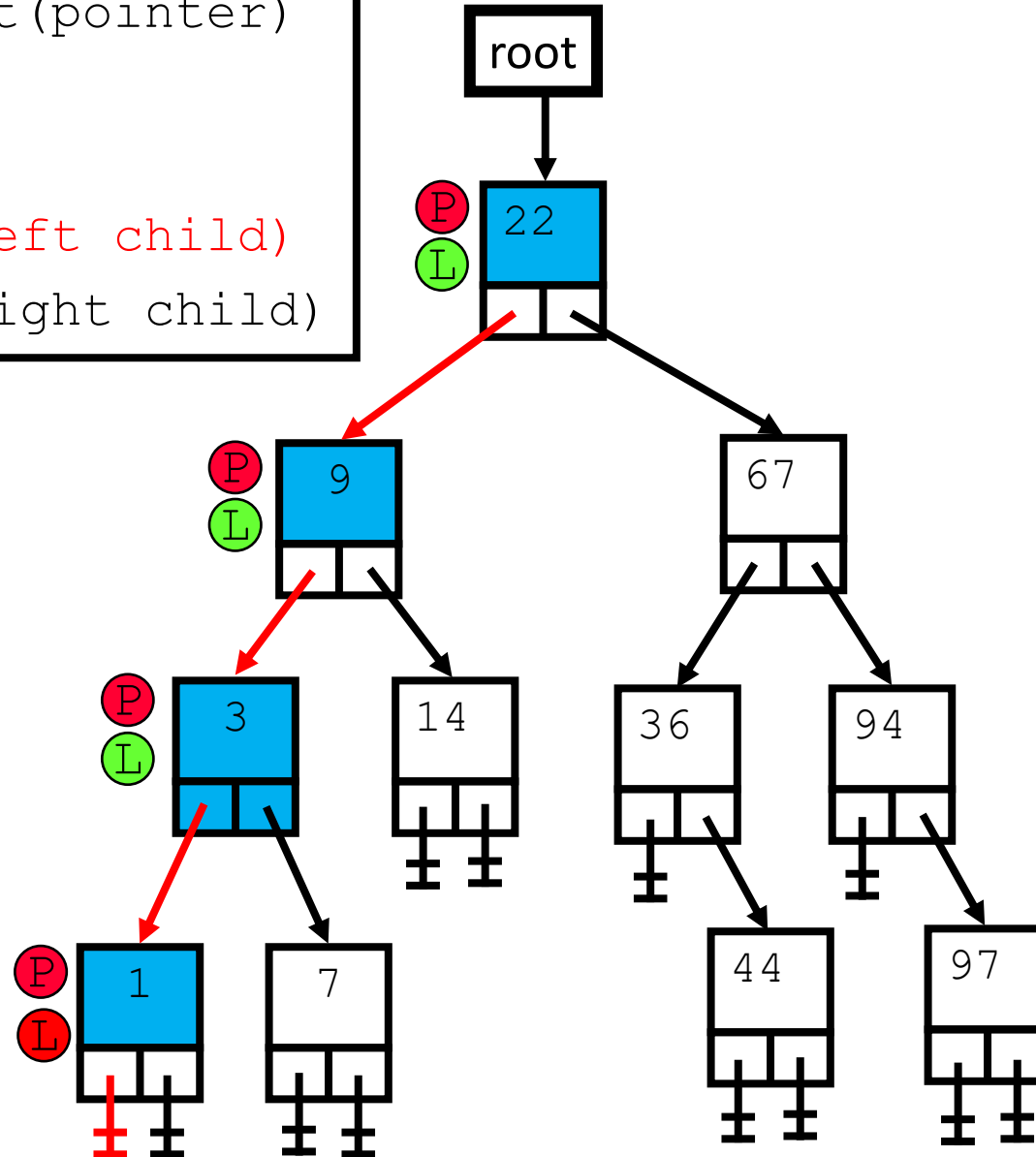
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1



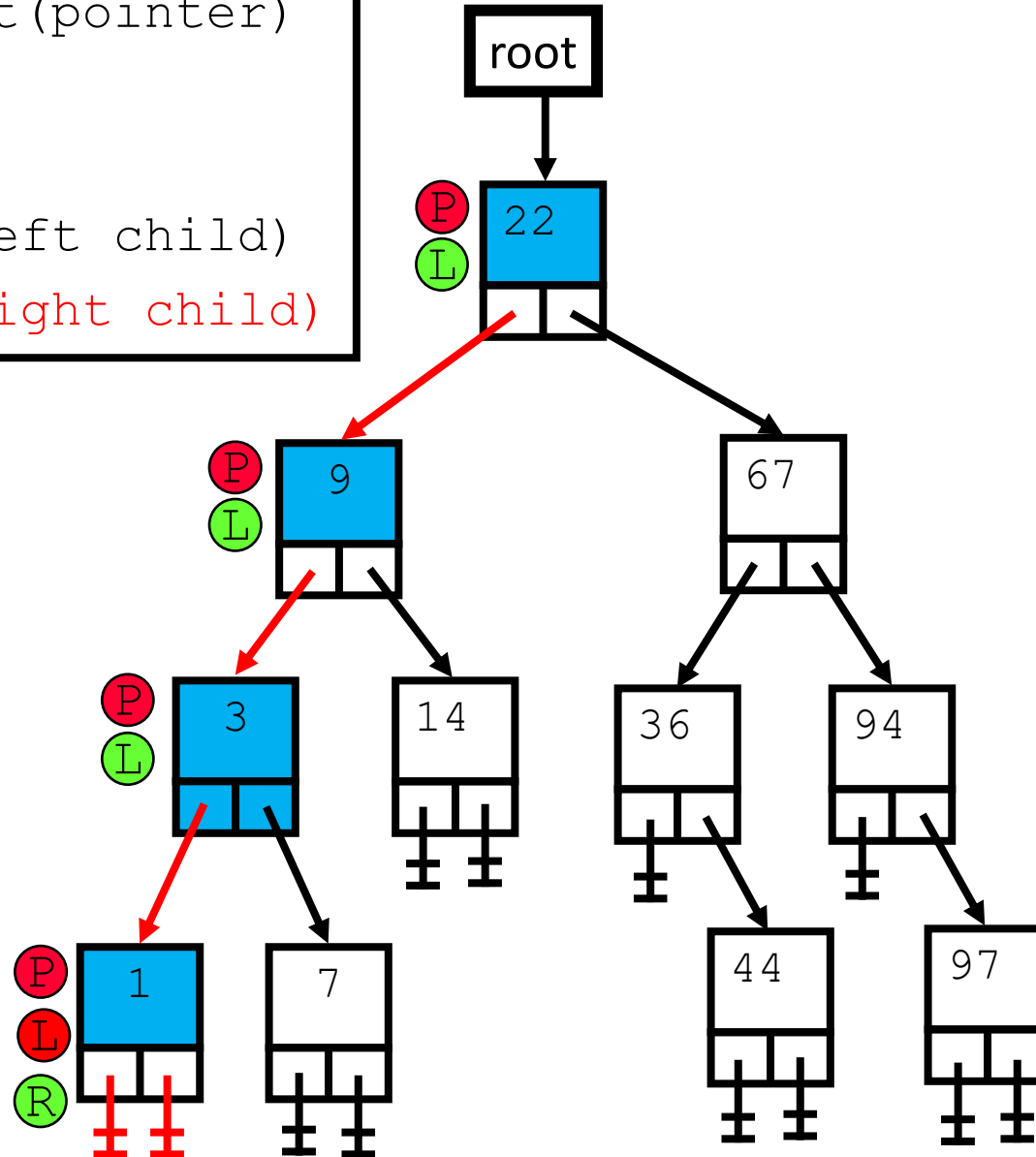
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

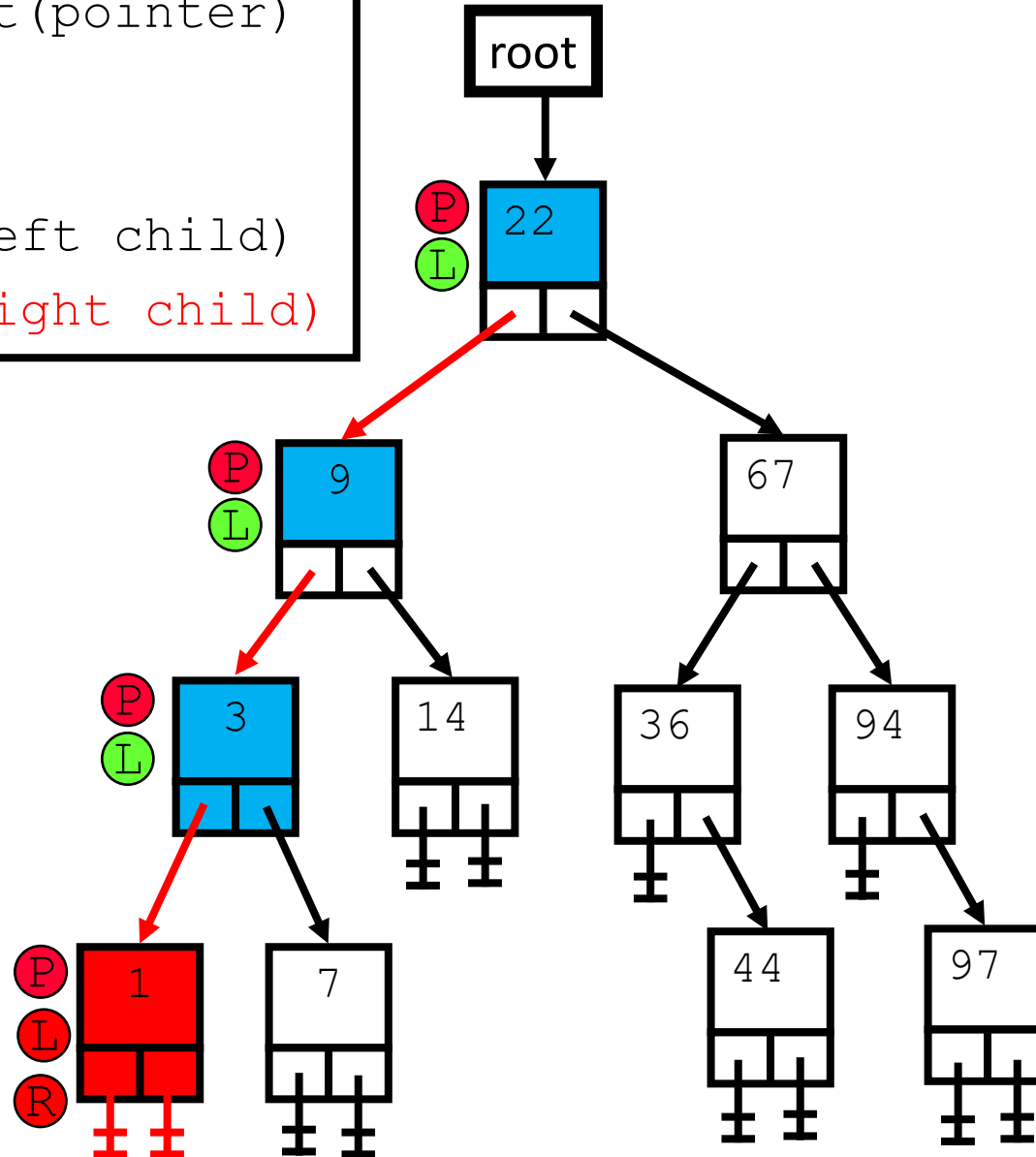
Output: 22 9 3 1





```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1

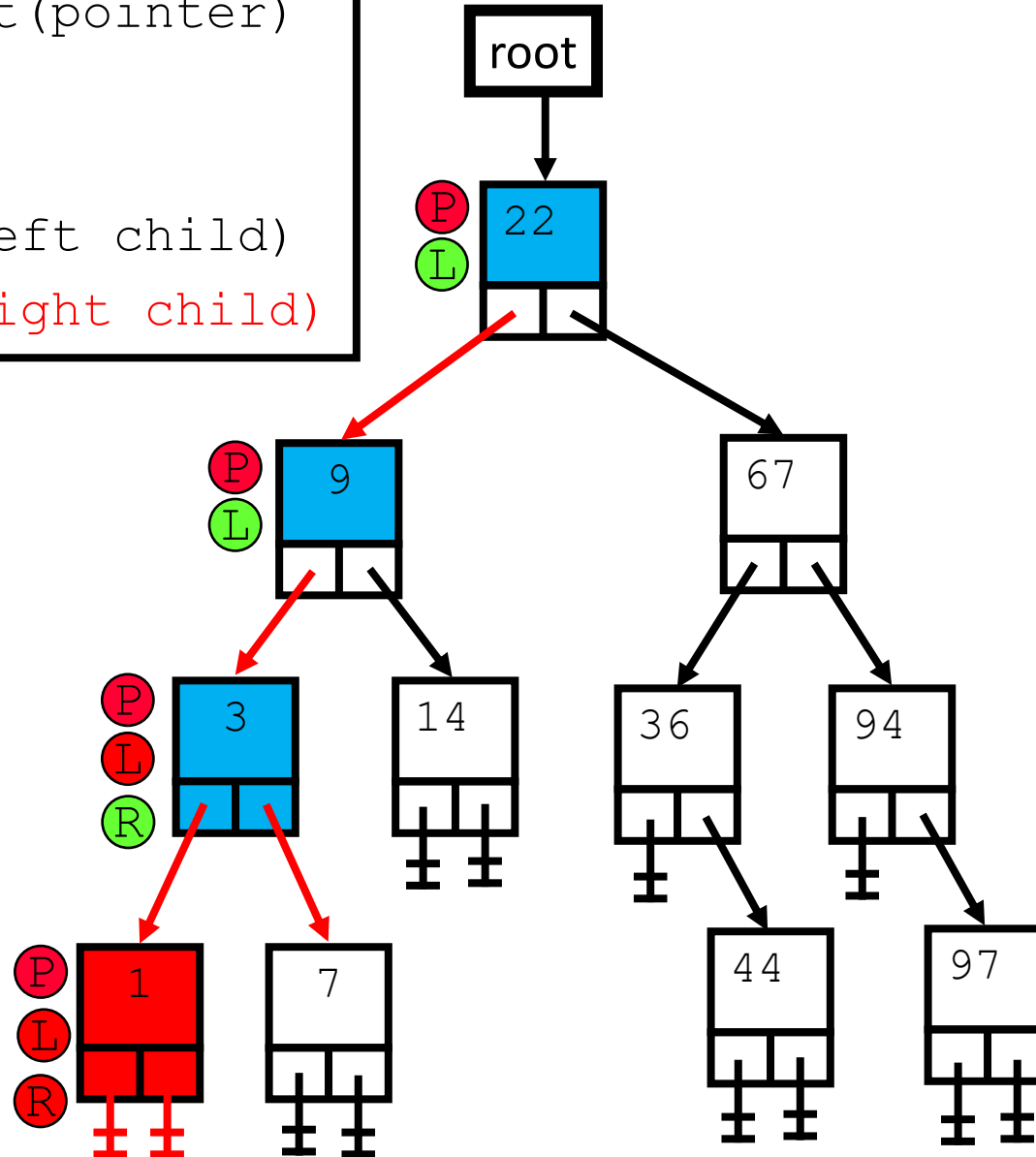


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1

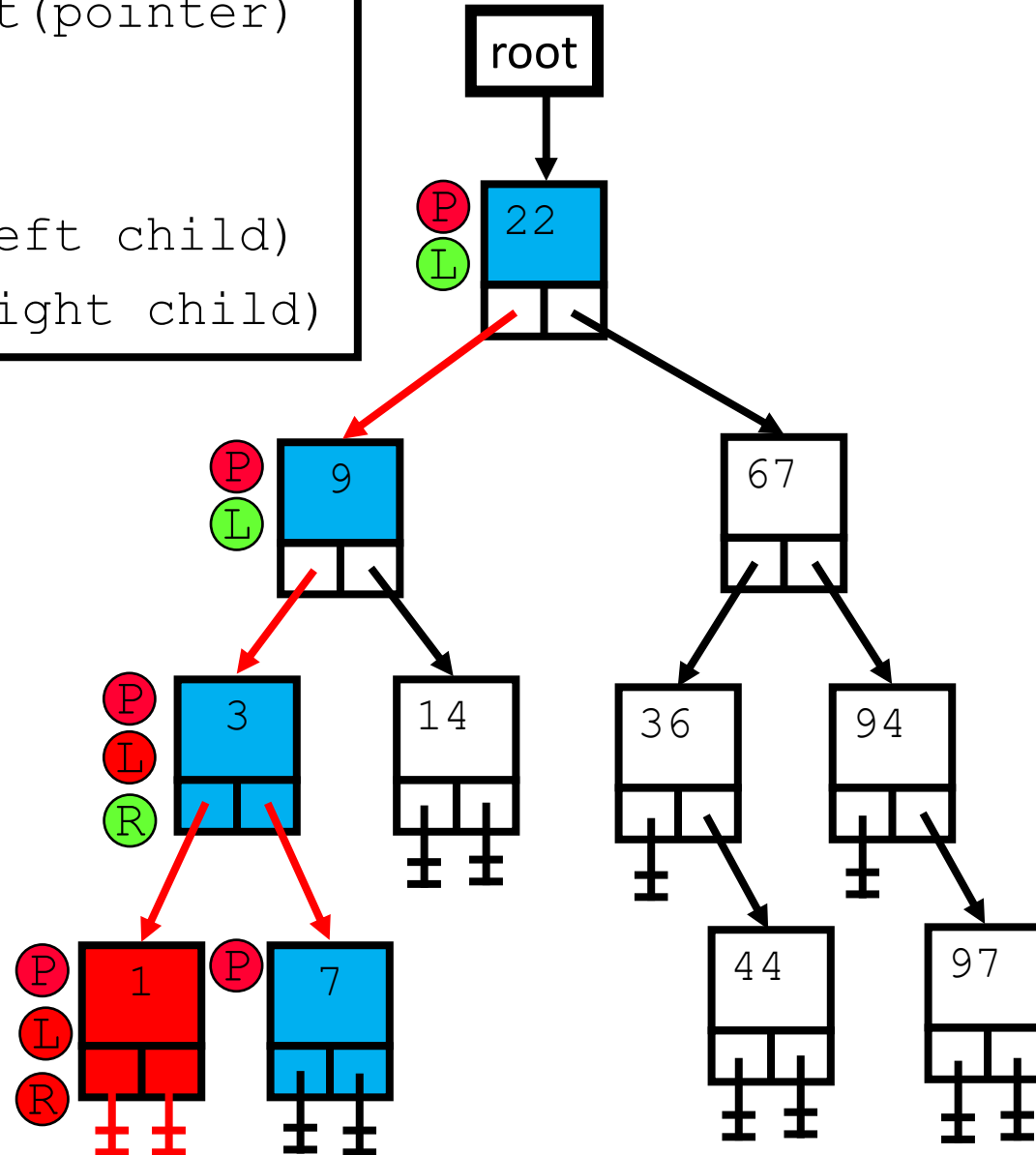


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7

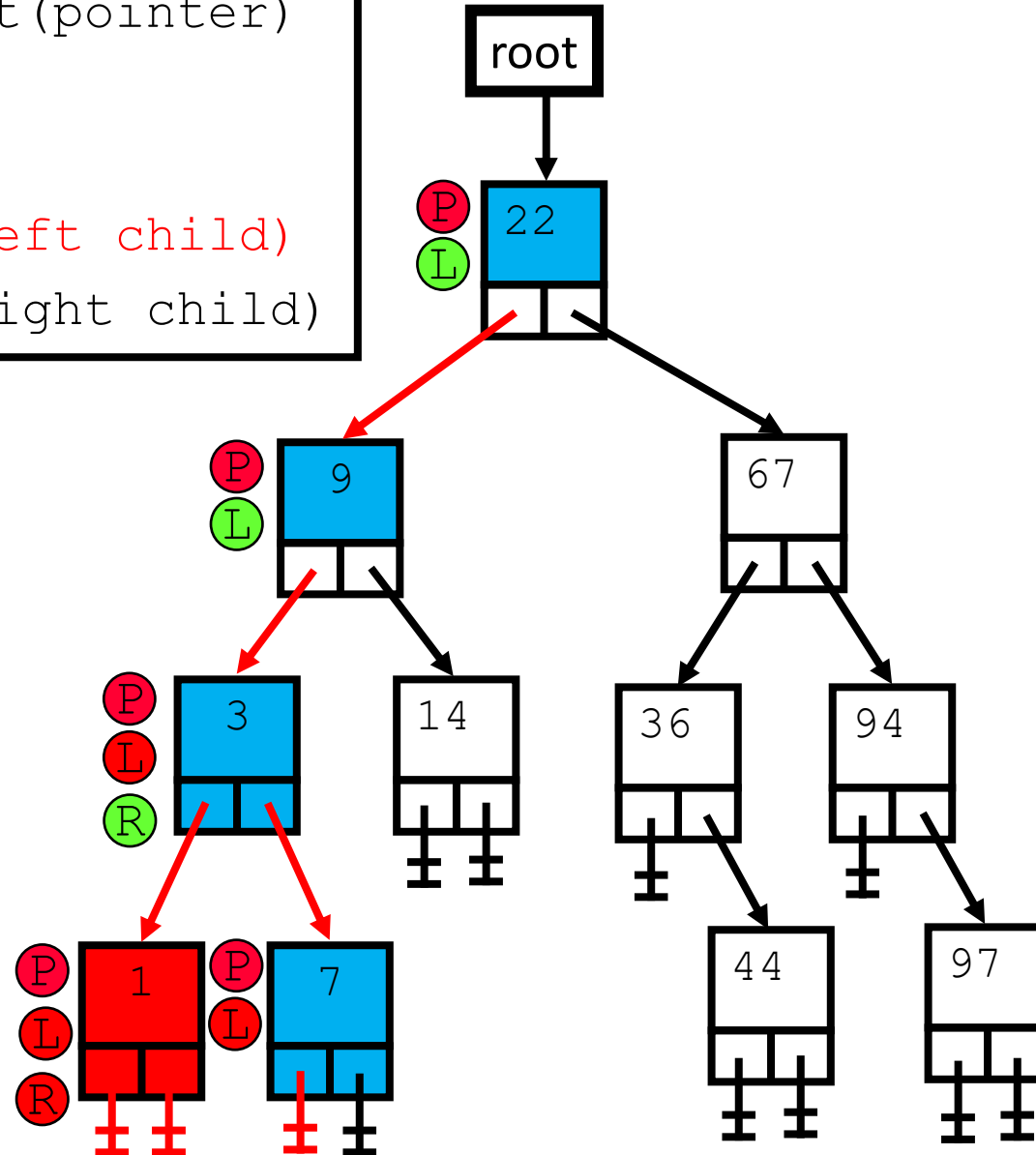


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7

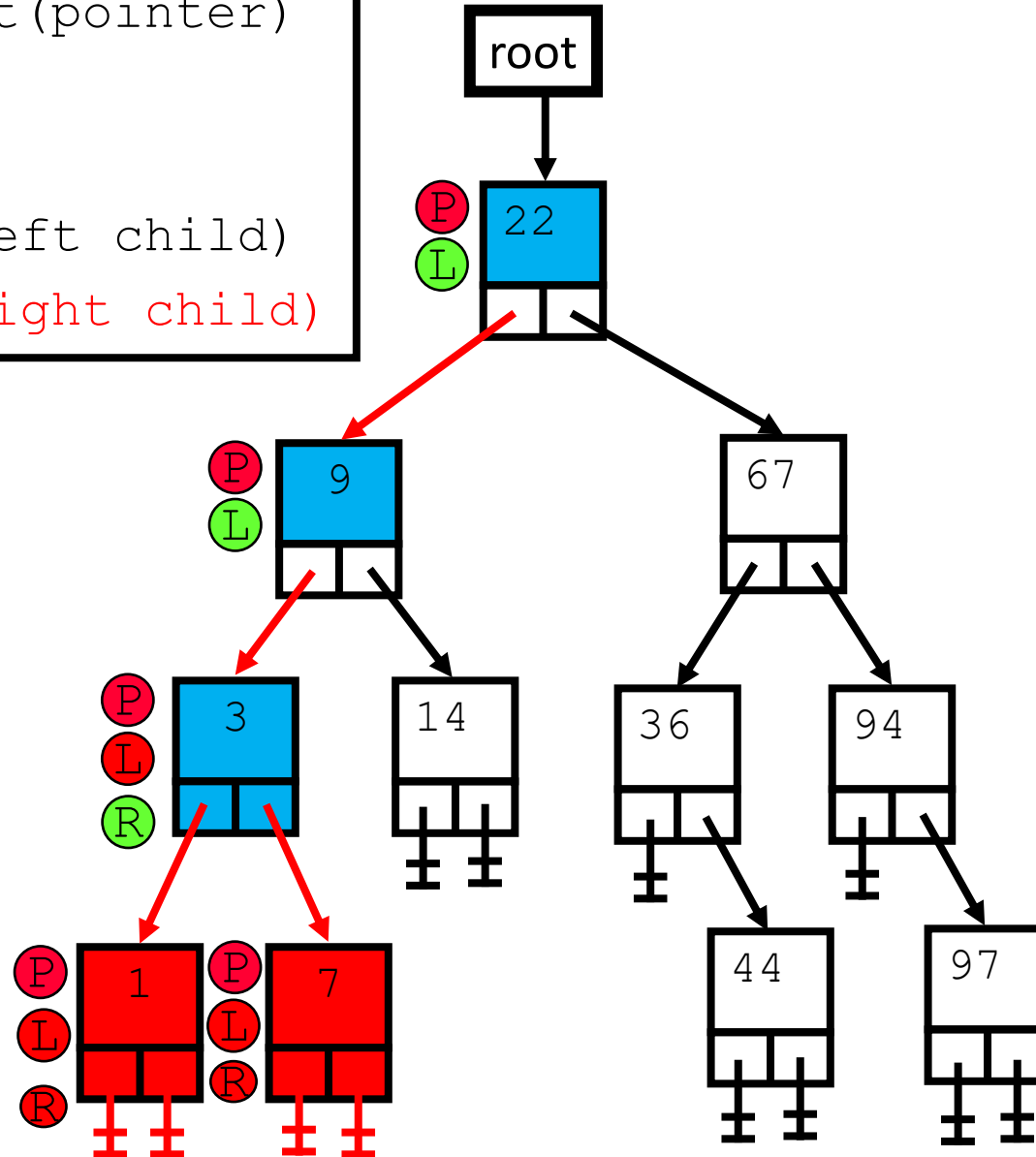


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

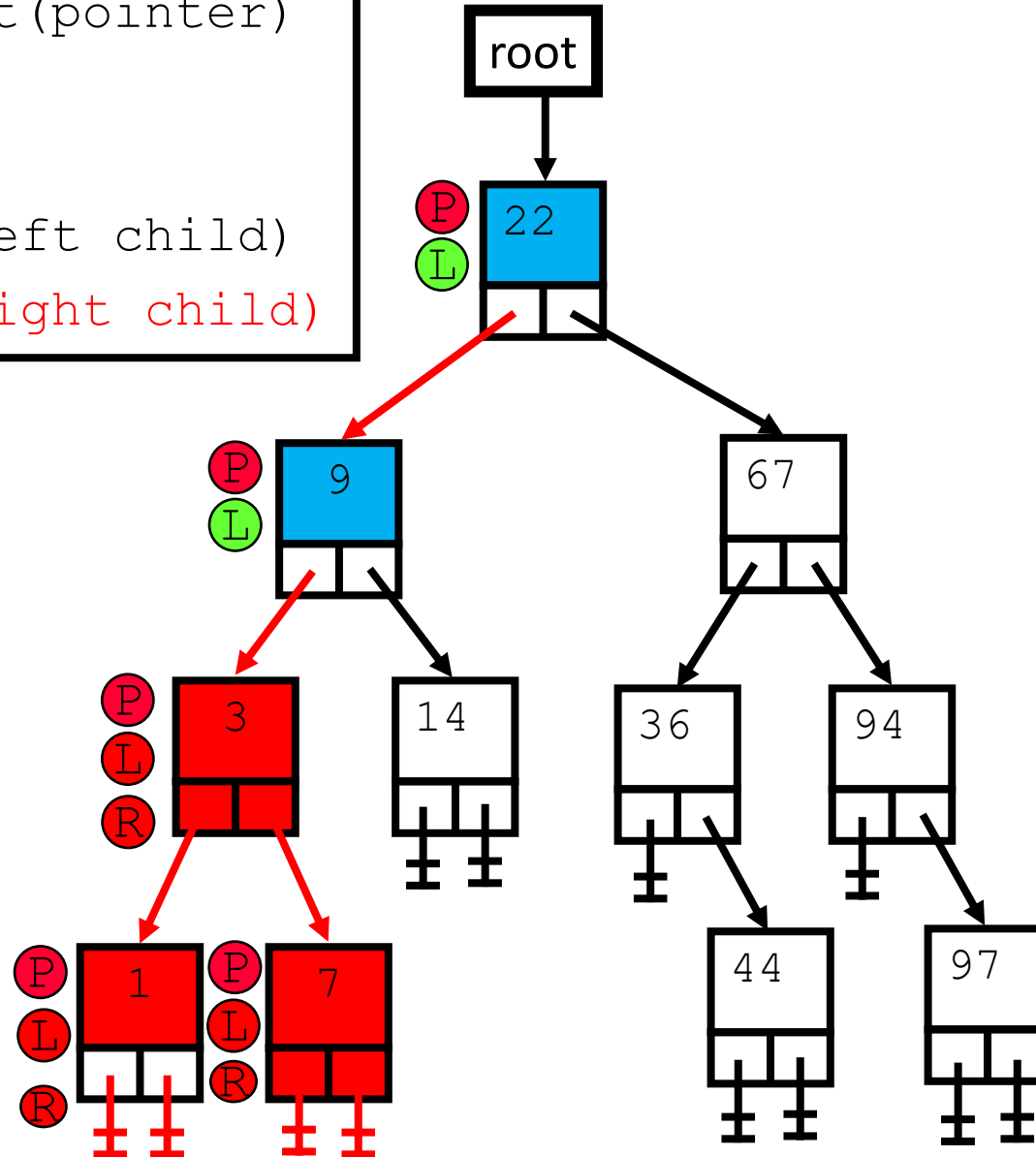
```

Output: 22 9 3 1 7



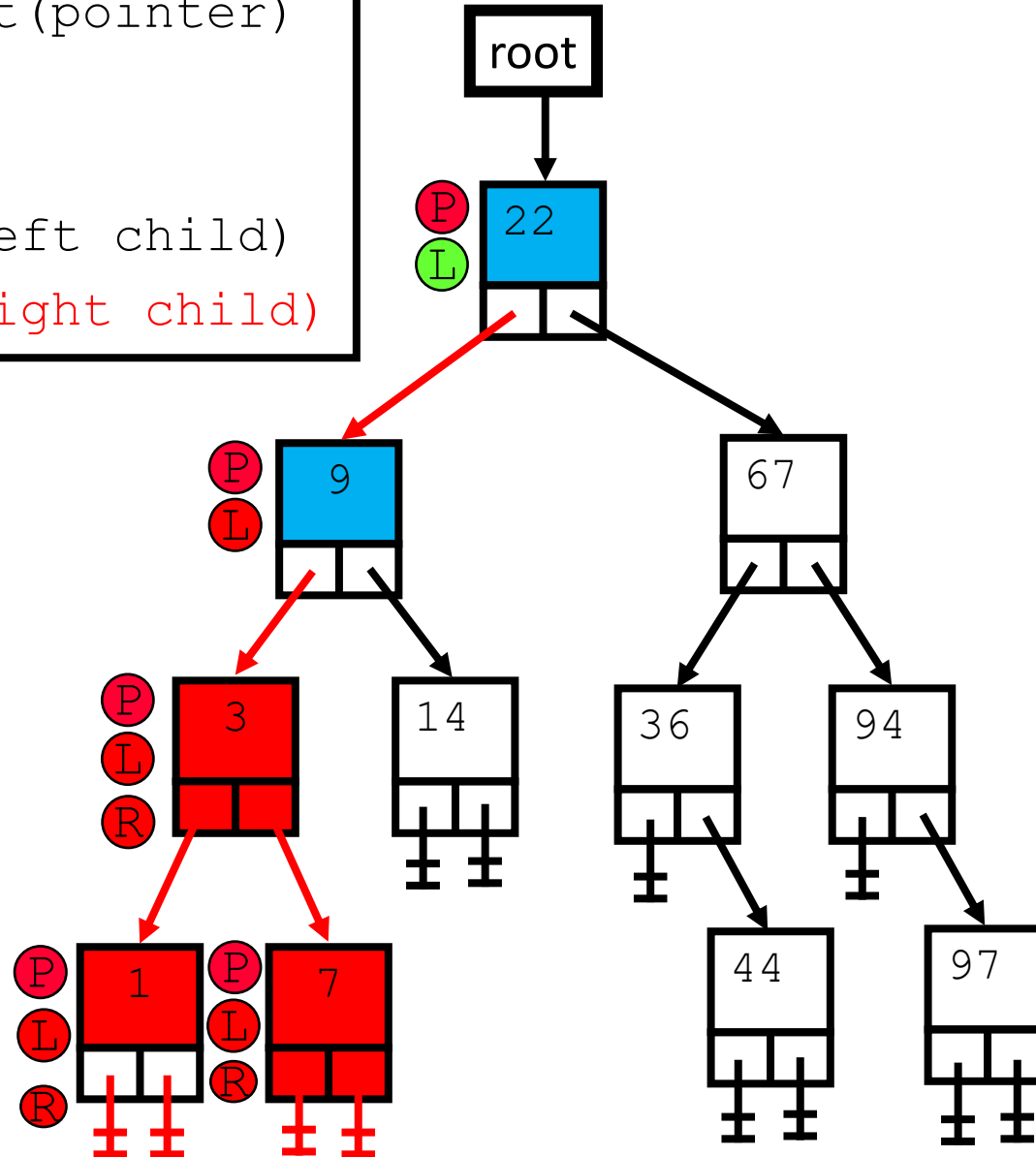
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1 7



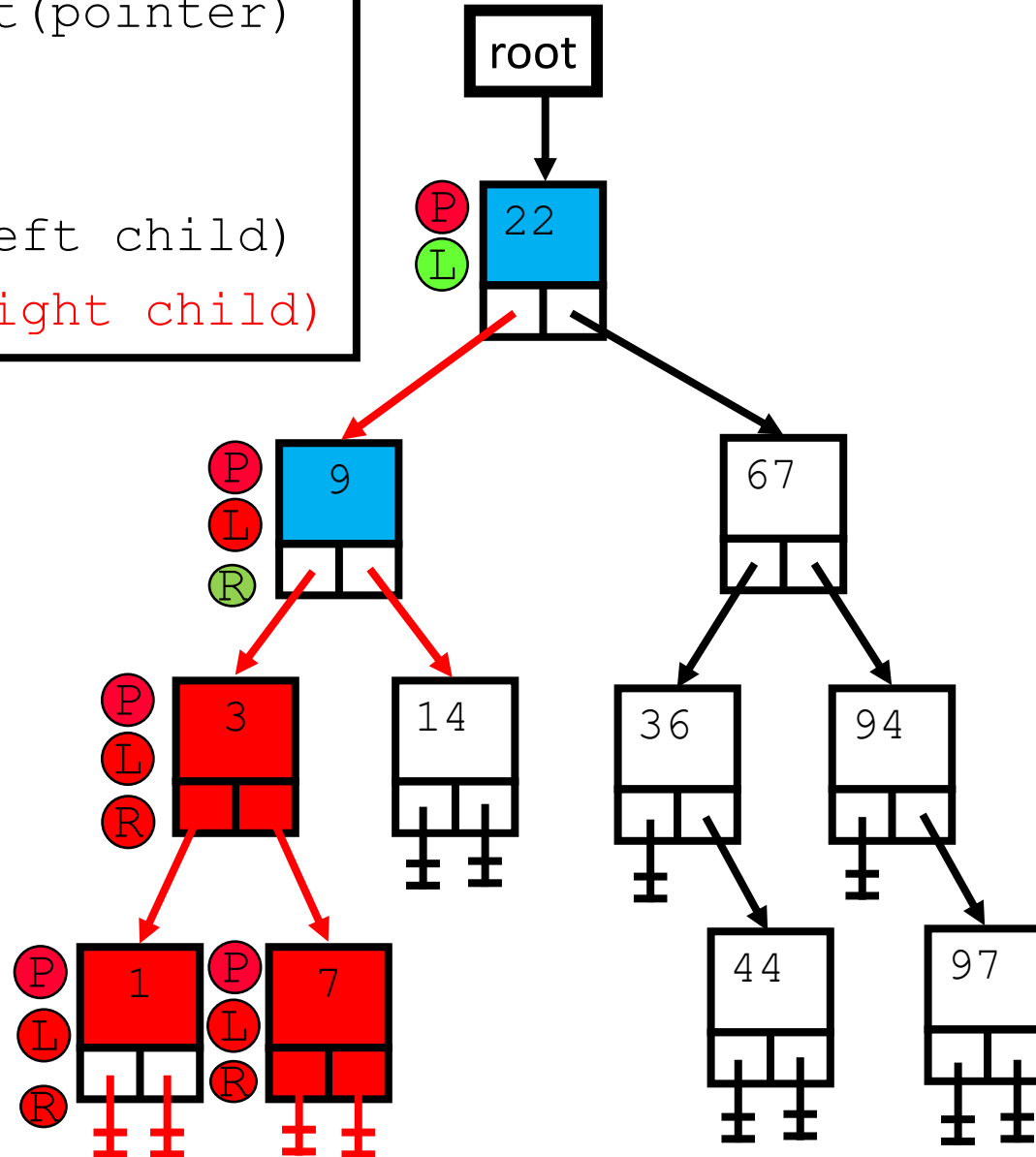
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1 7



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1 7



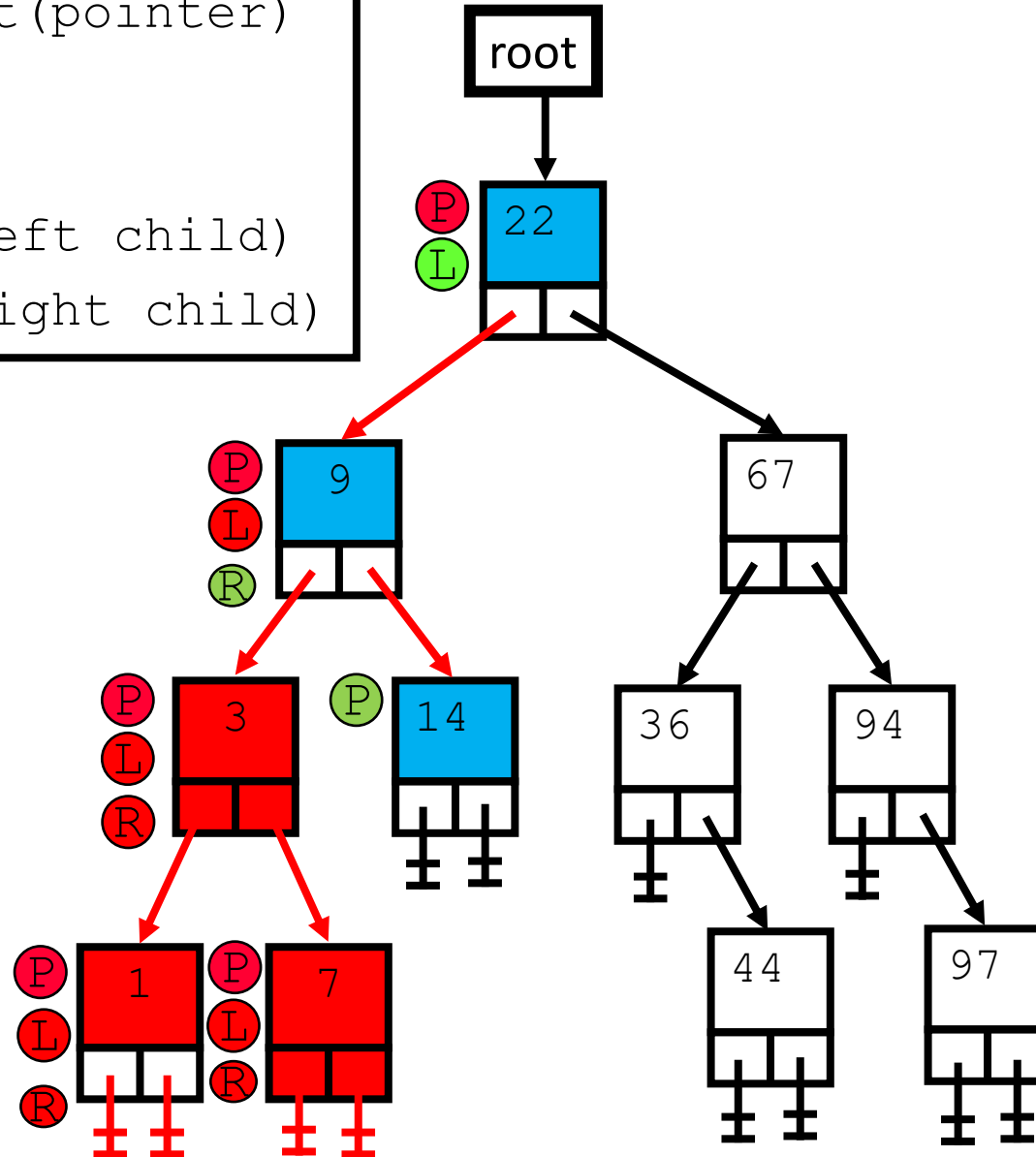


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14

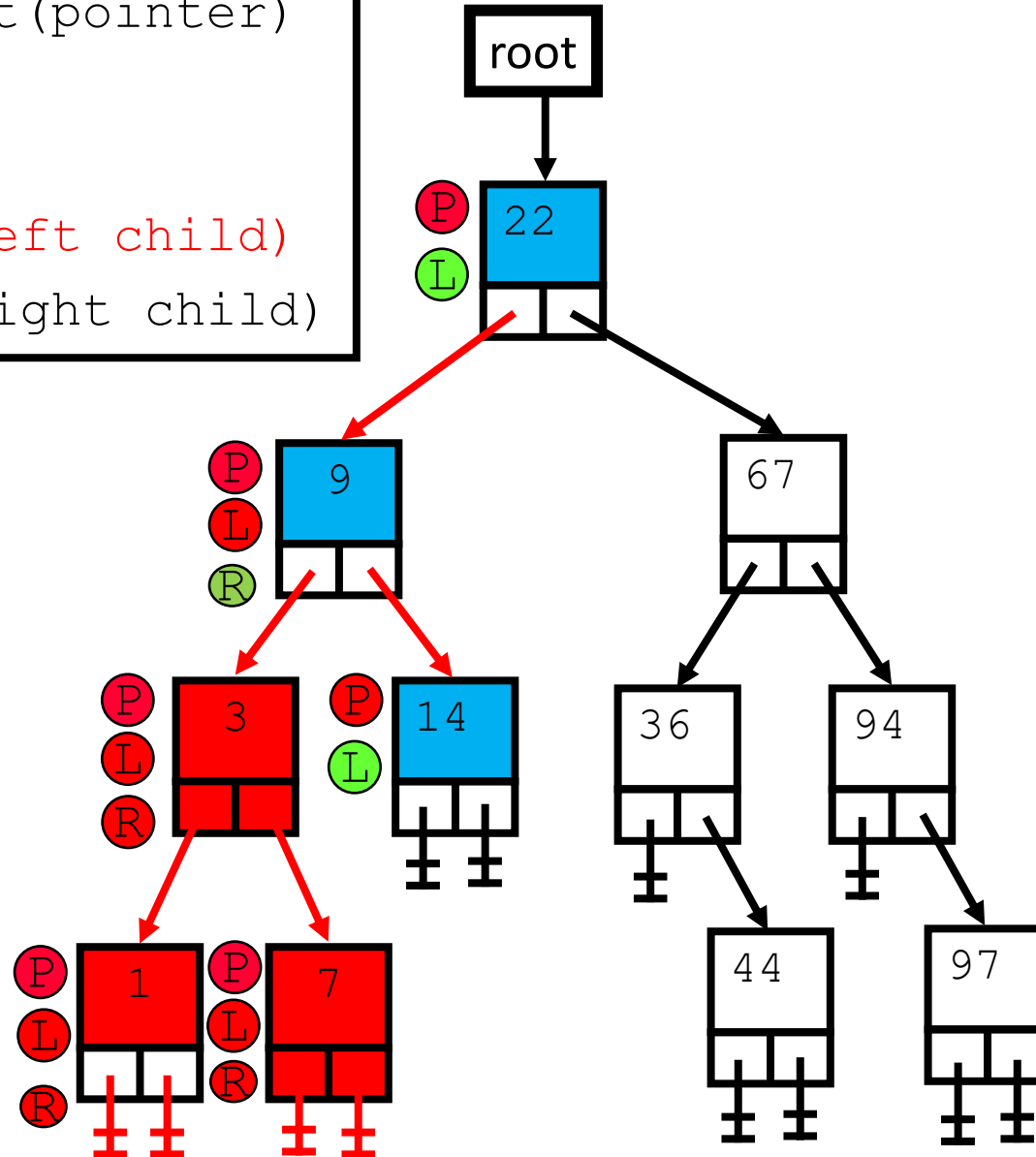


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14

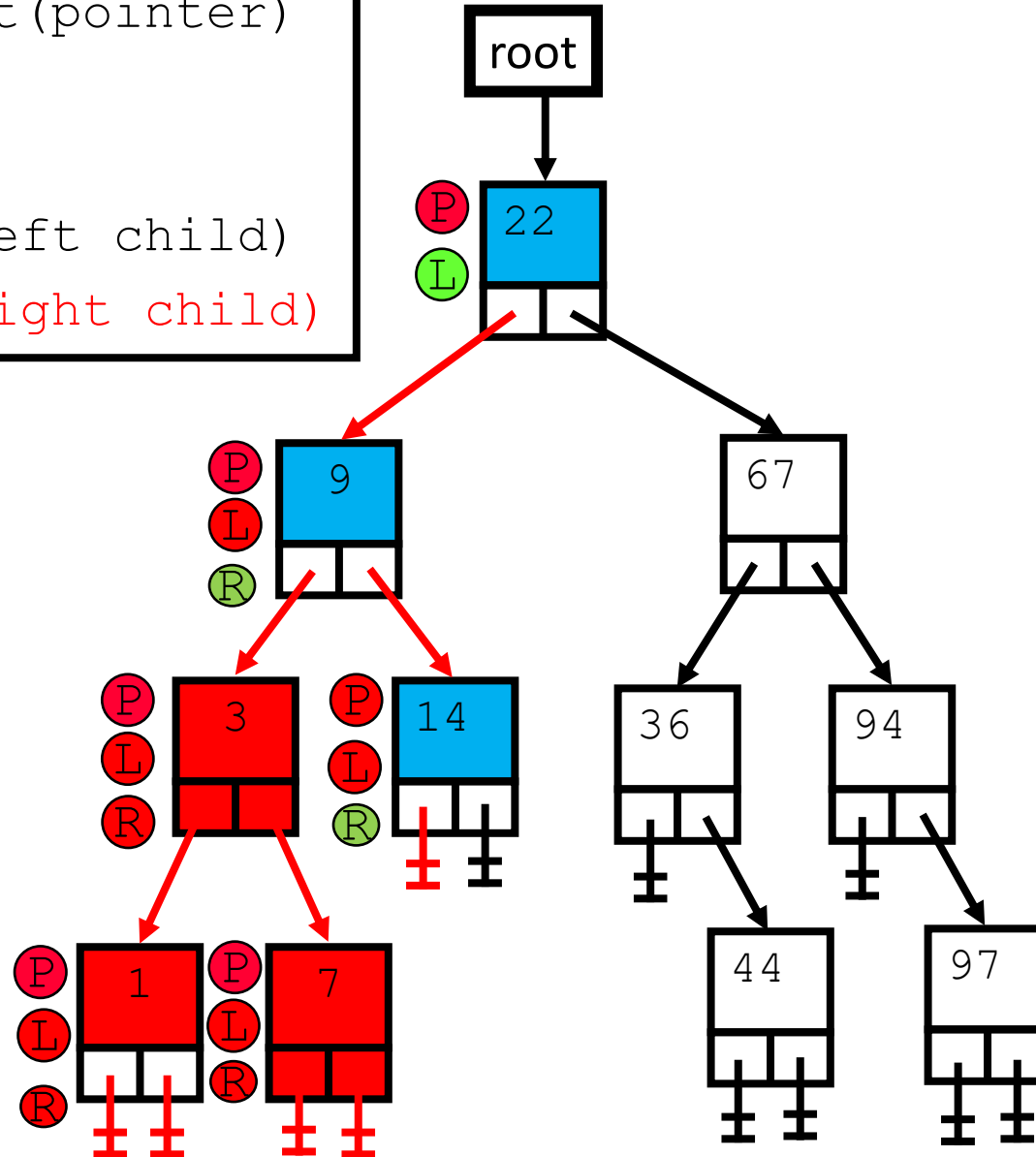


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14

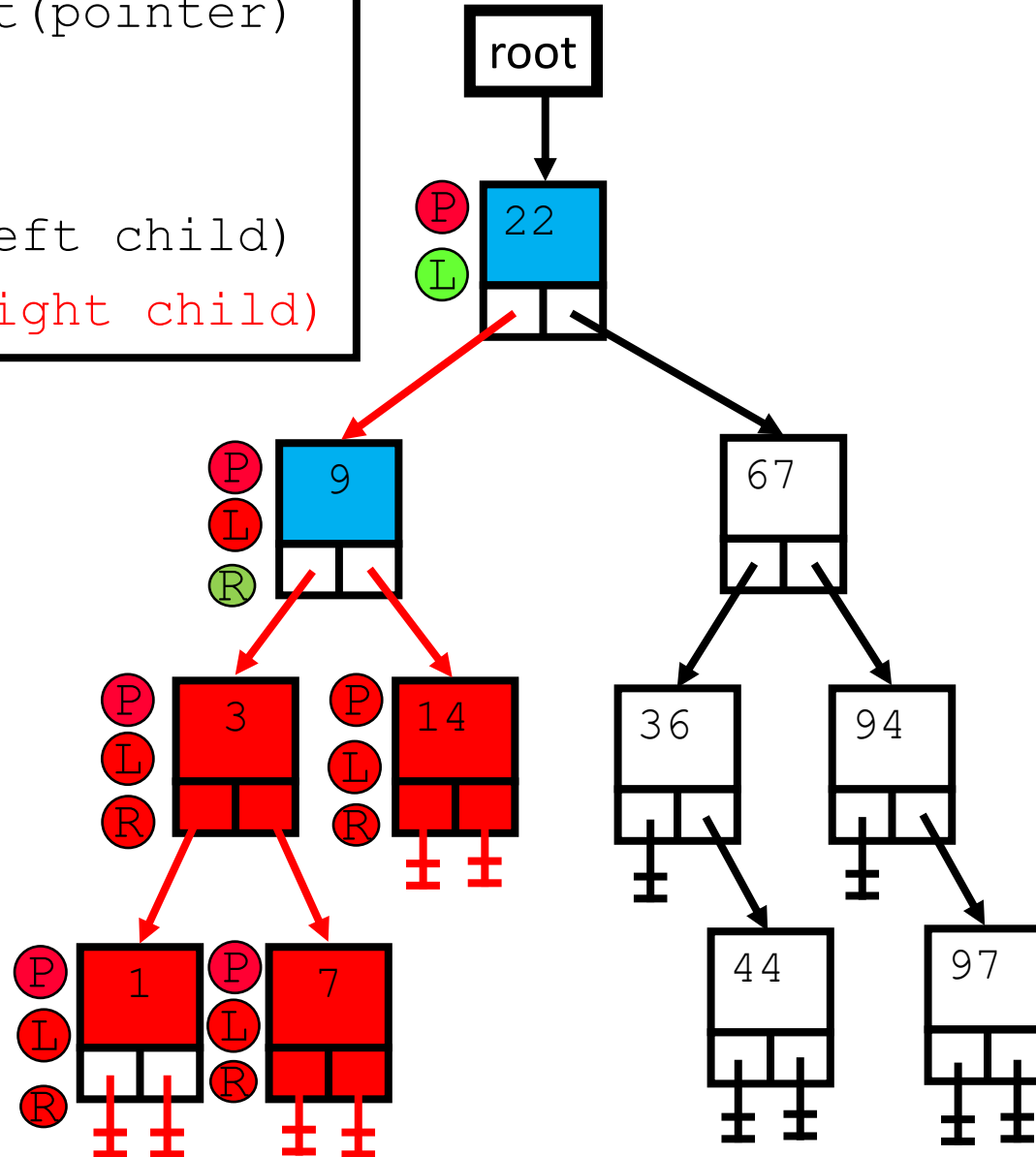


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

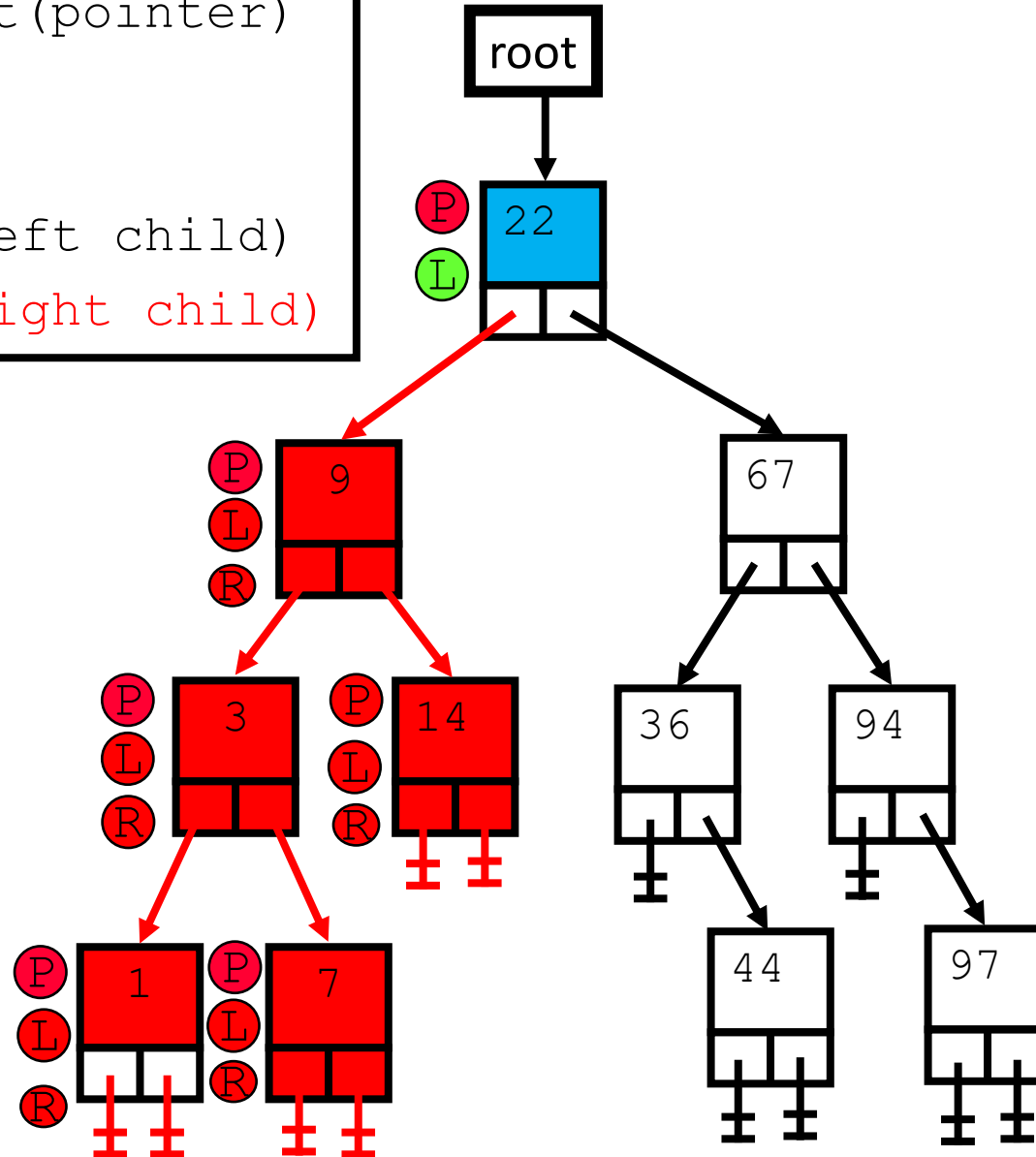
```

Output: 22 9 3 1 7 14



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1 7 14

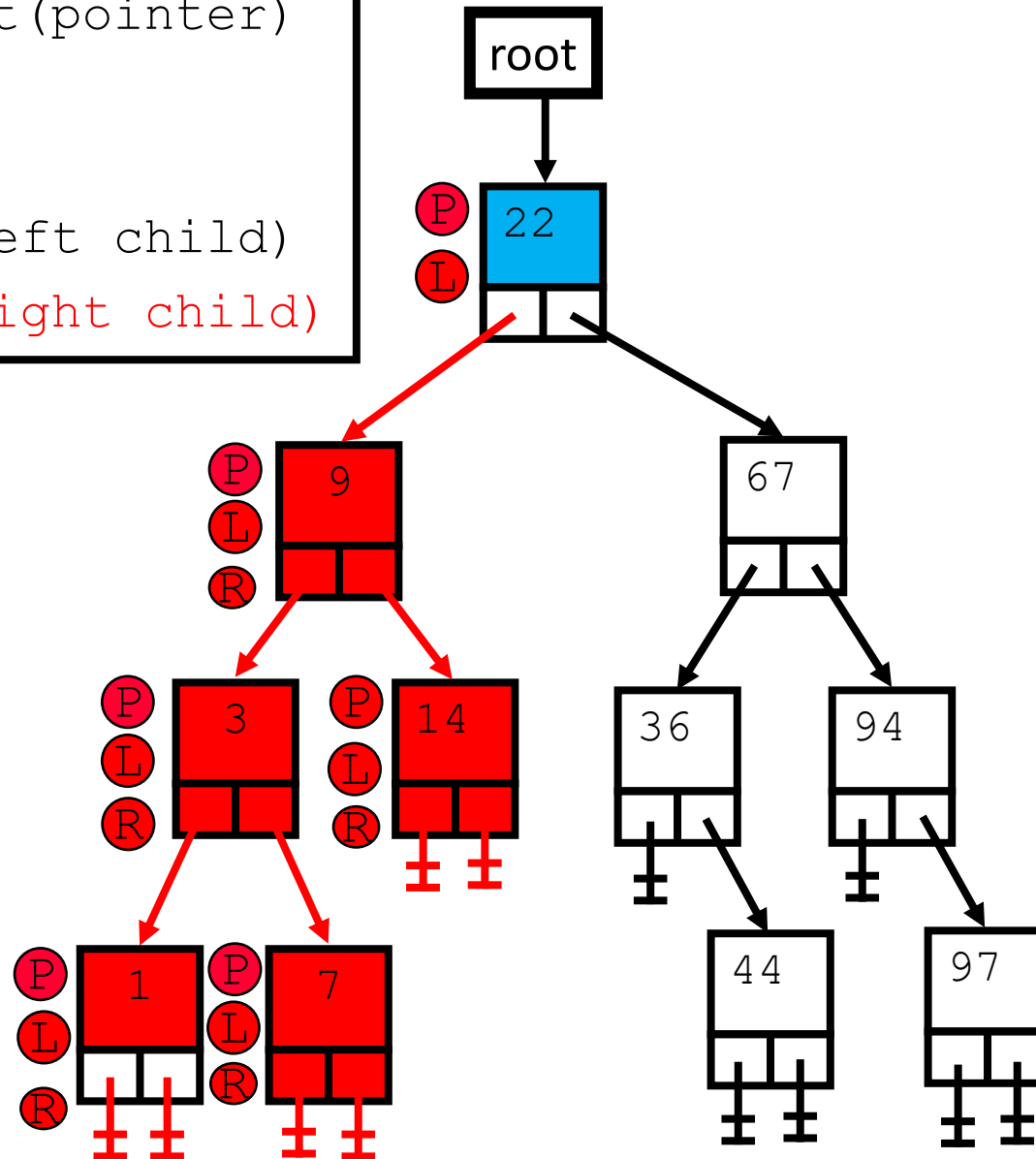


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

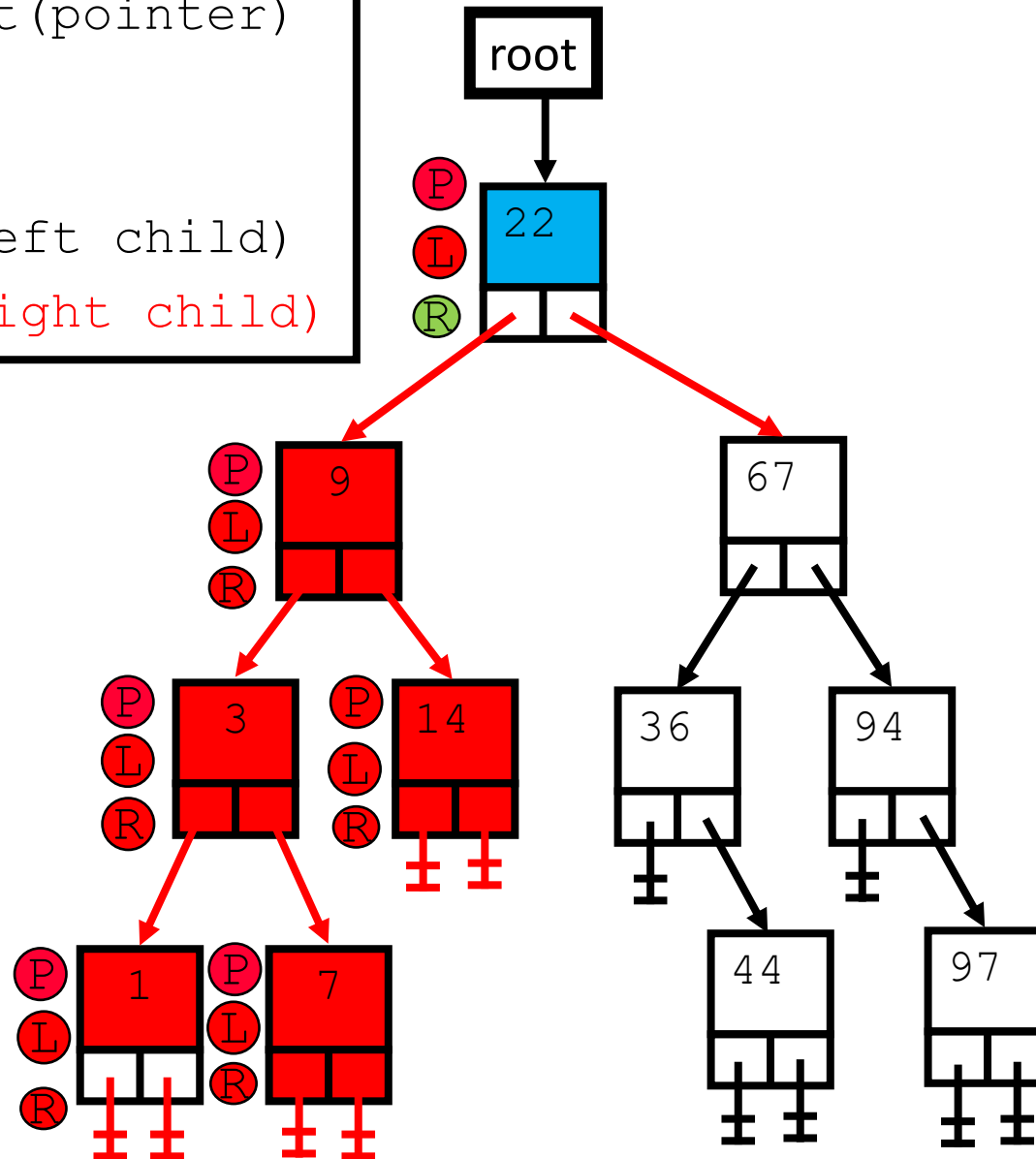
```

Output: 22 9 3 1 7 14



```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)
```

Output: 22 9 3 1 7 14



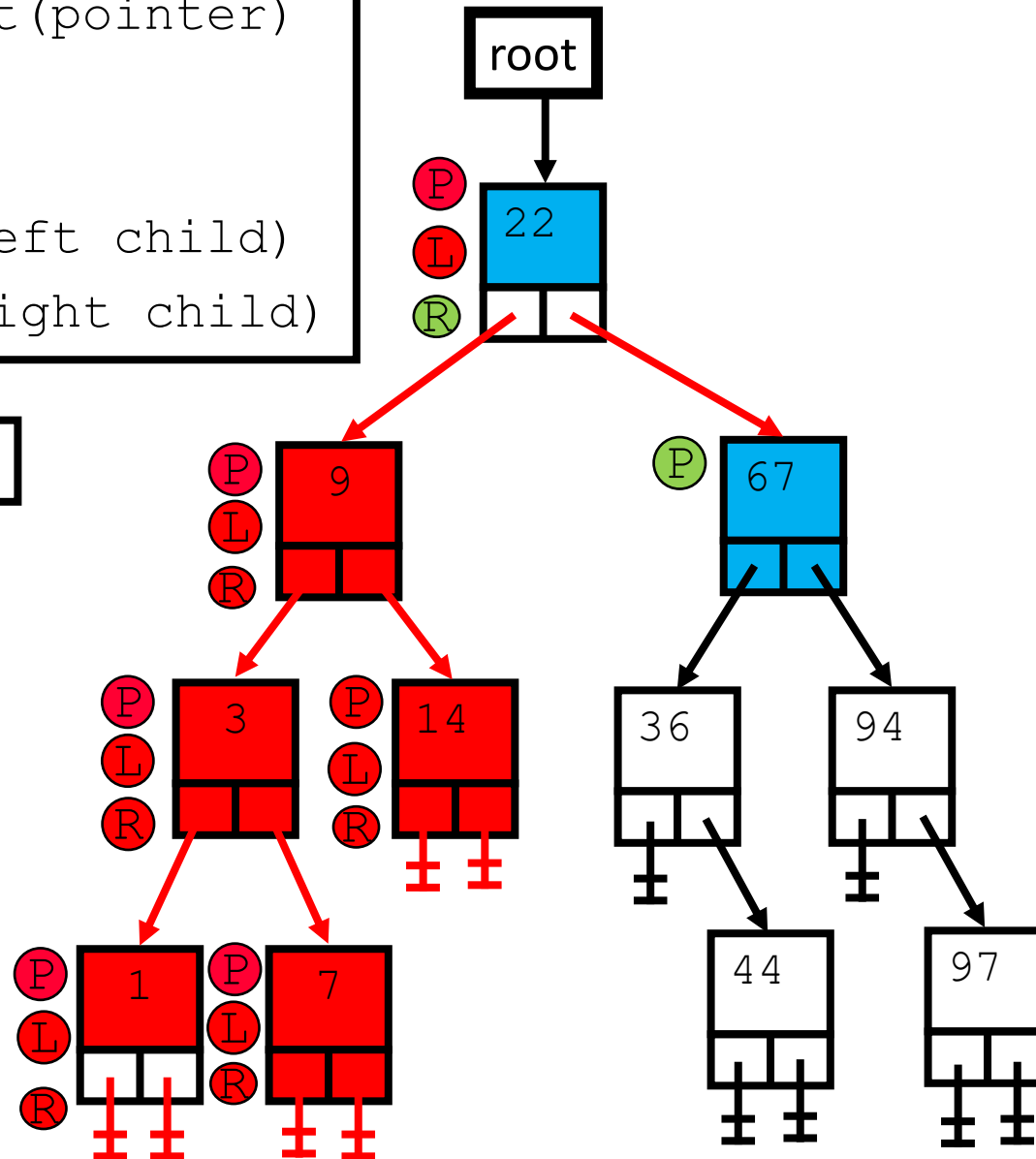
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
```

Ⓟ `print(data)`

Ⓛ `PreOrderPrint(left child)`

Ⓡ `PreOrderPrint(right child)`

Output: 22 9 3 1 7 14 67



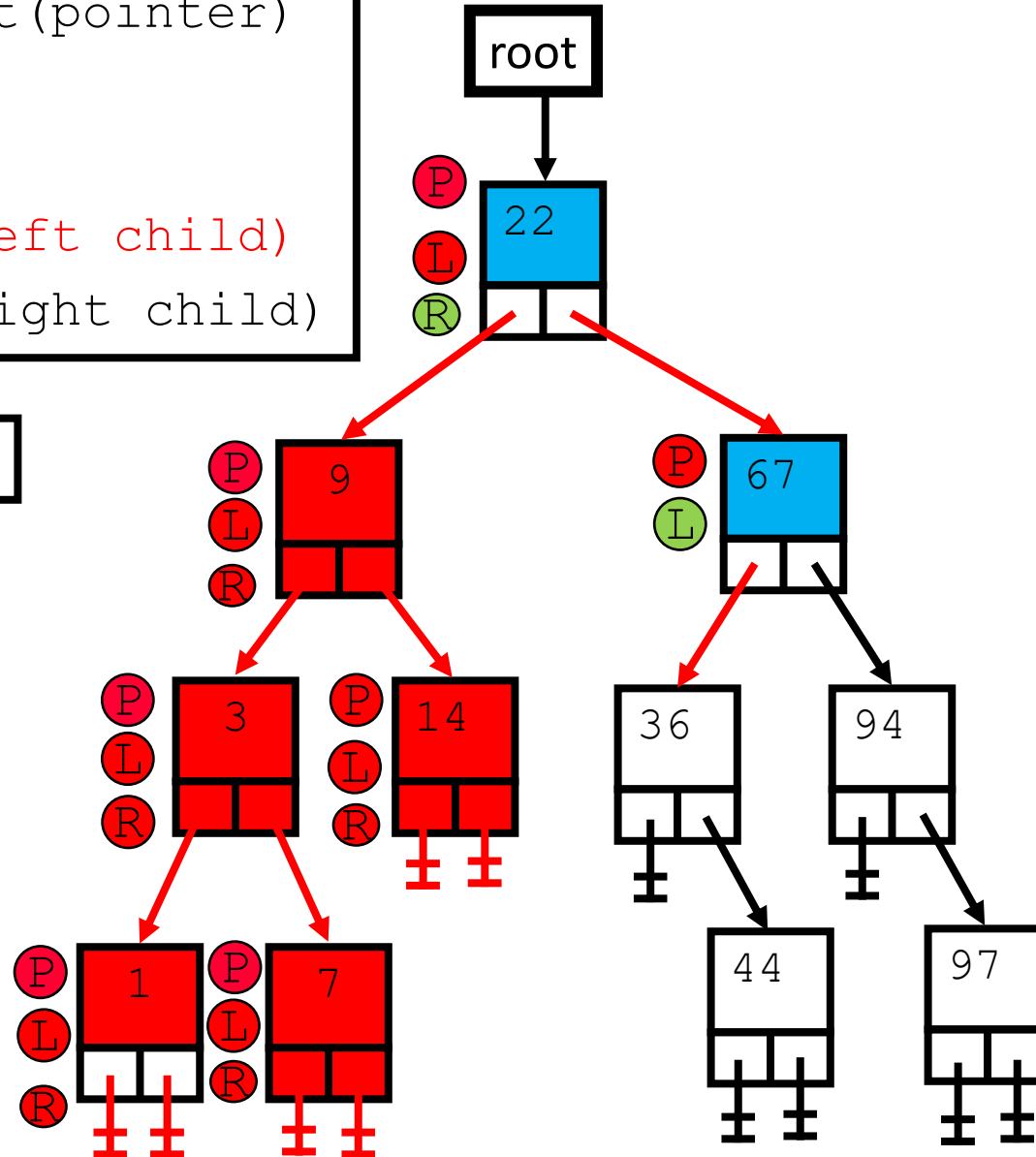


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67

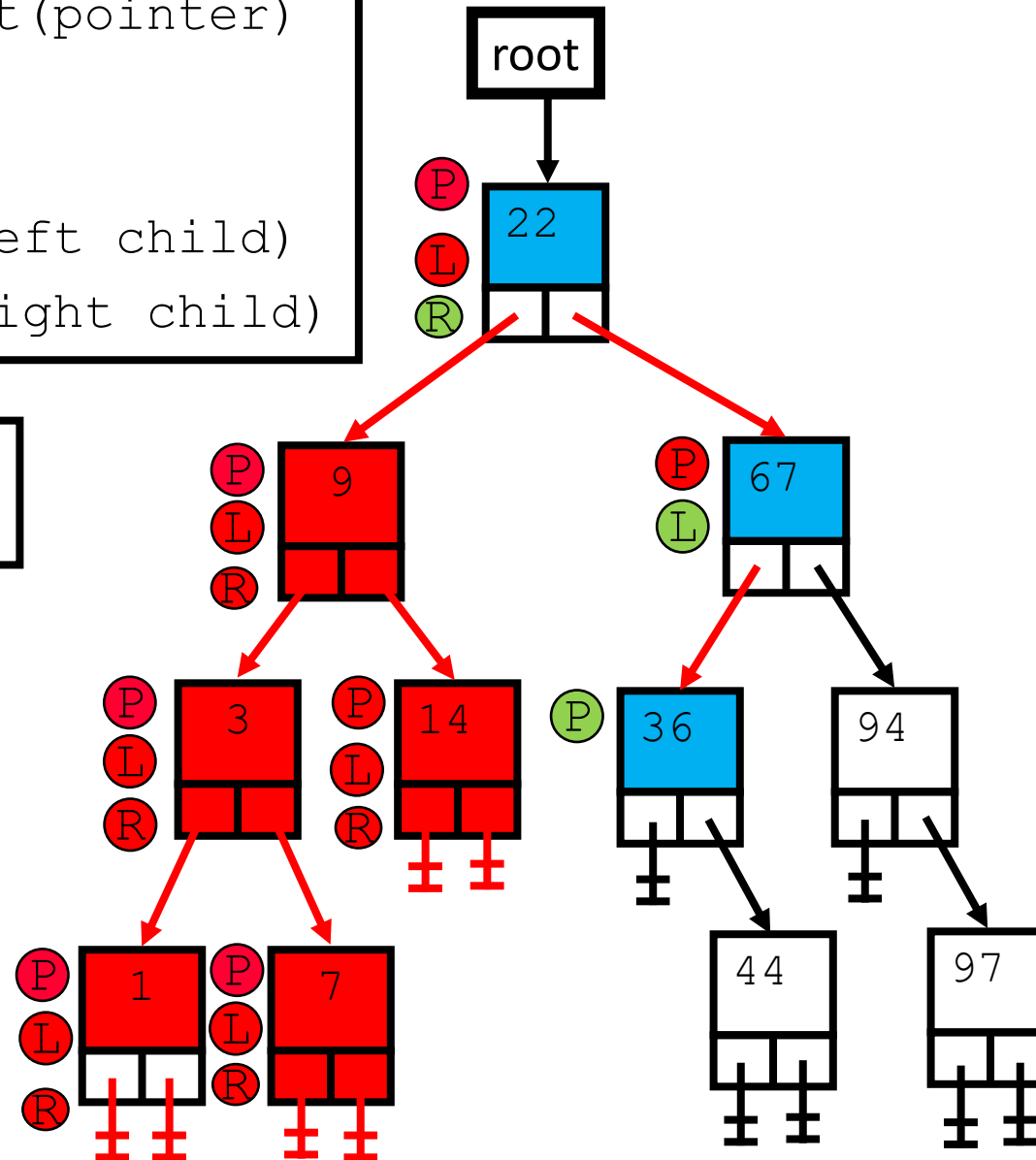


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36

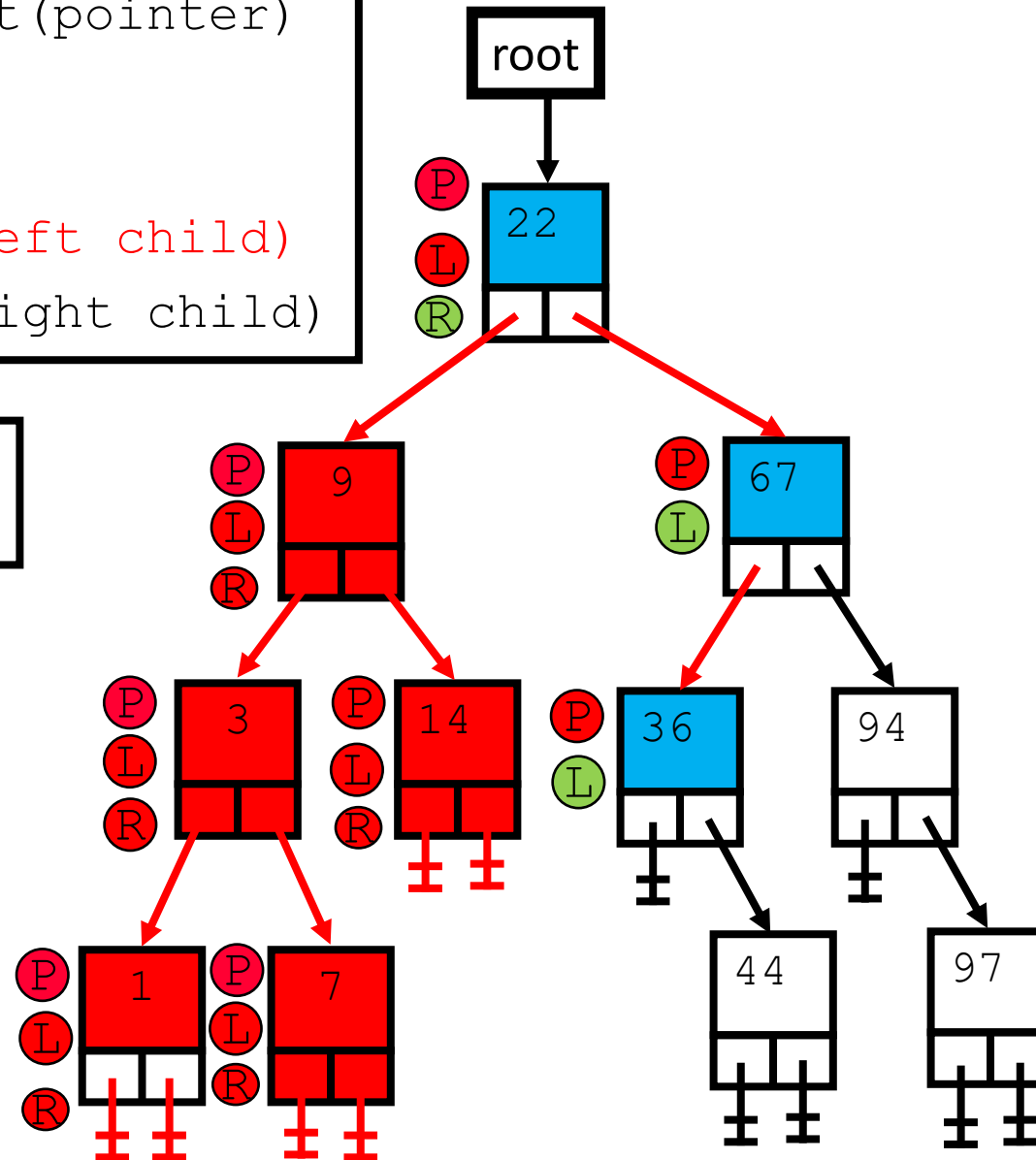


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36

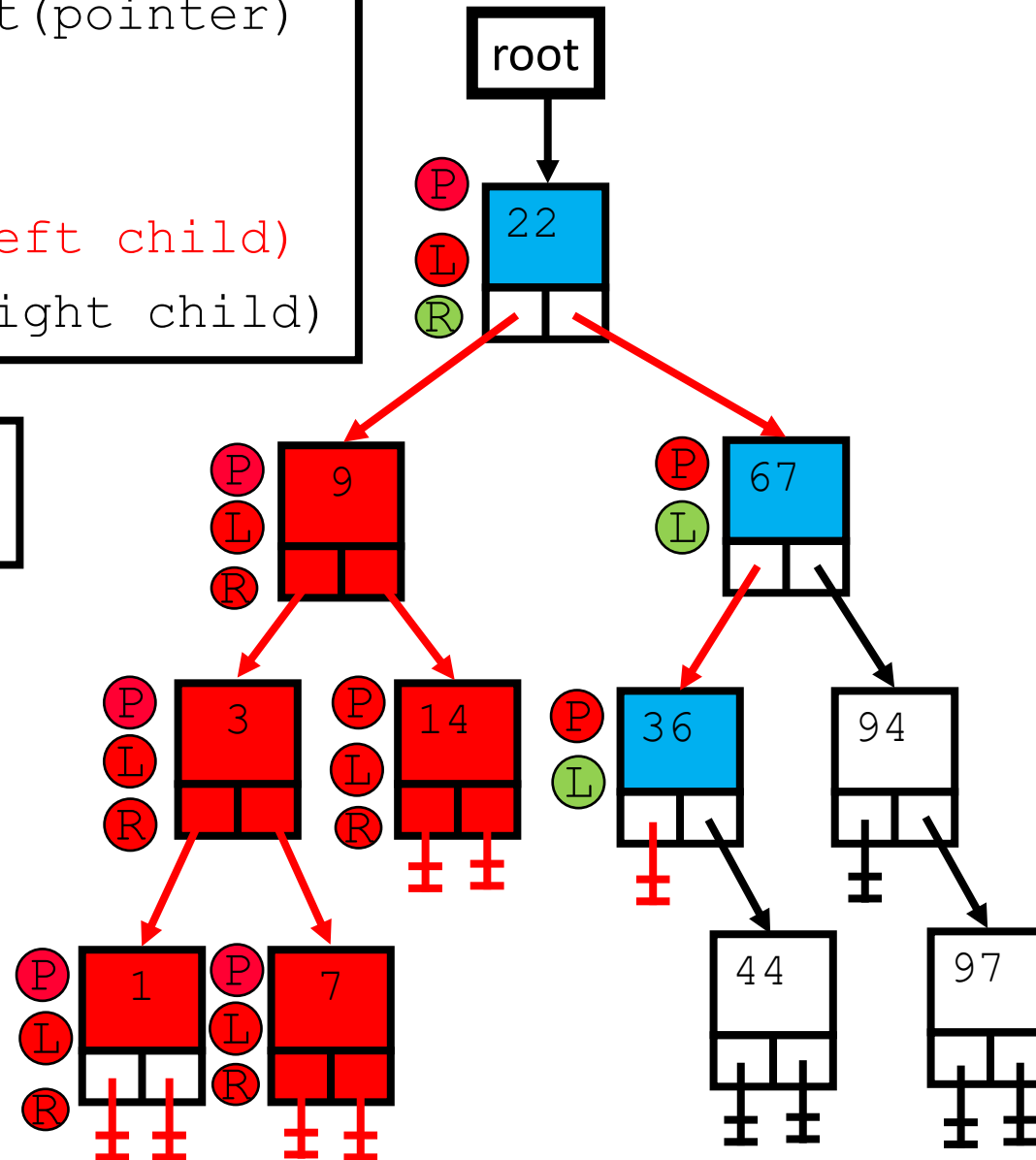


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36

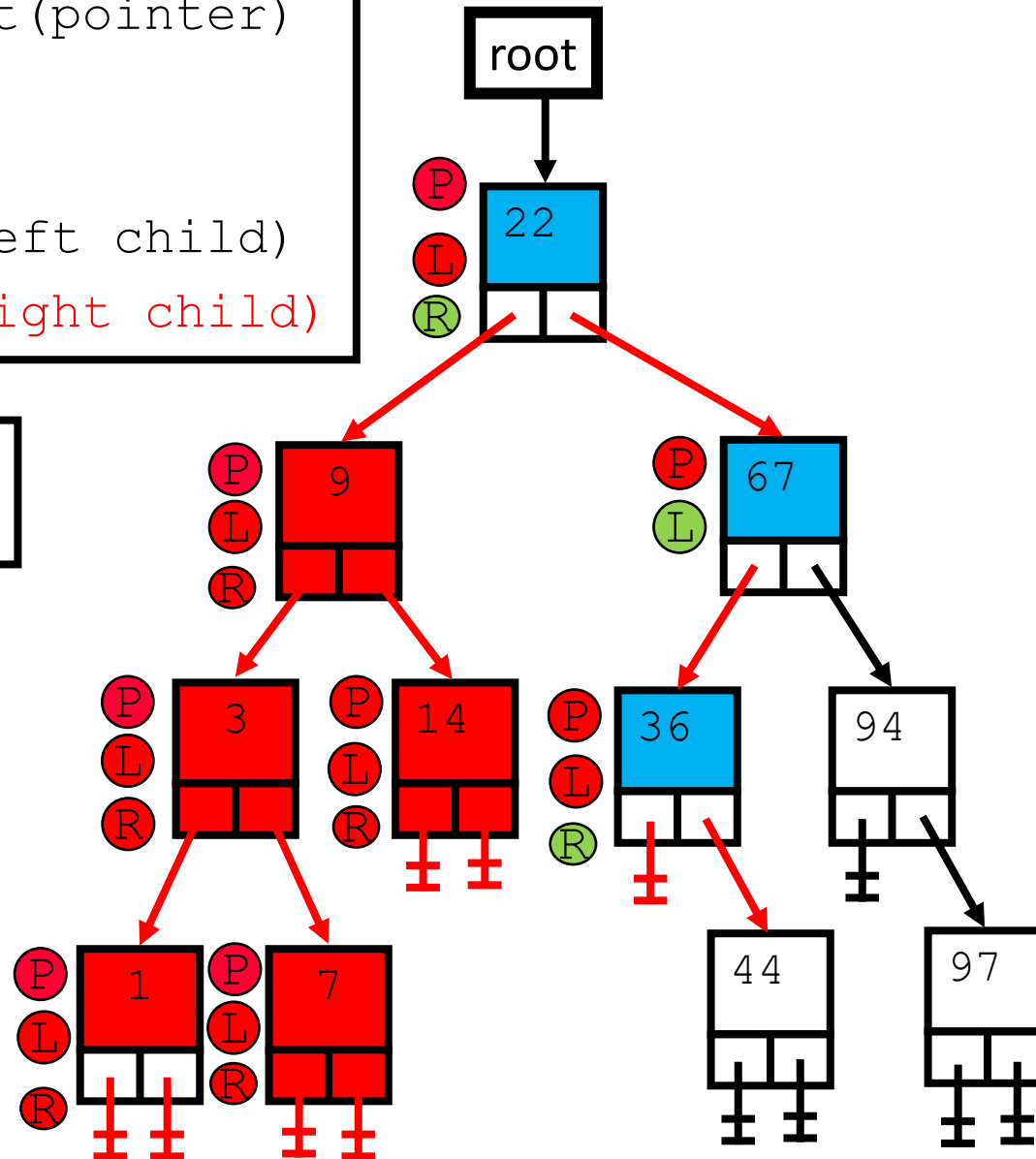


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36



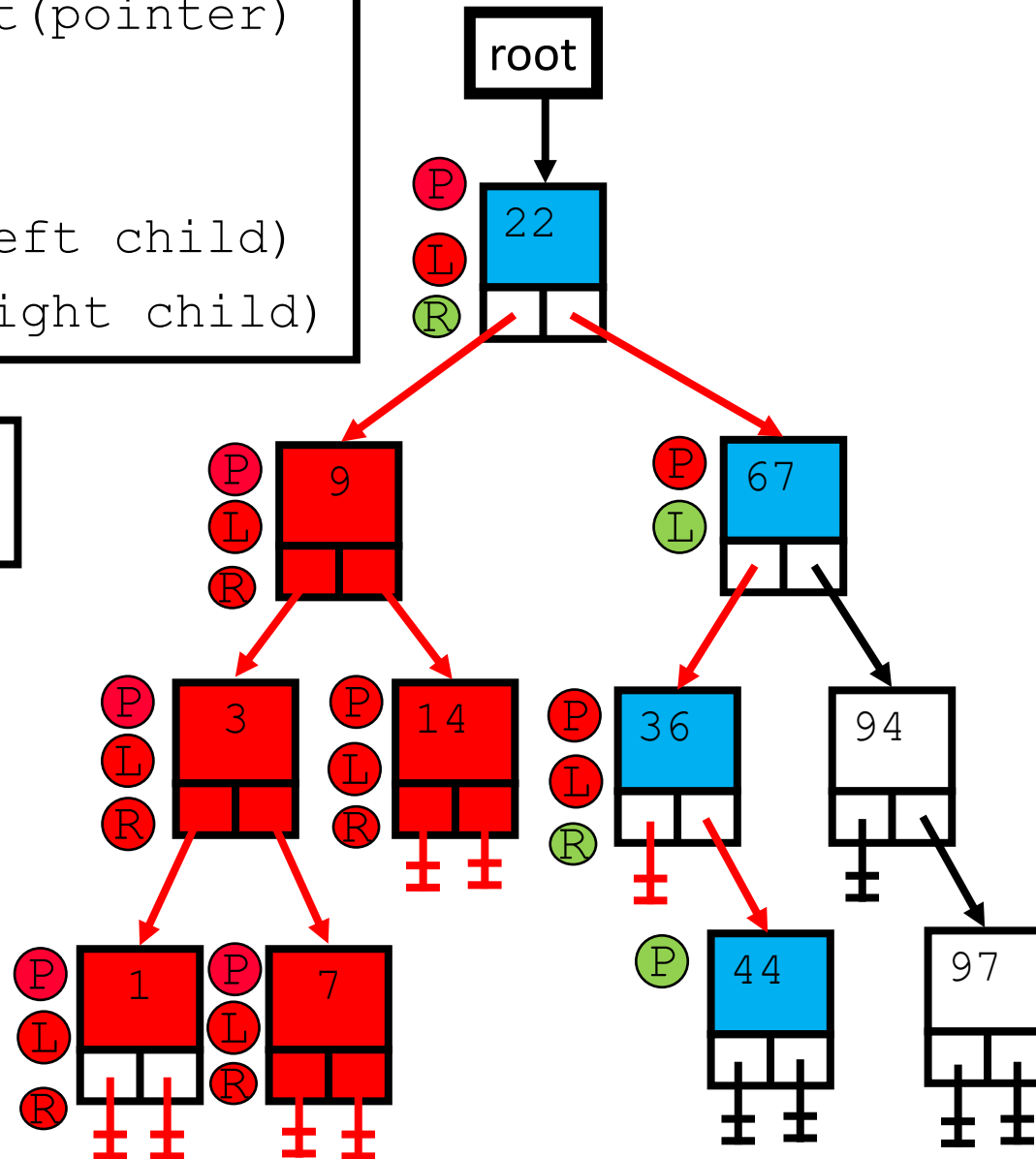
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
```

Ⓟ print(data)

Ⓛ PreOrderPrint(left child)

Ⓡ PreOrderPrint(right child)

Output: 22 9 3 1 7 14 67  
36 44

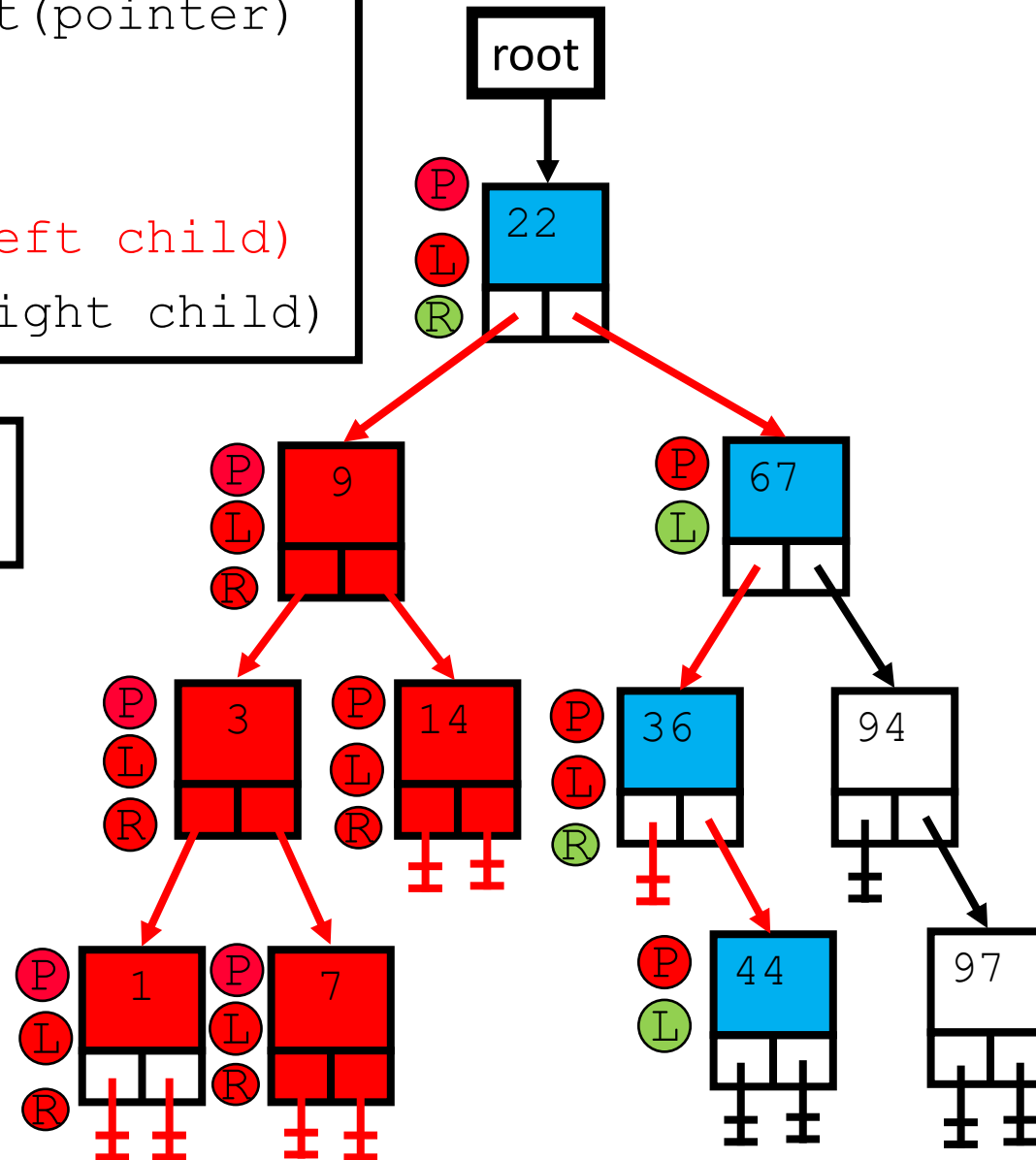


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44

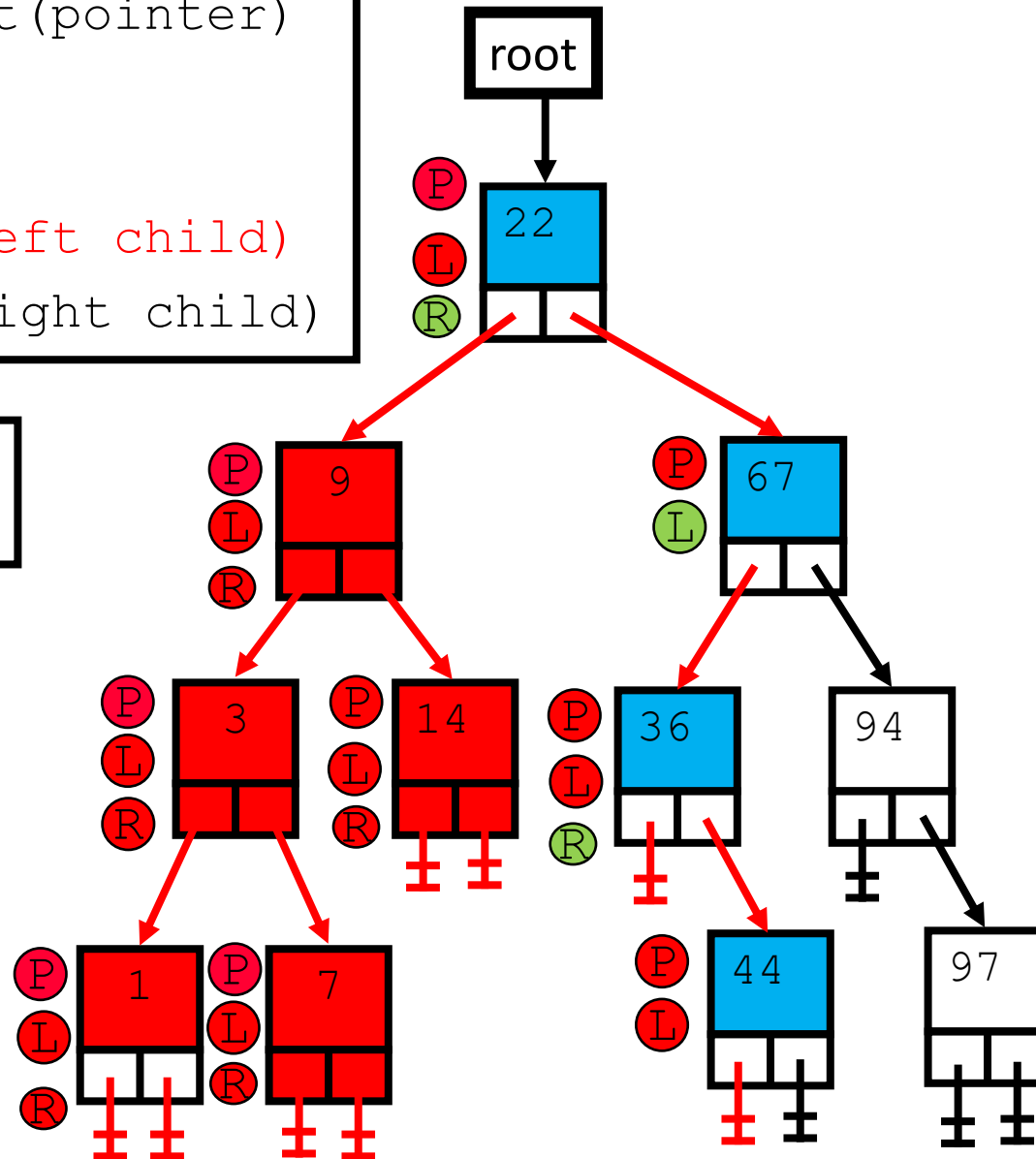


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44



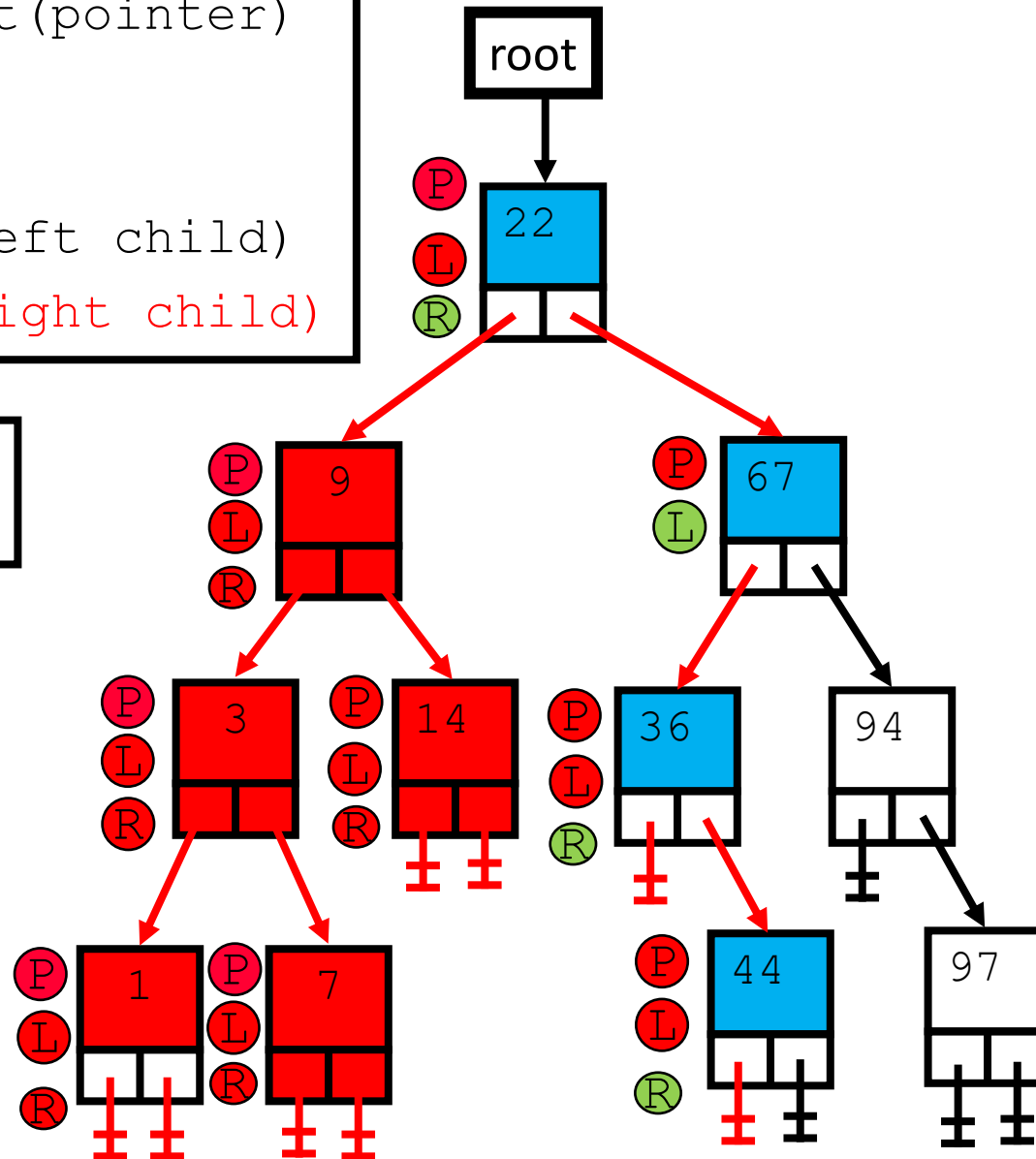


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44

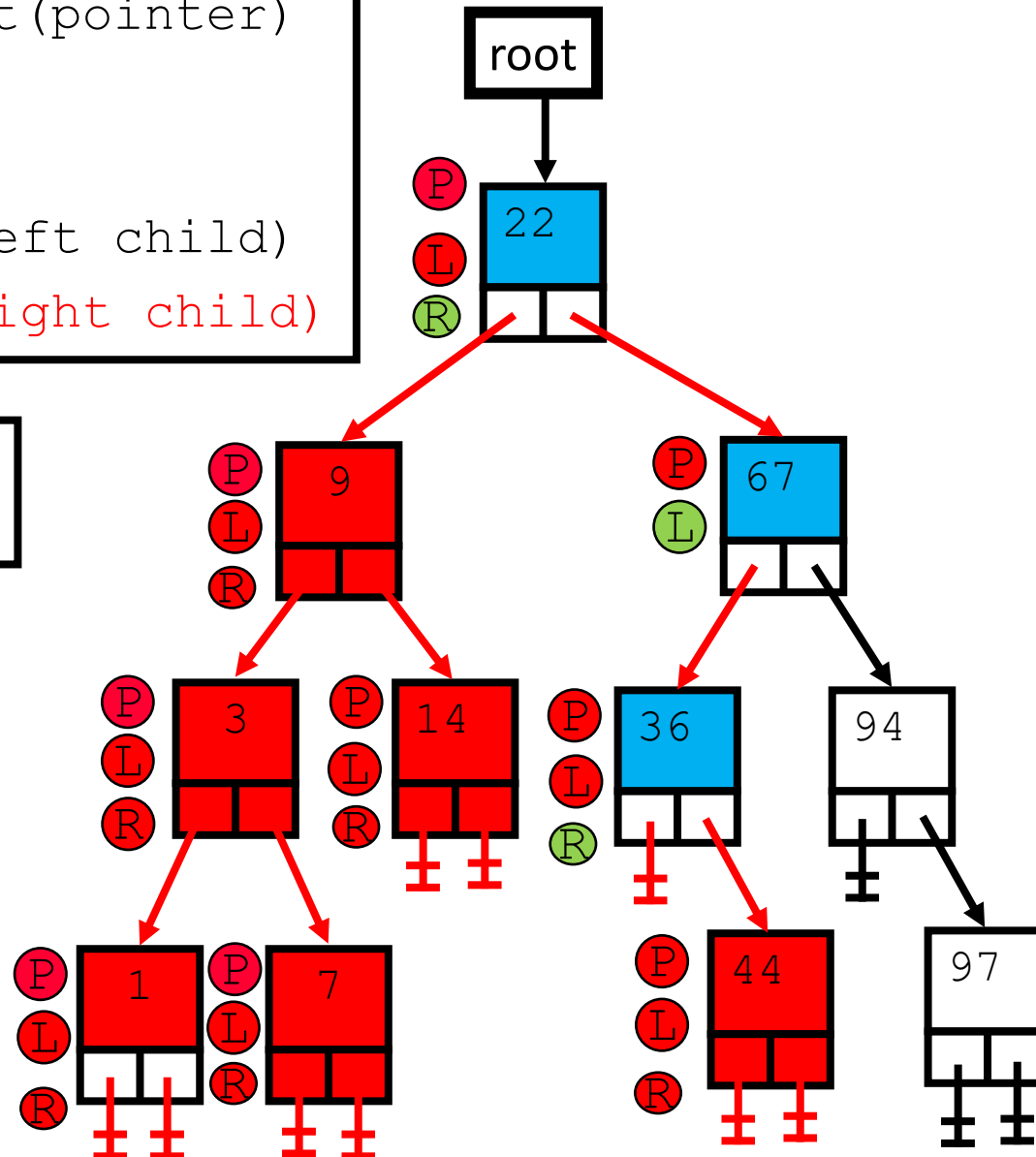


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44

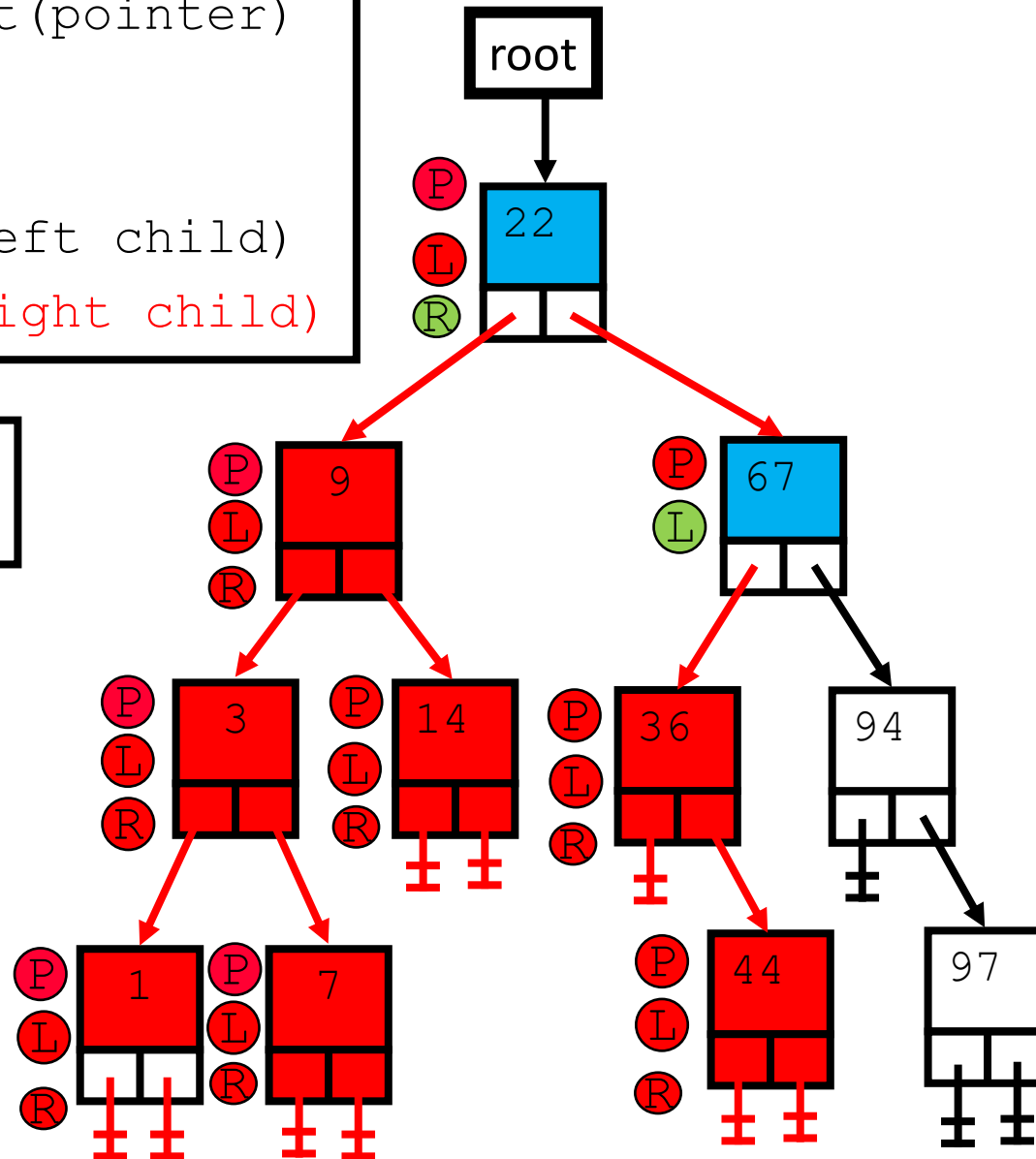


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44

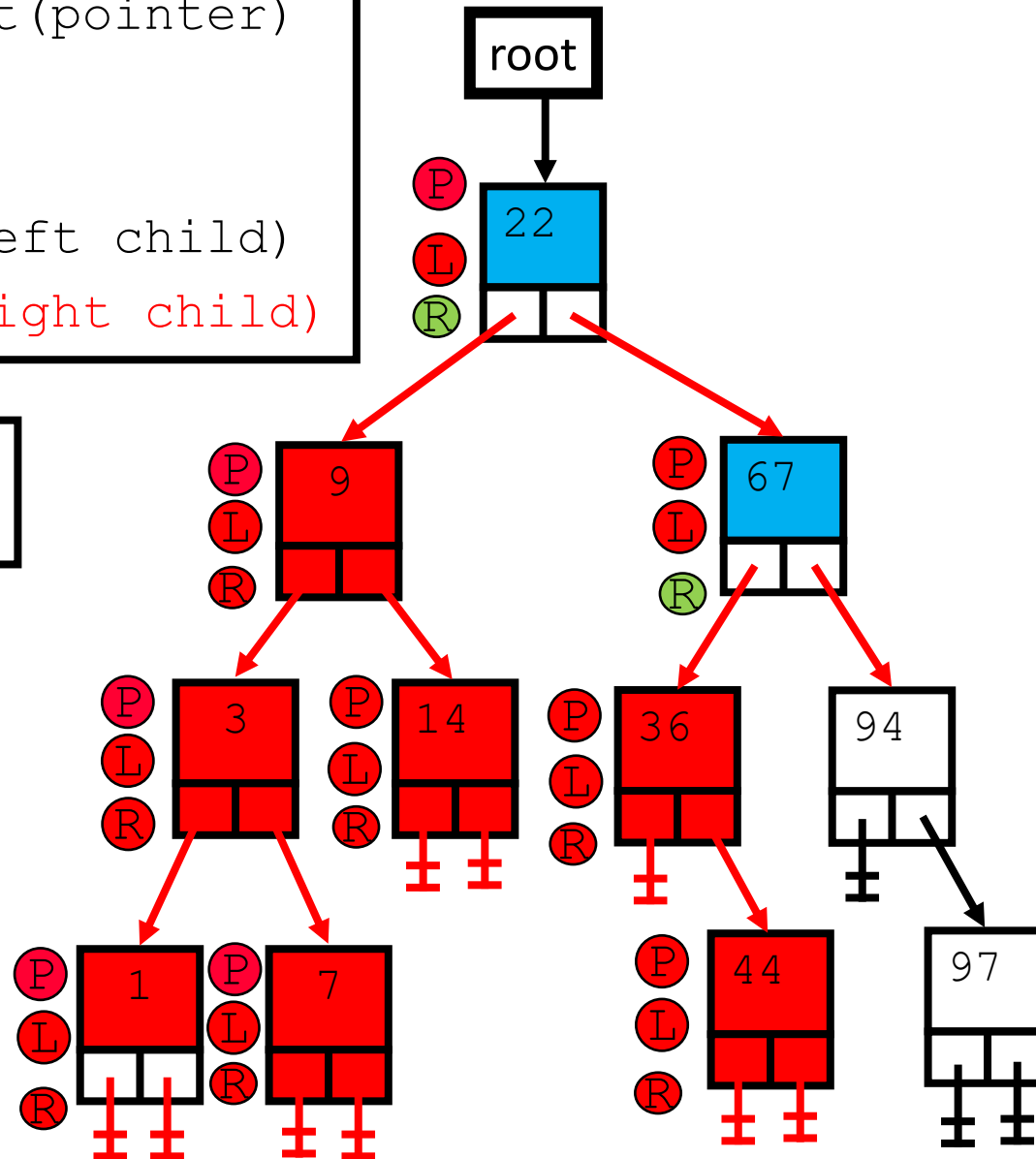


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44

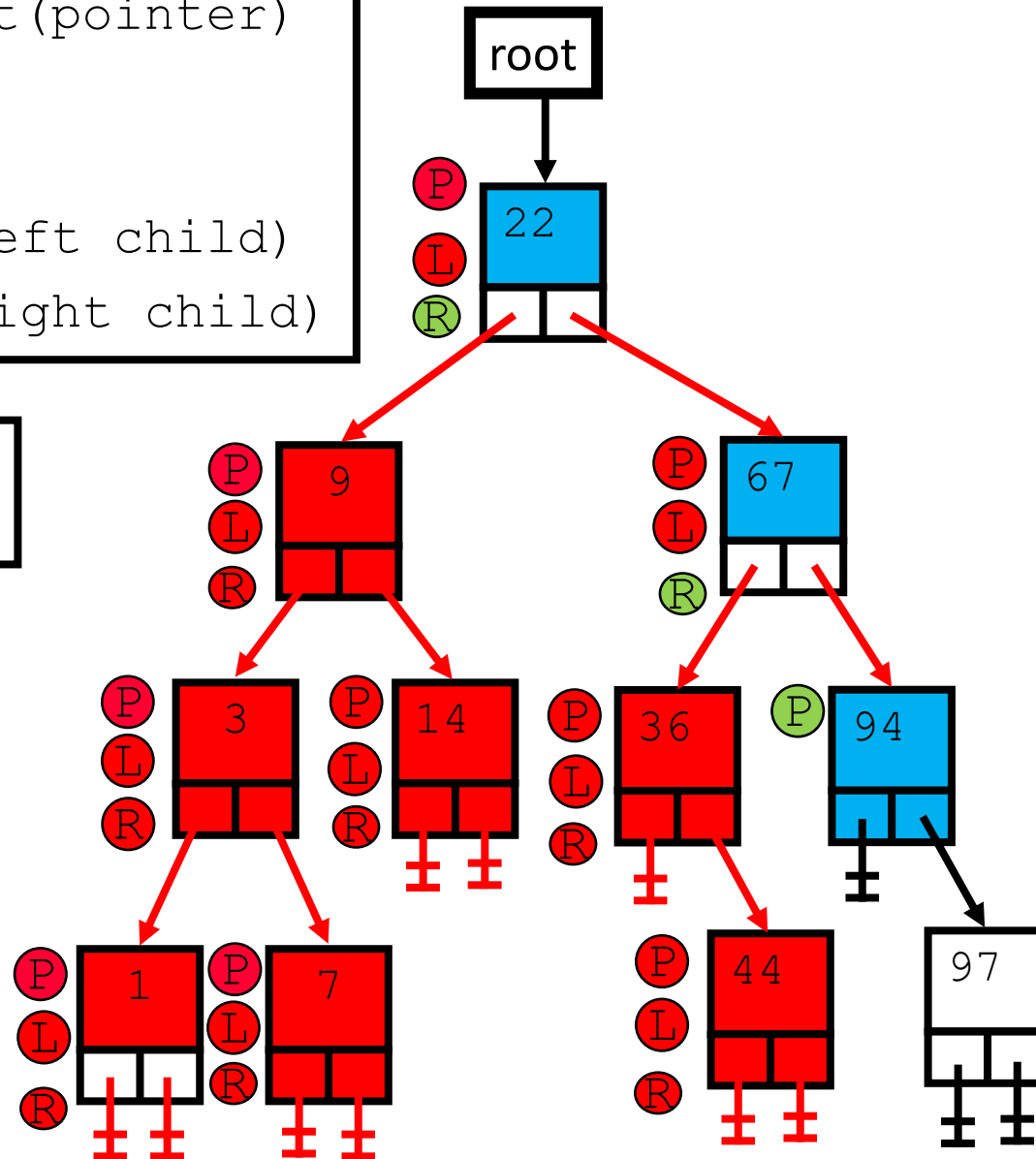


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94

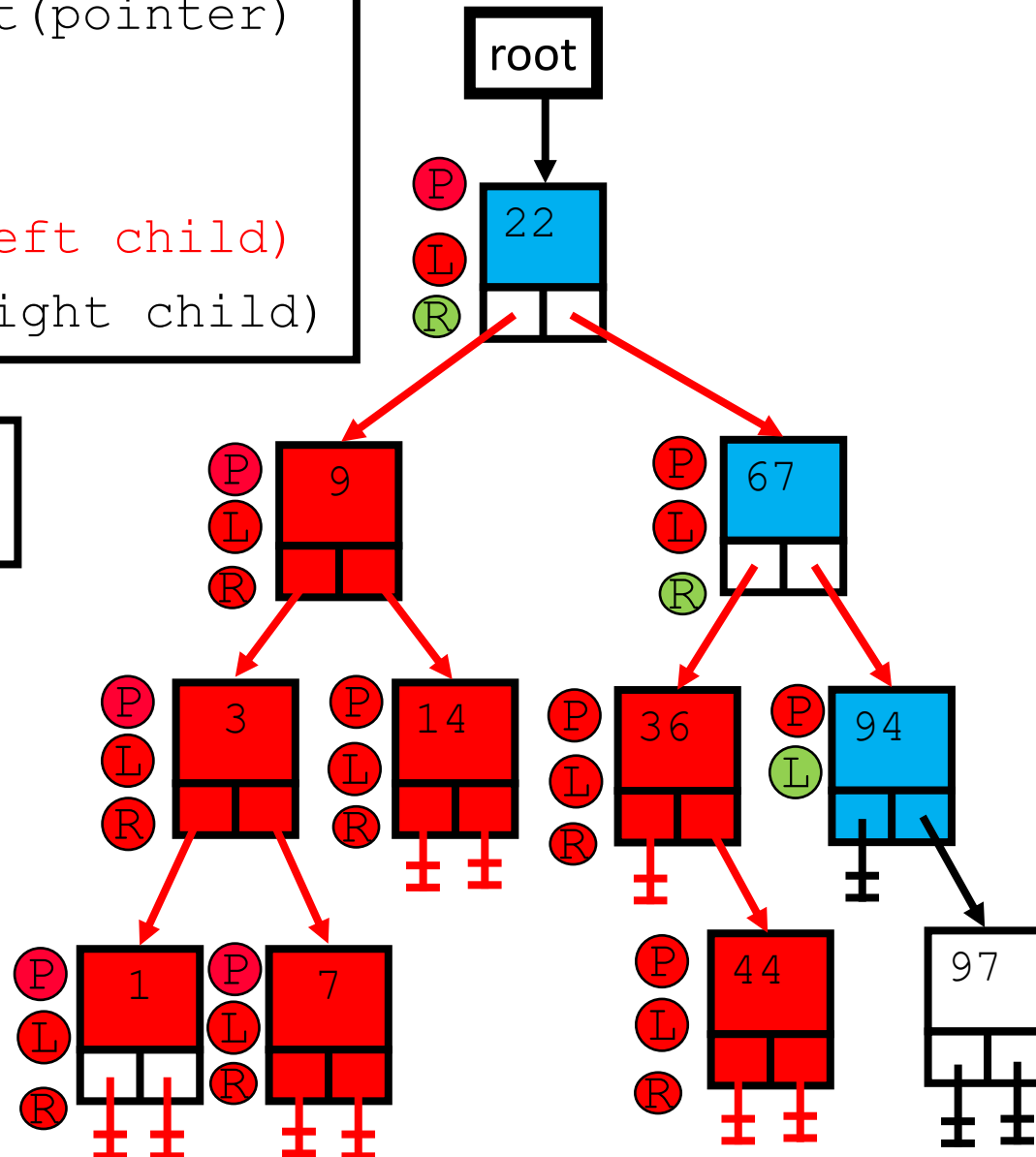


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94

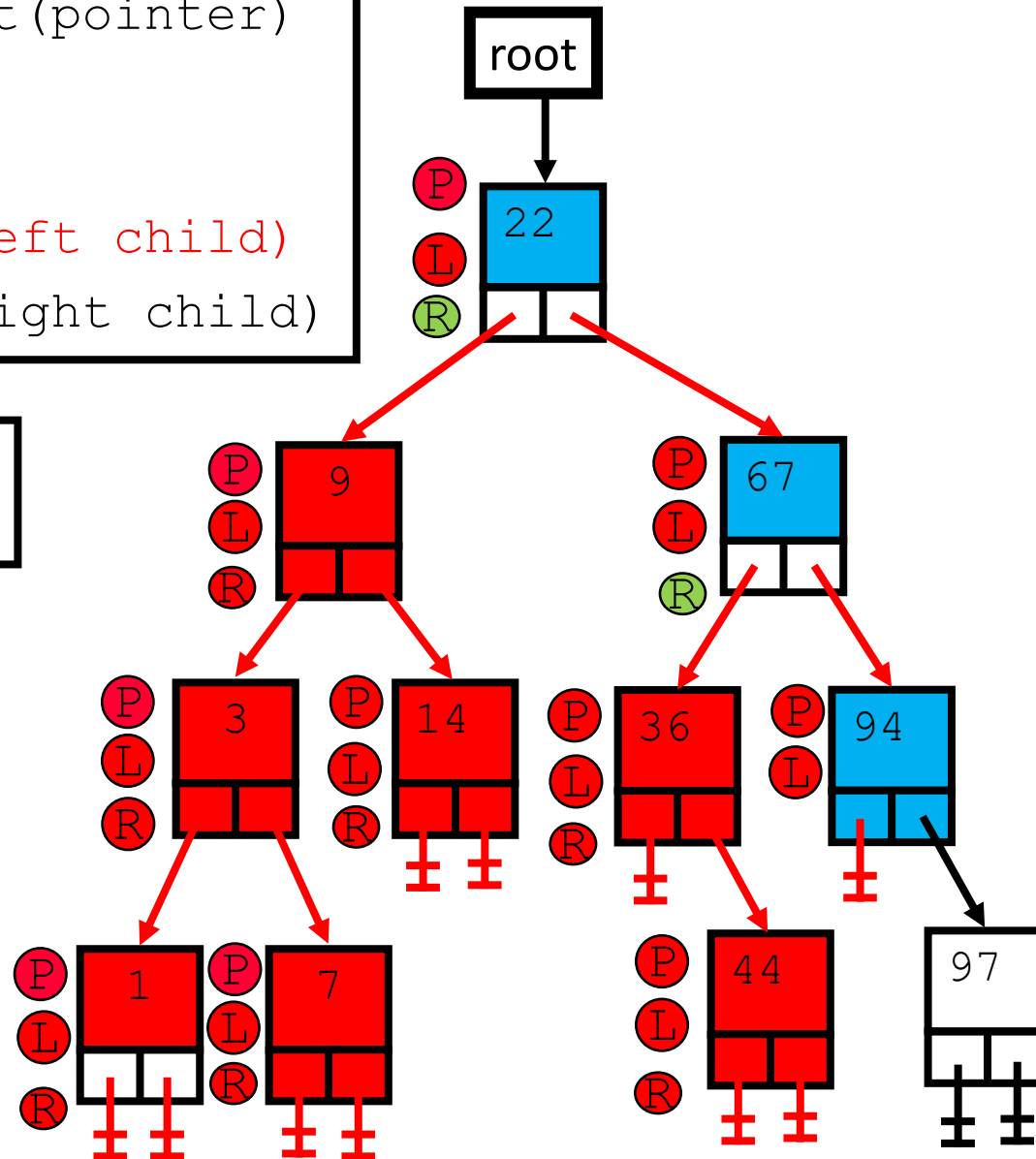


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94

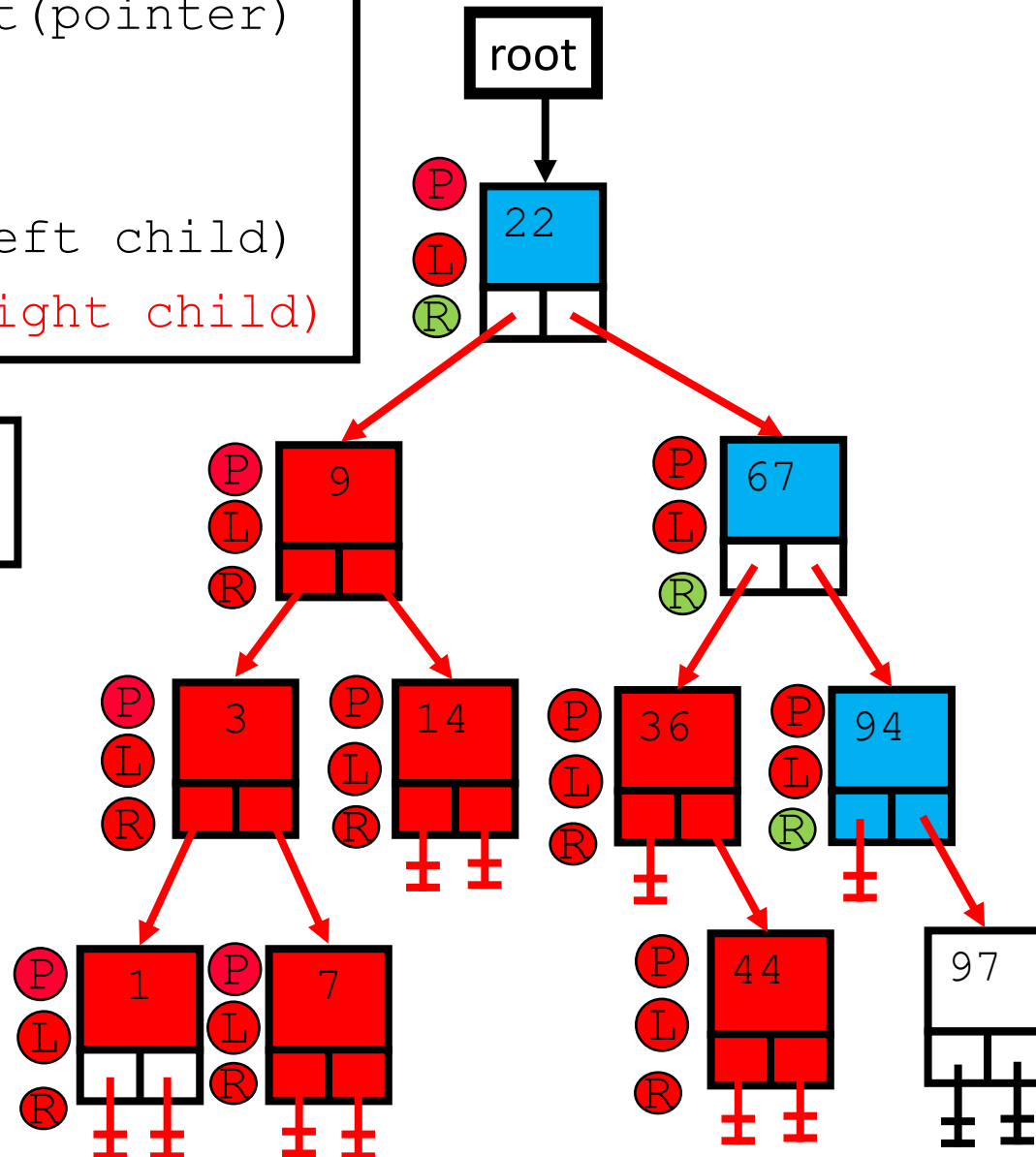


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94





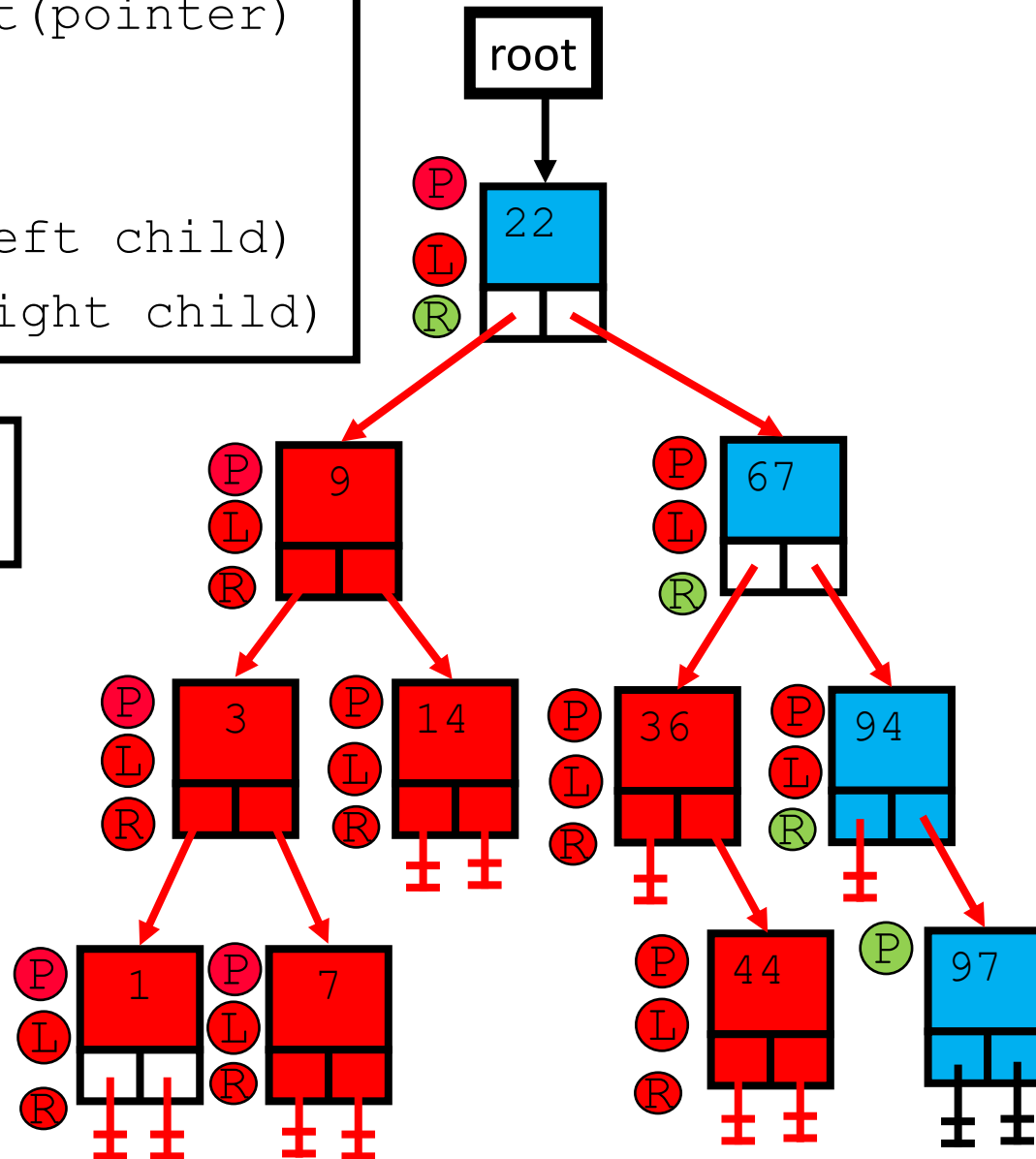
```
Proc PreOrderPrint(pointer)
  pointer NOT NIL?
```

Ⓟ print(data)

Ⓛ PreOrderPrint(left child)

Ⓡ PreOrderPrint(right child)

Output: 22 9 3 1 7 14 67  
36 44 94 97

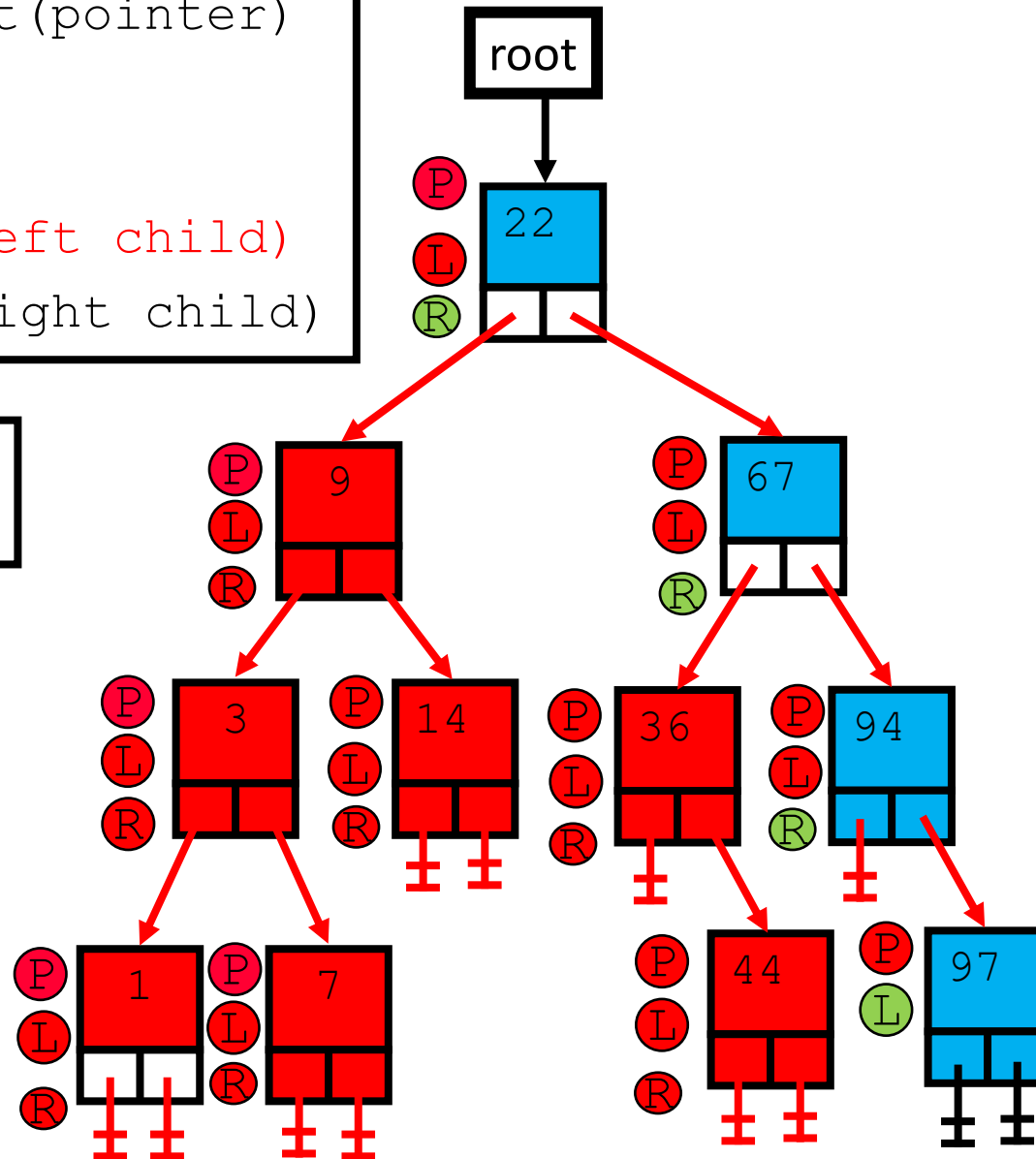


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94 97

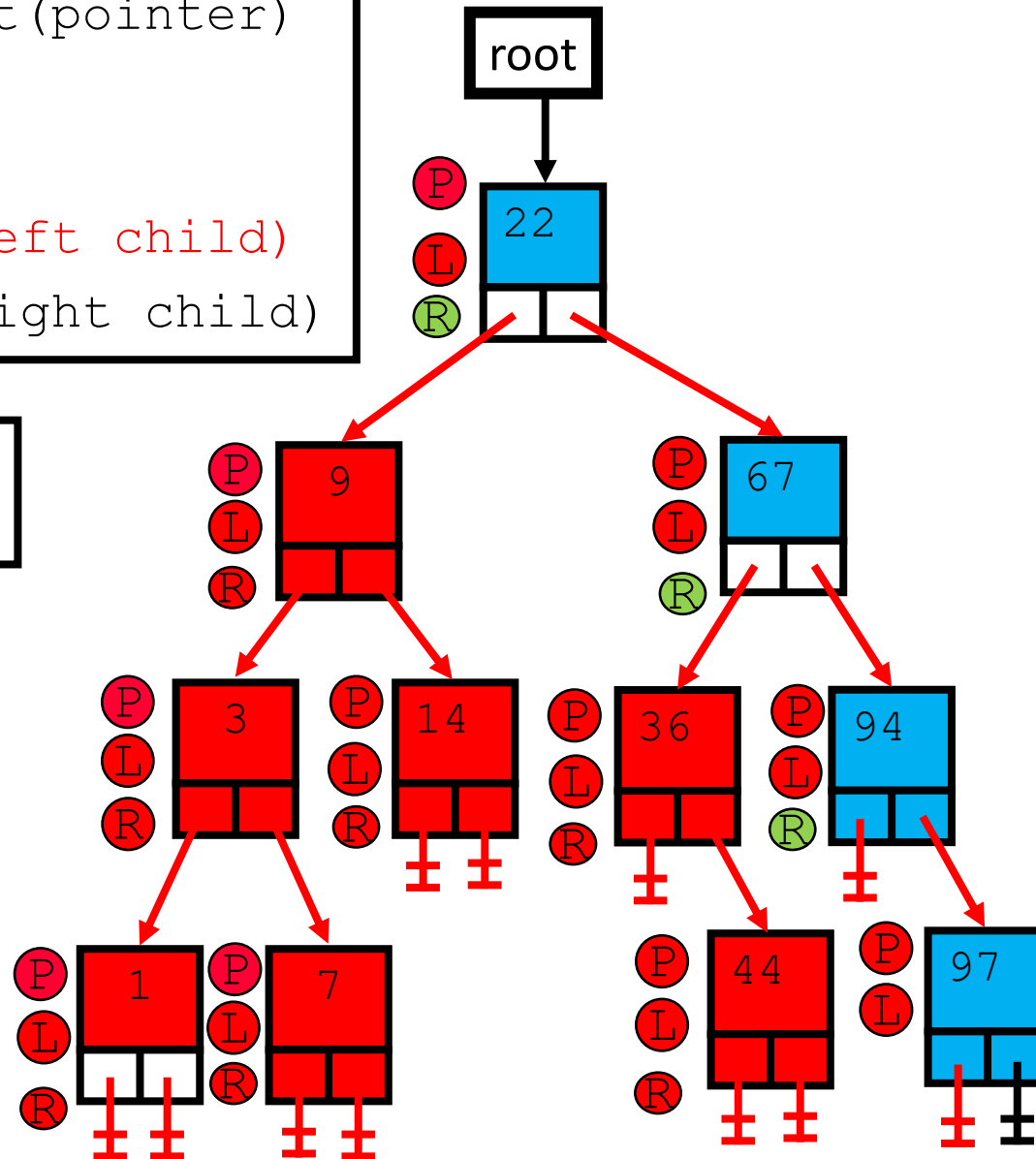


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94 97

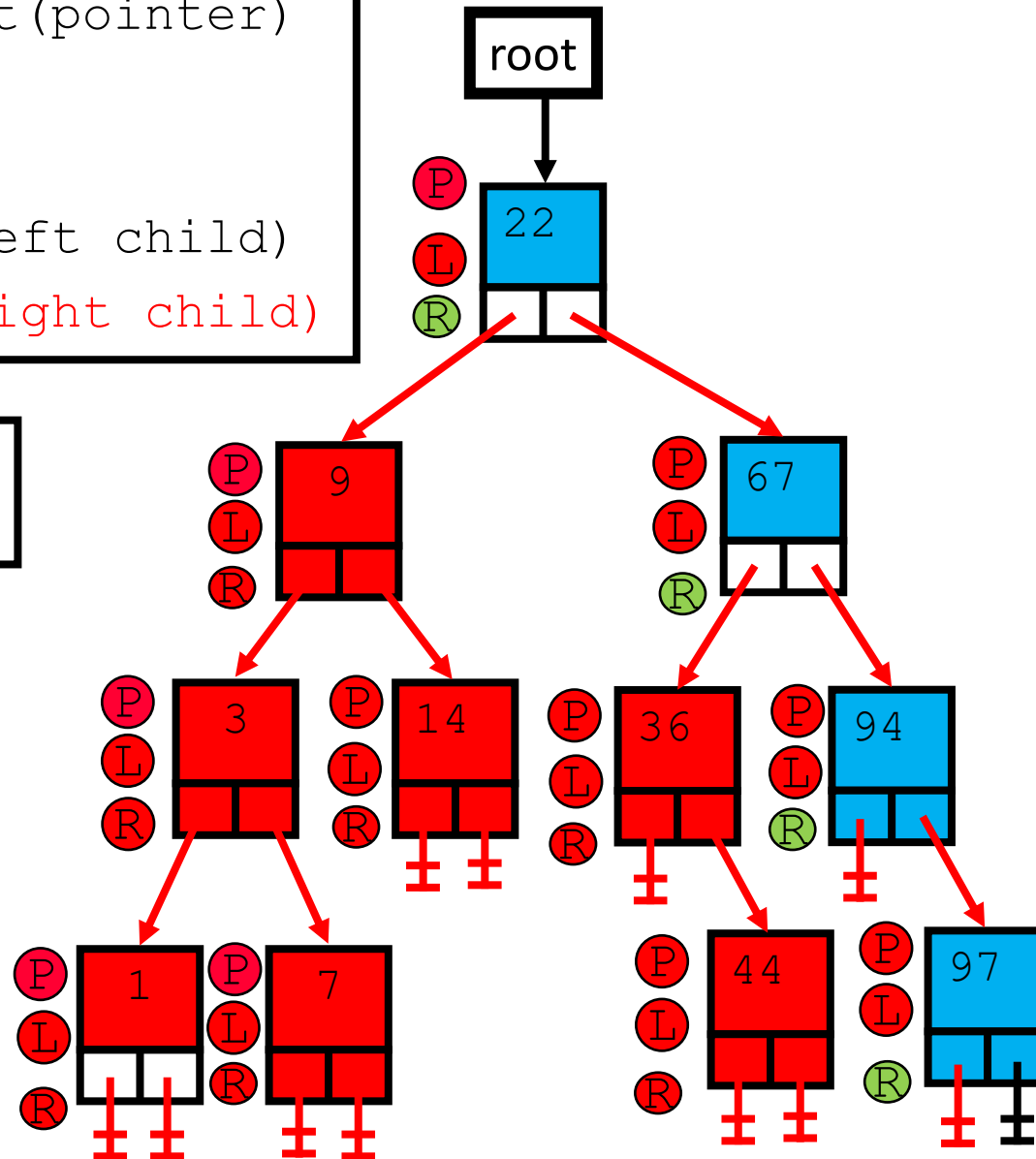


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94 97

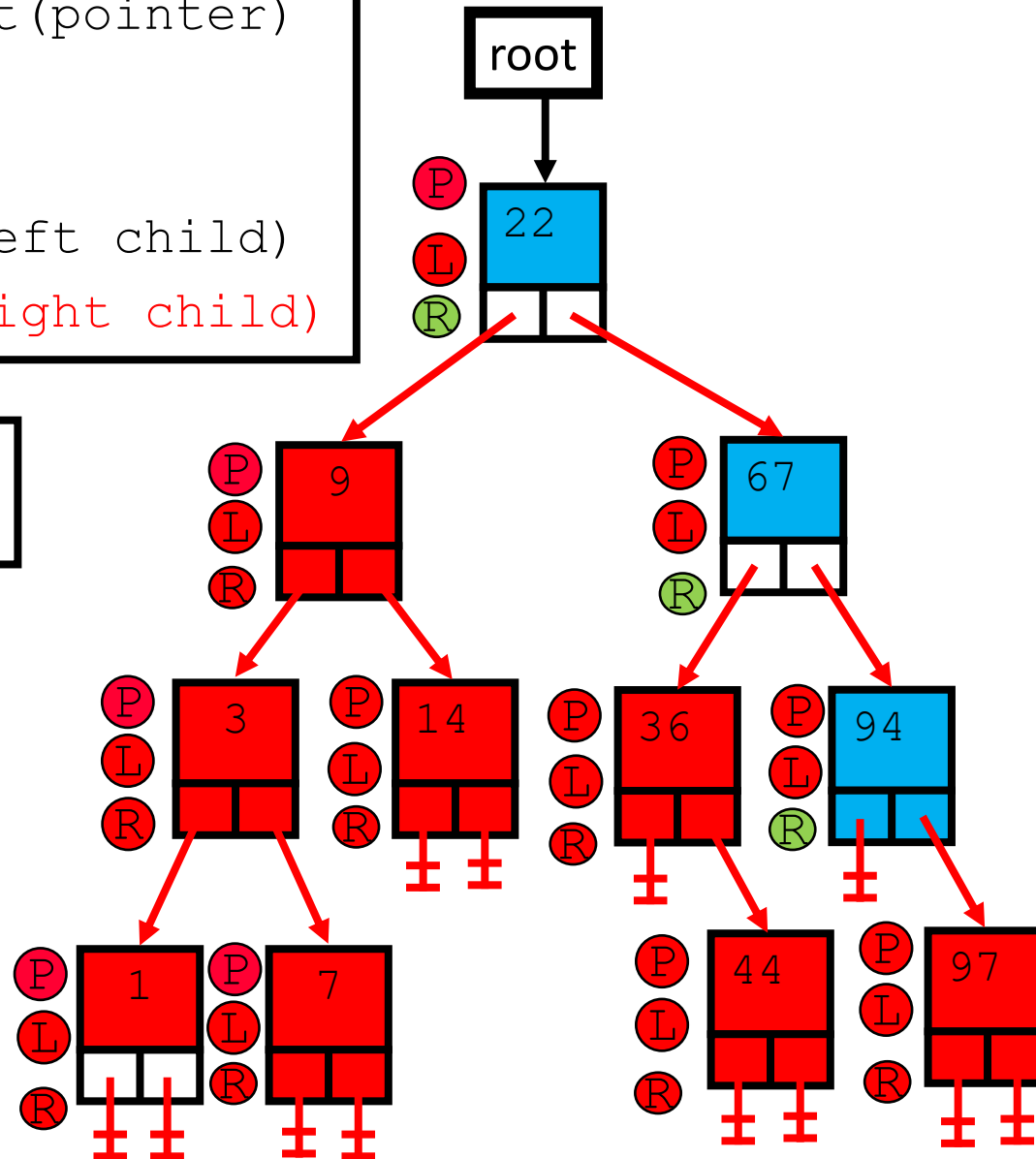


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94 97

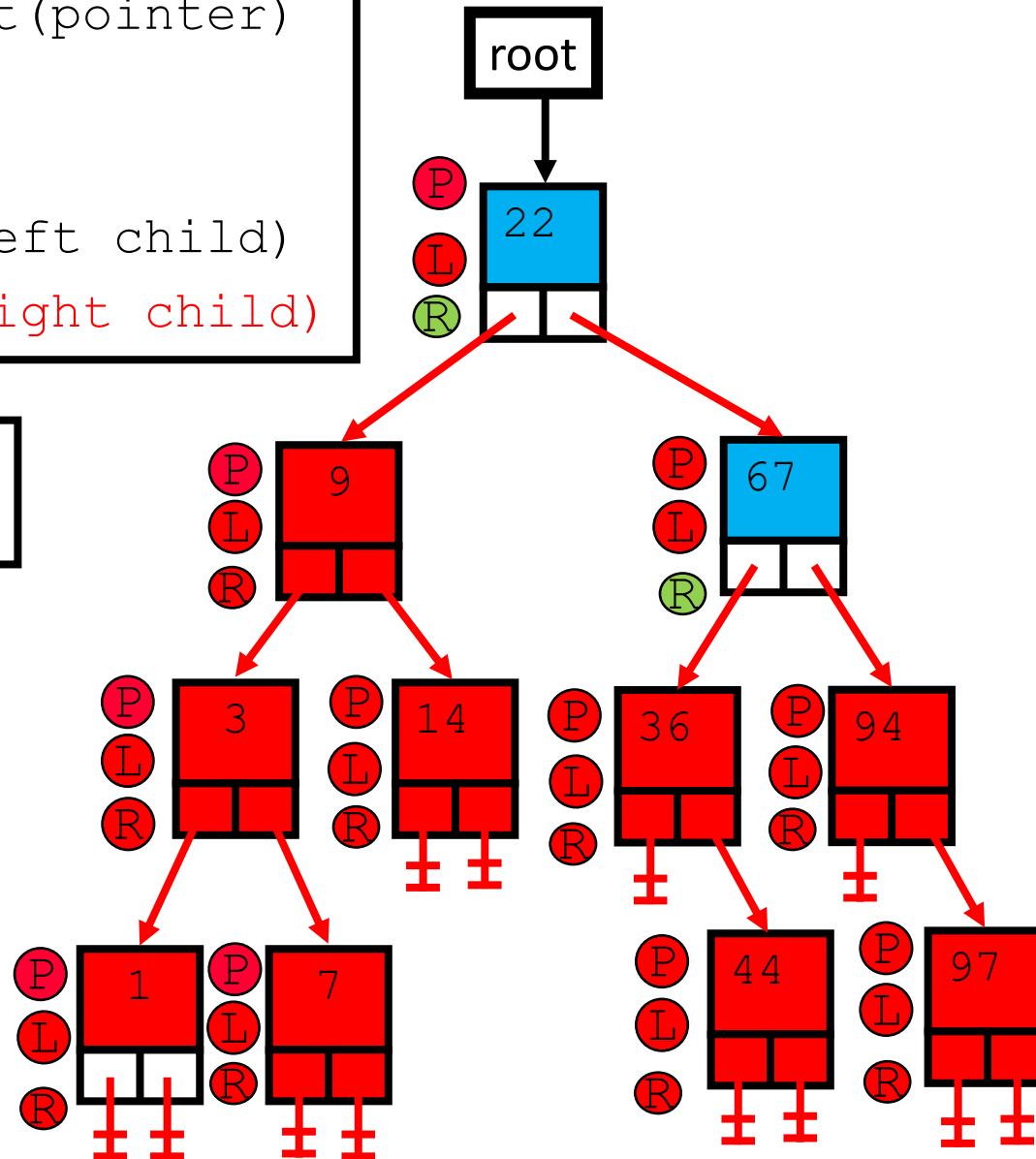


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
36 44 94 97

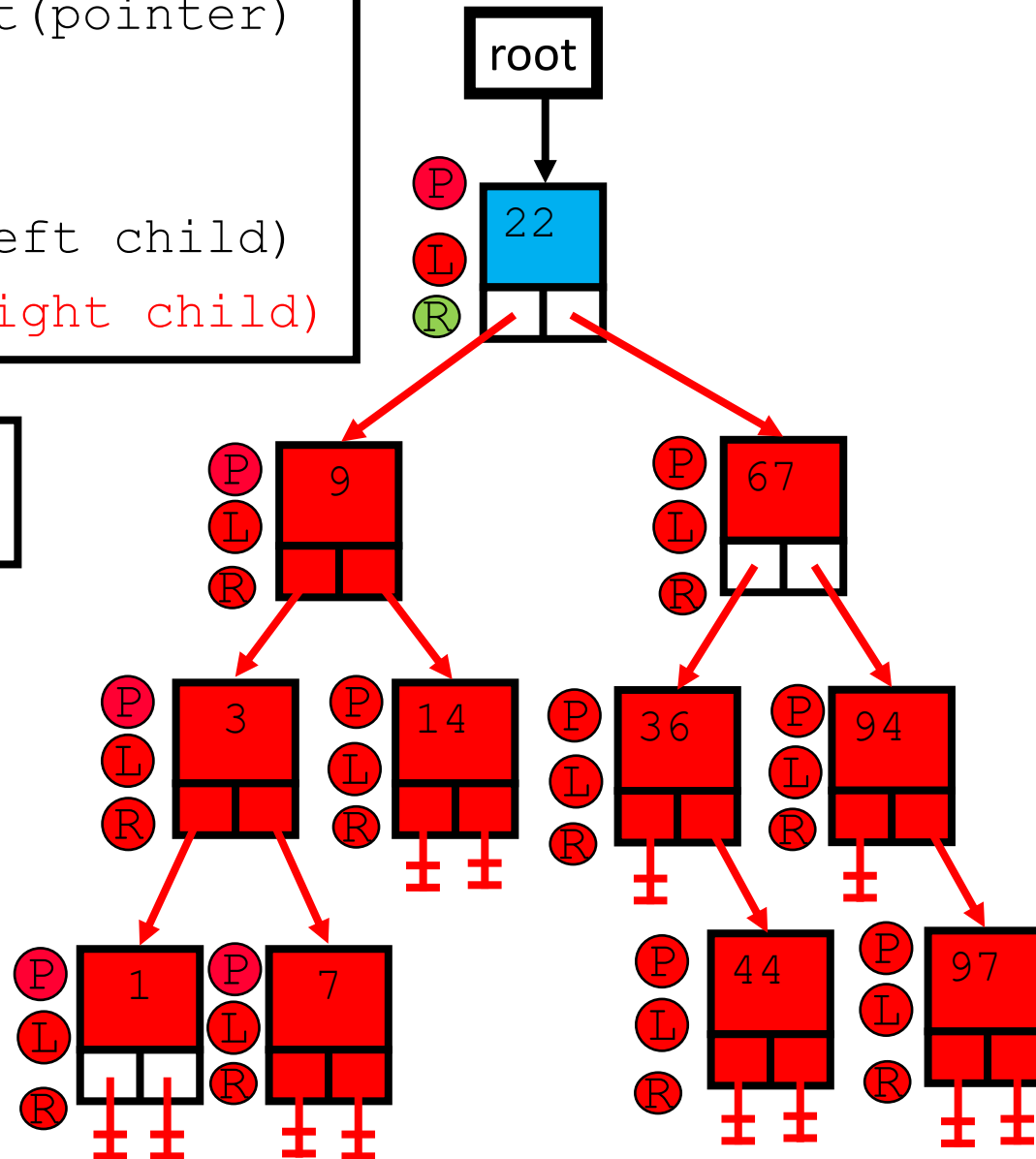


```

Proc PreOrderPrint(pointer)
  pointer NOT NIL?
  (P) print(data)
  (L) PreOrderPrint(left child)
  (R) PreOrderPrint(right child)

```

Output: 22 9 3 1 7 14 67  
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