Fundamentals of Computing: Lecture 27

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- Binary trees. A binary tree is either an empty Tree or a root node with two children left subtree and right subtree.
- General trees (some times called Rose trees). Either an empty tree or a node with a Forest of subtrees.

List

```
data List a = Empty | Cons a (List a)
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```
typedef struct Cons Cons;
typedef Cons *List
struct Cons {
  int datum;
  List next;
};
List emptyList = (List) NULL;
```

```
int head(List l)
{
  if( l == NULL) {error("head of an empty list");}
  else return l -> datum
}
List tail (List l)
{
  if( l == NULL) {error("tail of an empty list");}
  else return l -> next
}
```

Some list functions

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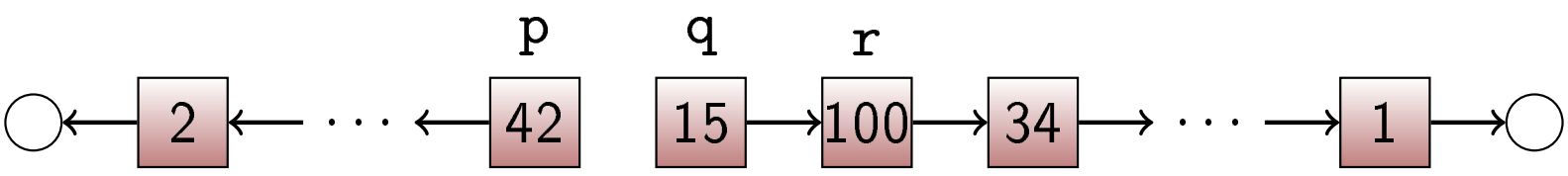
```
List singleton(int x){
  List l;
  l = (List) malloc(sizeof(Cons))
  if( l != NULL)
  {
    l -> datum = x;
    l -> next  = NULL;
  }
  return l;
}
```

```
void appendTo(List *a, List b)
{
  List ptr;
  if( *a == NULL){
    *a = b;
    return;
  }
  ptr = *a;
  while(ptr -> next != NULL)
  {
    ptr = ptr -> next;
  }
  ptr -> next = b;
  return;
}
```

Reverse a list



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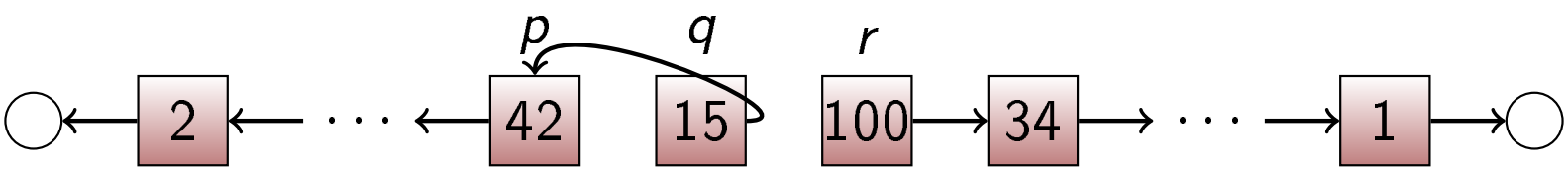

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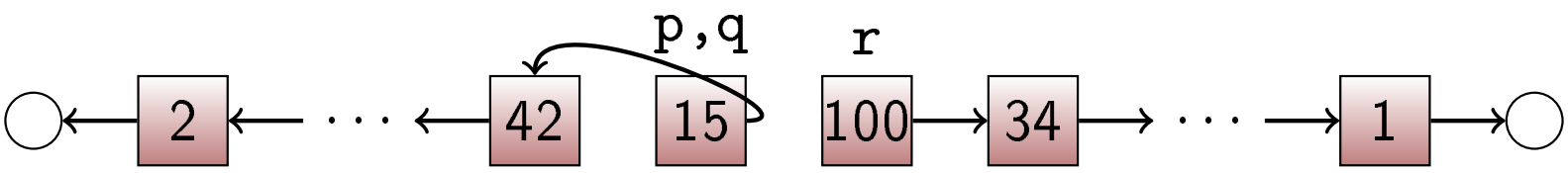

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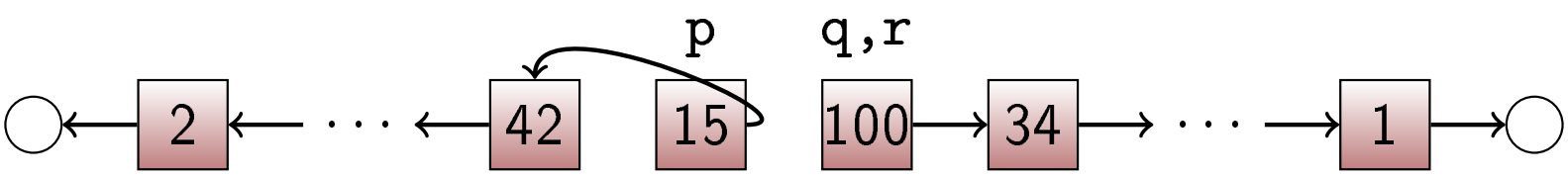

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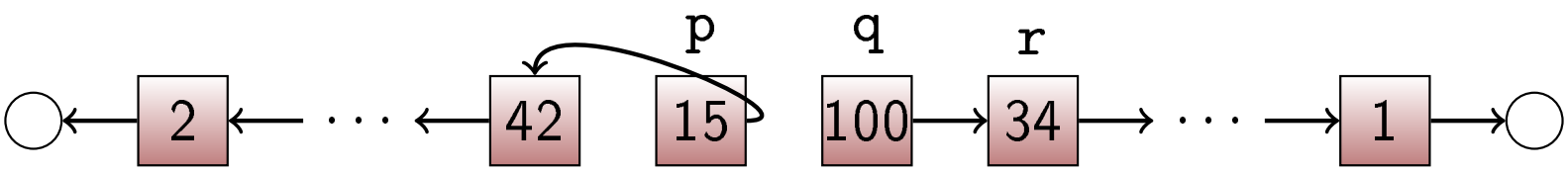

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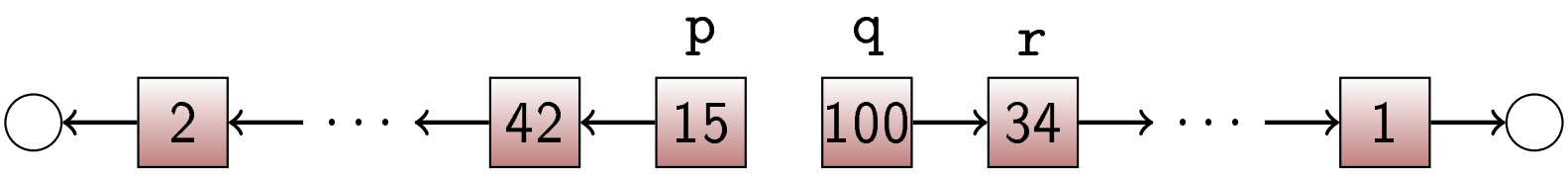

```
void reverse(List a)
{
  List p,q,r;
  if( a == NULL) return;
  p = NULL;
  q = a;
  r = a -> next;
  while( r )
  {
    q -> next = p;
    p = q;
    q = r;
    r = r -> next;
  }
}
```