DYNAMIC MEMORY

Sections 7.8.5

file input

- previously used fgetc

```
#include <stdio.h>

int result, x, y;
FILE *pFile;

pFile = fopen(“data/test.txt”, “r”);

result = fscanf(pFile, “%d %d”, &x, &y);

fclose(pFile);

// what does fprintf() do?
```

Allocation in C

```
#include <stdlib.h>

void *malloc(size_t size);
void free(void* ptr);
```

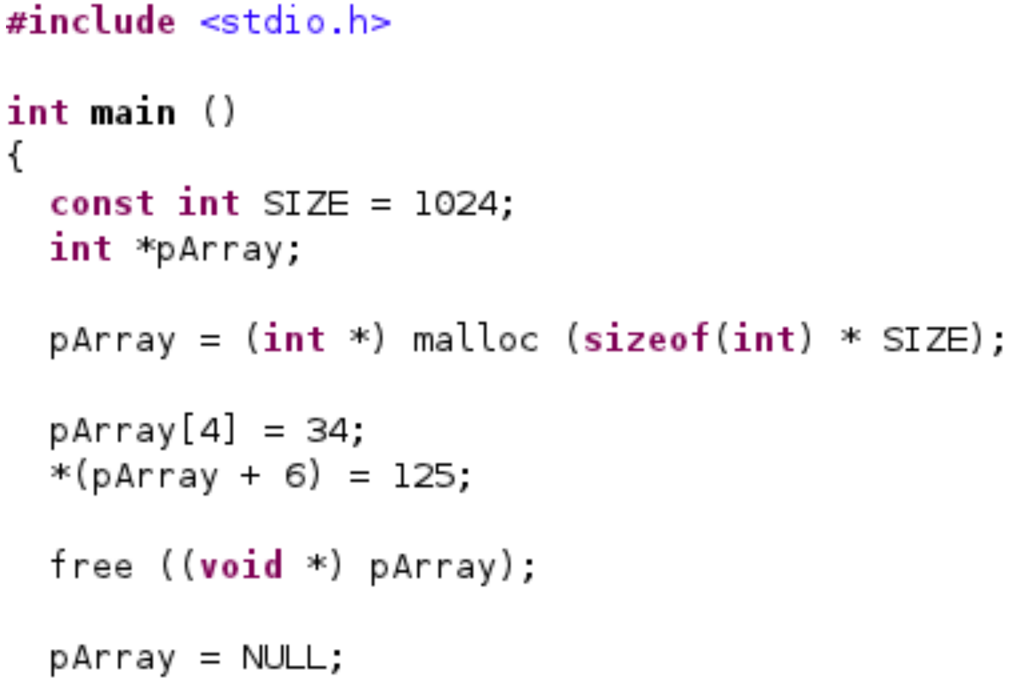
Allocate an Array

```
int *pArray;
const int SIZE = 1024;

pArray =       malloc(




free(
```



```c
#include <stdio.h>

int main ()
{
  const int SIZE = 1024;
  int *pArray;

  pArray = (int *) malloc (sizeof(int) * SIZE);

  pArray[4] = 34;
  *(pArray + 6) = 125;

  free ((void *) pArray);

  pArray = NULL;
```

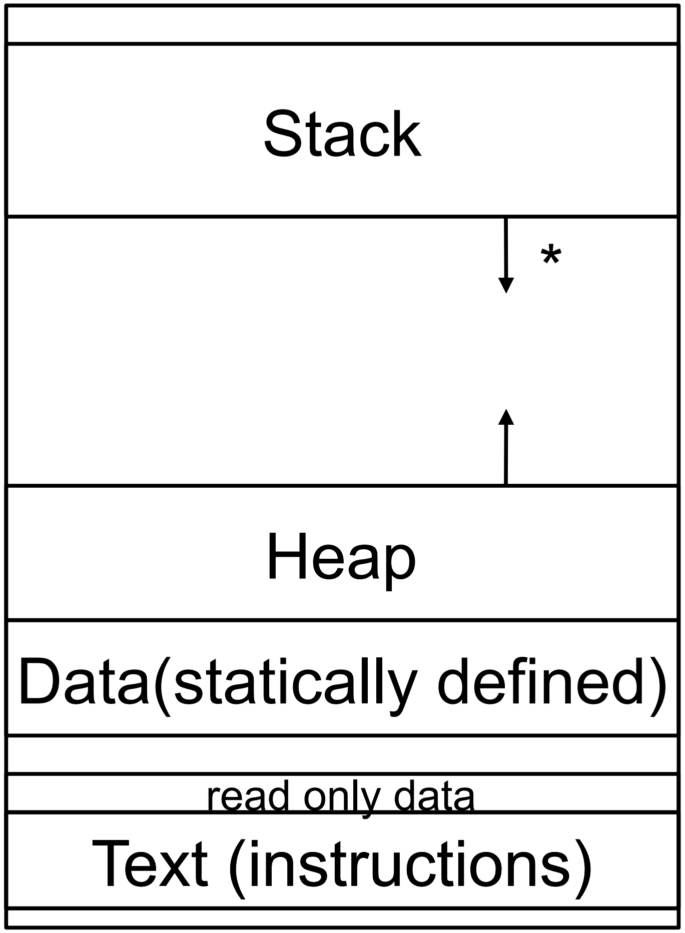
Memory Layout

- What is in each section?

```
#include <stdio.h>
#include <stdlib.h>

int gValue = 9;
int gArray[1024];

int main()
{
  int *pArray;
  int value = 10;
  printf(“%d”, gValue);
  pArray = (int*)
    malloc(sizeof (int) * 10)
  pArray[2] = 7;
  free(pArray);
  return 0;
}
```



Stack

*

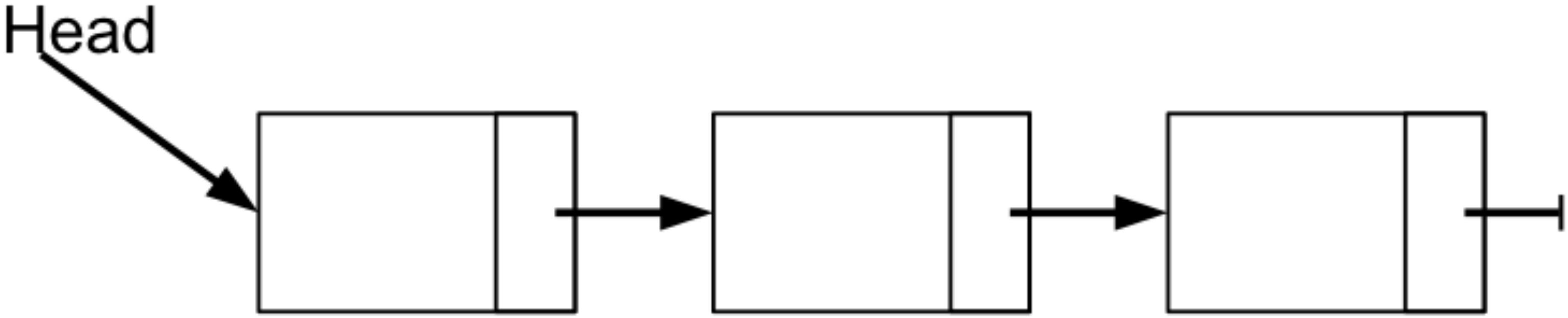
Heap

Data(statically defined)

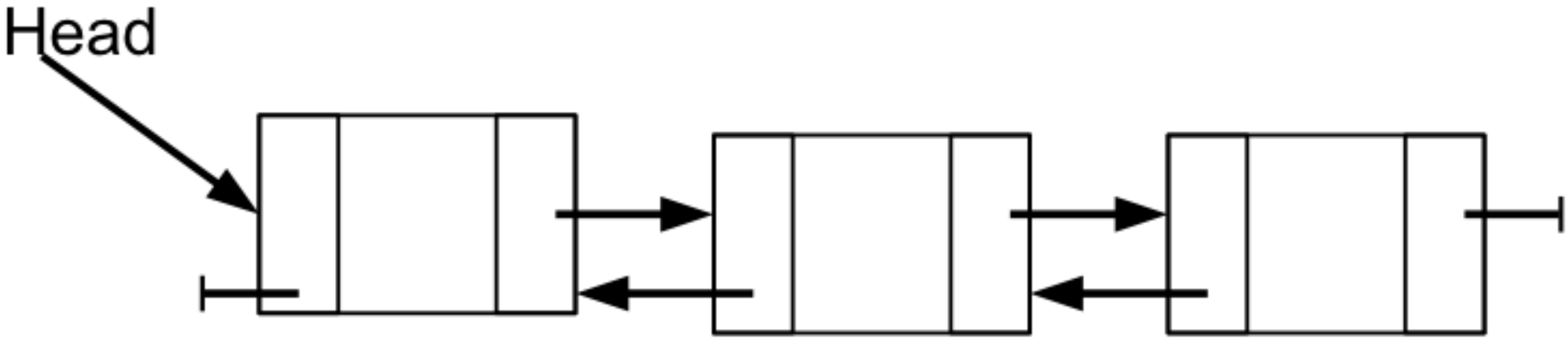
read only data

Text (instructions)

Singly Linked List



Doubly Linked List



How to represent a node

```
typedef struct Node *NodePtr;
typedef struct Node
{
  int data;
  struct Node* psNext;
} Node;

Node sList;
NodePtr psList;
```

Which of these are legal?

```
1.sList.data = 5;
2.sList->psNext = NULL;
3.sList = NULL;
4.psList->data = 5;
5.psList = NULL;
```

Problems

1. Create an empty list pointed to by **psList**.
2. Allocate space for a new node and set the list pointer to point to the new node.
3. Place the integer **10** into the data field of the single node.
4. Create another new node and place the integer **20** into the data field of the new node.
5. Link the two nodes together placing the node with 20 after the node 10.
6. A linked list exists pointed to by the list pointer **psList**. Write a function **length** that accepts the list pointer to a singly linked list and returns the length of the list.

Stack

```
typedef int DATATYPE;
typedef struct StackElement *StackElementPtr;
typedef struct StackElement
  {
    DATATYPE data; // the user data
    StackElementPtr psNext;
  } StackElement;

typedef  struct Stack
{
  StackElementPtr psTop;
} Stack;
```

- stkCreate(
- stkDispose(
- stkPush(
- stkPop(
- stkPeek(