A storage class represents the visibility and a location of a variable. It tells from what part of code we can access a variable. A storage class in C is used to describe the following things:

- The variable scope.
- The location where the variable will be stored.
- The initialized value of a variable.
- A lifetime of a variable.
- Who can access a variable?

Thus a storage class is used to represent the information about a variable.

NOTE: A variable is not only associated with a data type, its value but also a storage class.

There are total four types of standard storage classes. The table below represents the storage classes in C.

Storage class	Purpose
auto	It is a default storage class.
extern	It is a global variable.
static	It is a local variable which is capable of returning a value even when control is transferred to the function call.
register	It is a variable which is stored inside a Register.

Auto Storage Class in C

- Automatic variables are allocated memory automatically at runtime.
- The visibility of the automatic variables is limited to the block in which they are defined.
  The scope of the automatic variables is limited to the block in which they are defined.
- The automatic variables are initialized to garbage by default.
- The memory assigned to automatic variables gets freed upon exiting from the block.
- The keyword used for defining automatic variables is auto.
- Every local variable is automatic in C by default.

```
int add(void) {
```

```
  int a=13;
  auto int b=48;
return a+b;}
```

```
include <stdio.h>
int main( )
{
 auto int j = 1;
 {
  auto int j= 2;
  {
   auto int j = 3;
   printf ( " %d ", j);
  }
  printf ( "\t %d ",j);
 }
 printf( "%d\n", j);}
```

OUTPUT:

```
3 2 1
```

Static Storage Class in C

- The variables defined as static specifier can hold their value between the multiple function calls.
- Static local variables are visible only to the function or the block in which they are defined.
- A same static variable can be declared many times but can be assigned at only one time.
- Default initial value of the static integral variable is 0 otherwise null.
- The visibility of the static global variable is limited to the file in which it has declared.
- The keyword used to define static variable is static.

```
#include<stdio.h>
static char c;
static int i;
static float f;
static char s[100];
void main ()
{
printf("%d %d %f %s",c,i,f); // the initial default value of c, i, and f will be printed.
}
```

Output:

```
0 0 0.000000 (null)
```

```
#include<stdio.h>
void sum()
{
static int a = 10;
static int b = 24;
```

```
printf("%d %d \n",a,b);
a++;
b++;
}
void main()
{
int i;
for(i = 0; i< 3; i++)
{
sum(); // The static variables holds their value between multiple function calls.
}
}
```

Output:

```
10 24
11 25
12 26
```

Register

- The variables defined as the register is allocated the memory into the CPU registers depending upon the size of the memory remaining in the CPU.
- We can not dereference the register variables, i.e., we can not use &operator for the register variable.
- The access time of the register variables is faster than the automatic variables.
- The initial default value of the register local variables is 0.
- The register keyword is used for the variable which should be stored in the CPU register. However, it is compiler?s choice whether or not; the variables can be stored in the register.
- We can store pointers into the register, i.e., a register can store the address of a variable.
- Static variables can not be stored into the register since we can not use more than one storage specifier for the same variable.

Example 1

```
#include <stdio.h>
int main()
{
register int a; // variable a is allocated memory in the CPU register. The initial default value of a is 0.
printf("%d",a);
}
```

Output:

```
0
```

Example 2

```
#include <stdio.h>
int main()
{
register int a = 0;
printf("%u",&a); // This will give a compile time error since we can not access the address of a register variable.
}
```

Output:

```
main.c:5:5: error: address of register variable ?a? requested
printf("%u",&a);
^~~~~~
```

External

- The external storage class is used to tell the compiler that the variable defined as extern is declared with an external linkage elsewhere in the program.
- The variables declared as extern are not allocated any memory. It is only declaration and intended to specify that the variable is declared elsewhere in the program.
- The default initial value of external integral type is 0 otherwise null.
- We can only initialize the extern variable globally, i.e., we can not initialize the external variable within any block or method.
- An external variable can be declared many times but can be initialized at only once.
- If a variable is declared as external then the compiler searches for that variable to be initialized somewhere in the program which may be extern or static. If it is not, then the compiler will show an error.

Example 1

```
#include <stdio.h>
int main()
{
extern int a;
printf("%d",a);
}
```

Output

```
main.c:(.text+0x6): undefined reference to `a'
collect2: error: ld returned 1 exit status
```

Example 2

```
#include <stdio.h>
int a;
int main()
{
extern int a; // variable a is defined globally, the memory will not be allocated to a
printf("%d",a);
}
```

Output

```
0
```

Example 3

```
#include <stdio.h>
int a;
int main()
{
extern int a = 0; // this will show a compiler error since we can not use extern and initializer at sa
me time
printf("%d",a);
}
```

Output

```
compile time error
main.c: In function ?main?:
main.c:5:16: error: ?a? has both ?extern? and initializer
extern int a = 0;
```

Example 4

```
#include <stdio.h>
int main()
{
extern int a; // Compiler will search here for a variable a defined and initialized somewhere in th
e pogram or not.
printf("%d",a);
}
int a = 20;
```

Output

20

Example 5

```
extern int a;
int a = 10;
#include <stdio.h>
int main()
{
printf("%d",a);
}
int a = 20; // compiler will show an error at this line
```

Output

compile time error