

C programming examples

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Programming examples in C

- ❑ Dynamic queue
- ❑ Use of timing functions
- ❑ Generating random numbers
- ❑ Arguments and main
- ❑ Use of static
- ❑ Counting bits

Programming examples taken from the on-line book:

Programming in C

UNIX System Calls and Subroutines using C

<http://www.cs.cf.ac.uk/Dave/C/CE.html>

```

/*
/* queue.c
/* Demo of dynamic data structures in C

#include <stdio.h>

#define FALSE 0
#define NULL 0

typedef struct {
    int    dataitem;
    struct listelement *link;
}         listelement;

void Menu (int *choice);
listelement * AddItem (listelement * listpointer, int data);
listelement * RemoveItem (listelement * listpointer);
void PrintQueue (listelement * listpointer);
void ClearQueue (listelement * listpointer);

main () {
    listelement listmember, *listpointer;
    int    data, choice;
    listpointer = NULL;

```

```

Menu (&choice);
switch (choice) {
    case 1:
        printf ("Enter data item value to add\n");
        scanf ("%d", &data);
        listpointer = AddItem (listpointer, data);
        break;
    case 2:
        if (listpointer == NULL)
            printf ("Queue empty!\n");
        else
            listpointer = RemoveItem (listpointer);
        break;
    case 3:
        PrintQueue (listpointer); break;
    case 4:
        break;
    default:
        printf ("Invalid menu choice - try again\n");
        break;
}

while (choice != 4);
PrintQueue (listpointer);
return (0);

/* main */

```

```
void Menu (int *choice) {  
  
    char  local;  
  
    printf ("\nEnter\t1 to add item,\n\t2 to remove item\n\n\t3 to print queue\n\t4 to quit\n");  
    do {  
        local = getchar ();  
        if ((isdigit (local) == FALSE) && (local != '\n')) {  
            printf ("\nyou must enter an integer.\n");  
            printf ("Enter 1 to add, 2 to remove, 3 to print, 4 to quit\n");  
        }  
    } while (isdigit ((unsigned char) local) == FALSE);  
    *choice = (int) local - '0';  
}
```

```
listelement * AddItem (listelement * listpointer, int data) {  
  
    listelement * lp = listpointer;  
  
    if (listpointer != NULL) {  
        while (listpointer -> link != NULL)  
            listpointer = listpointer -> link;  
        listpointer -> link = (struct listelement *) malloc (sizeof (listelement));  
        listpointer = listpointer -> link;  
        listpointer -> link = NULL;  
        listpointer -> dataitem = data;  
        return lp;  
    }  
    else {  
        listpointer = (struct listelement *) malloc (sizeof (listelement));  
        listpointer -> link = NULL;  
        listpointer -> dataitem = data;  
        return listpointer;  
    }  
}
```

```
listelement * RemoveItem (listelement * listpointer) {
```

```
    listelement * temp;
    printf ("Element removed is %d\n", listpointer -> dataitem);
    temp = listpointer -> link;
    free (listpointer);
    return temp;
}
```

```
void PrintQueue (listelement * listpointer) {
```

```
    if (listpointer == NULL)
        printf ("queue is empty!\n");
    else
        while (listpointer != NULL) {
            printf ("%d\t", listpointer -> dataitem);
            listpointer = listpointer -> link;
        }
    printf ("\n");
}
```

```
void ClearQueue (listelement * listpointer
```

```
    while (listpointer != NULL) {
        listpointer = RemoveItem (listpointer)
    }
}
```

Use of timing functions

```
/* timer.c */
```

```
/* Computes the time in seconds to do a computation */
```

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

```
#include <sys/types.h>
```

```
#include <time.h>
```

```
main()
```

```
{
```

```
    int i;
```

```
    time_t t1,t2;
```

```
    (void) time(&t1);
```

```
    for (i=1;i<=300;++i)
```

```
        printf("`%d %d %dn",i, i*i, i*i*i);
```

```
    (void) time(&t2);
```

```
    printf("`n Time to do 300 squares and  
    cubes= %d secondsn", (int) t2-t1);
```

```
}
```

Generating random numbers

```
/* random.c */
#include <stdio.h>
#include <sys/types.h>
#include <time.h>

main()
{
    int i;
    time_t t1;

    (void) time(&t1);
    srand48((long) t1);
    /* use time in seconds to set seed */
    printf("5 random numbers (Seed = %d):n", (int) t1);
    for (i=0; i<5; ++i) printf("%d ", lrand48());
    printf("\n\n"); /* flush print buffer */
}
```


On random number generation in C



- ❑ `lrand48()` returns non-negative long integers uniformly distributed over the interval $(0, 2^{31})$.
- ❑ A similar function `drand48()` returns double precision numbers in the range $[0.0, 1.0)$.
- ❑ `srand48()` sets the seed for these random number generators. It is important to have different seeds when we call the functions otherwise the same set of pseudo-random numbers will be generated. `time()` always provides a unique seed.

Arguments and main

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

```
main(int argc, char **argv)
```

```
{ /* program to print arguments from command line */
```

```
    int i;
```

```
    printf("argc = %d\n\n",argc);
```

```
    for (i=0;i<argc;++i)
```

```
        printf("argv[%d]: %s\n",i, argv[i]);
```

```
}
```

Use of static

```
#include <stdio.h>

void stat();

main() {
    int counter;    /* loop counter */

    for (counter = 0; counter < 5; counter++) {
        stat();
    }
}

void stat()
{ int temporary = 1;
  static int permanent = 1;
  (void)printf("Temporary %d Permanent %d\n",
              temporary, permanent);
  temporary++;
  permanent++;
}
```

Counting bits

```
int bitcount(unsigned char x)

{ int count;

    for (count=0; x != 0; x>>=1)
        if ( x & 01) count++;
    return count;
}
```