

Array example and initialization

```
#include <stdio.h>
#define size 10
int main () {
    int n1[10];
    int i;
    for( i = 0; i < 10; i = i + 1 ){    n1[i] = 0;    }

    printf("%s%13s\n", "Elements", "Value");
    for( i = 0; i < 10; i = i + 1 ) printf("%7d%13d\n", i, n1[i]);

    int n2[size] = {30, 28, 47, 52, 42, 44, 48, 78, 92, 10 };
    printf("%s%13s\n", "Elements", "Value");
    for( i = 0; i < size; i = i + 1 ) printf("%7d%13d\n", i, n2[i]);

    int n3[size] = {11, 22, 33, 44, 55};
    printf("%s%13s\n", "Elements", "Value");
    for( i = 0; i < size; i = i + 1 ) printf("%7d%13d\n", i, n3[i]);
    return 0;
}
```

Histogram/plot printing program with array

```
#include <stdio.h>
#define size 10

int main () {
    int n[size] = {15, 10, 5, 7, 11, 13, 1, 5, 15, 10 };
    int i, j;

    printf("Element          Value          Histogram\n");

    for( i = 0; i < size; i = i + 1 ){
        printf("%7d%13d", i, n[i]);
        for( j = 0; j <= n[i]; j = j + 1 ) printf("%c", '|');
        printf("\n");
    }

    return 0;
}
```

Treating character array as strings

```
#include <stdio.h>
int main () {
    char s1[20] ;
    char s2[] = "string literal";
    /* here s2 reserve 15 characters; 14 are given above
       and it ends with a character '\0' known as null character */
    printf("Enter a string: ");
    scanf("%s", s1);
    printf("First string: %s\nSecond string: %s\n"
           "Given string with spaces between characters is:\n", s1, s2);
    int i ;
    for( i = 0; s1[i] != '\0'; i = i + 1 ){
        printf("%c ", s1[i]);
    }
    printf("\n");
    return 0;
}
```

Summarizing the results of rolling die in an array

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#define size 6
int main () {
    int face, roll, frequency[size] = {0};
    srand( time(NULL));
    for( roll = 1; roll <= 6000; roll = roll + 1 ){
        face = 1 + rand()%6;
        ++frequency[face];
    }
    printf("Face          Frequency\n");
    for( face = 1; face < size; face = face + 1 ){
        printf("%4d%17d\n", face, frequency[face]);
    }
    return 0;
}
```

Static local arrays and automatic local arrays

```
#include <stdio.h>
void staticArrayInit();

void automaticArrayInit();

int main () {
    printf("First call to each function");
    staticArrayInit();
    automaticArrayInit();

    printf("\n\nSecond call to each function");
    staticArrayInit();
    automaticArrayInit();

    printf("\n");
    return 0;
}

void staticArrayInit(){
    static int array1[3];
```

```

void staticArrayInit(){
    static int array1[3];
    int i;
    printf("\nValues of entering staticArrayInit:\n");
    for( i = 0; i <= 2; i++ ){
        printf("array1[%d] = %d ", i, array1[i]); }
    printf("\nValues on exiting staticArrayInit:\n");
    for( i = 0; i <= 2; i++ ){
        printf("array1[ %d ] = %d ", i, array1[i] += 5);
    }
}

void automaticArrayInit(){
    static int array2[3] = { 1, 2, 3 };
    int i;
    printf("\n\nValues on entering automaticArrayInit:\n");
    for( i = 0; i < 3; i++ ){
        printf("array2[%d] = %d ", i, array2[i]);
    }
    printf("\nValues on exiting automaticArrayInit:\n");
    for( i = 0; i < 3; i++ ){
        printf("array2[ %d ] = %d ", i, array2[i] += 5);
    }
}

```

Passing arrays and individual array elements to functions

```
#include <stdio.h>
#define size 5
void modifyArray(int [], int);
void modifyElement(int);
int main () {
    int a1[size] = {0, 1, 2, 3, 4 };
    int i;
    printf("Effects of passing entire array by reference:\n\nThe "
           "values of the original array are:\n");
    for( i = 0; i < size; i = i + 1 ) printf("%3d", a1[i]);
    printf("\n");

    modifyArray(a1, size);

    printf("The values of the modified array are:\n");
    for( i = 0; i < size; i = i + 1 ) printf("%3d", a1[i]);
    printf("\n\n\nEffects of passing array element "
           "by value:\n\nThe value of a[3] is %d\n", a1[3]);
```

```

printf("\n\nEffects of passing array element "
       "by value:\n\nThe value of a[3] is %d\n", a1[3]);
modifyElement(a1[3]);
printf("The value of a[3] is %d\n", a1[3]);
return 0;
}
void modifyArray(int b[], int x){ /*here "int size" can conflict variables.*/
    int j;
    for( j = 0; j < x; j++ ) b[j] *= 2;
}
void modifyElement(int e){
    printf("Value in modifyElement is %d\n", e *= 2 );
}

```

Demonstrating the const type qualifier with arrays

```
#include <stdio.h>
void tryToModifyArray(const int []);
int main () {
    int a2[] = {10, 20, 30};
    tryToModifyArray(a2);
    printf("%d %d %d\n", a2[0], a2[1], a2[2]);
    return 0;
}

void tryToModifyArray(const int b[]){
    b[0]/ = 2;
    b[1]/= 2;
    b[2]/= 2;
}
```

This program will not compile. There are two errors. Given operation `/ =` is not defined because there is a space between slash and equal. Another problem in compilation is: we are trying to modify constant array.

Sorting an array's values into ascending order

```
#include <stdio.h>
#define size 10
int main () {
    int a1[size] = {2, 5, 6, 18, 3, 28, 99, 20, 21, 35 };
    int p, i, temp;
    printf("Data items in original order\n");
    for( i = 0; i < size; i++ ) printf("%4d", a1[i]);

    /* bubble sorting */
    for( p = 0; p < size; p++ ){
        for( i = 0; i < size - 1; i++ ){
            if( a1[i] > a1[i+1] ){
                temp = a1[i];
                a1[i] = a1[i+1];
                a1[i+1] = temp;
            }
        }
    }
    printf("\nData items in ascending order\n");
    for( i = 0; i < size; i++ ) printf("%4d", a1[i]);      printf("\n");
    return 0;
}
```

Data analysis

```
/*  
    File name: lecture10_5.c  
    This program introduces the topic of survey data analysis.  
    It computes the mean, median and mode of the data  
    Linear search of an array  
    Binary search of a sorted array  
*/  
#include <stdio.h>  
#define size 100  
#define size1 15  
void mean(const int []);  
void median(int []);  
void mode(int [], const int []);  
void bubbleSort(int []);  
void printArray(const int []);  
int linearSearch(const int [], int, int);  
int binarySearch(const int [], int, int, int);  
void printHeader();  
void printRow(const int [], int, int, int);  
int main(){  
    int f[10]={0};  
    int r[size] =
```

```

int main(){
    int f[10]={0};
    int r[size] =
        {6, 7, 8, 9, 8, 7, 8, 9, 8, 9,
         7, 8, 9, 5, 9, 8, 7, 8, 7, 8,
         6, 7, 8, 9, 3, 9, 8, 7, 8, 7,
         7, 8, 9, 8, 9, 8, 9, 7, 8, 9,
         6, 7, 8, 7, 8, 7, 9, 8, 9, 2,
         7, 8, 9, 8, 9, 8, 9, 7, 5, 3,
         5, 6, 7, 2, 5, 3, 9, 4, 6, 4,
         7, 8, 9, 6, 8, 7, 8, 9, 7, 8,
         7, 4, 4, 2, 5, 3, 8, 7, 5, 6,
         4, 5, 6, 1, 6, 5, 7, 8, 7, 5};
    mean(r);
    median(r);
    mode(f, r);

    /* creating new data */
    int a1[size], x, searchKey, element;
    for(x=0; x< size; x++)a1[x]=2*x;
    printf("Enter integer search key:\n");
    scanf("%d", &searchKey);
    element = linearSearch(a1, searchKey, size);
    if(element != -1) printf("Found value in element %d\n", element);
}

```

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if(element != -1) printf("Found value in element %d\n", element);
else printf("Value not found!\n");

/* re-creating new data */
int a2[size1], key, result;
for(x=0; x< size; x++)a2[x]=2*x;
printf( "Enter a number between 0 and 28: " );
scanf( "%d", &key );
printHeader();
result = binarySearch(a2, key, 0, size1 - 1 );
if(result != -1) printf("\n%d found in array element %d\n", key, result );
else printf("\n%d not found\n", key);
return 0;
}
/* calculate average of all response values */
void mean(const int answer[]){
    int j, total=0;
    printf("\n*****\n Mean \n*****\n");
    for(j=0; j< size; j++) total+=answer[j];
    printf("Mean is the average value of the data item.\n"
           "Mean value of (%d) data items is: %d/%d= %.3f\n\n",
           size, total, size, (float) total/size);
}
void median(int answer[]){

```

```

void median(int answer[]){
    printf("\n*****\n Median \n*****\n"
           "Unsorted array: \n");
    printArray(answer);
    bubbleSort(answer);
    printf("\n\nThe sorted array is");
    printArray(answer);
    printf("\n\nThe median is %dth element of sorted %d element array.\n"
           "Median is %d\n\n", size/2, size, answer[size/2]);
}

void mode(int freq[], const int answer[]){
    int rate, j, histo, largest=0, modeValue=0;
    printf("\n*****\n Mode\n*****\n");
    for(rate=1; rate<=9; rate++)freq[rate]=0;
    for(j=0; j< size; j++) ++freq[answer[j]];
    printf("Response Frequency          Histogram:\n\n");
    for(rate=0; rate<=9; rate++){
        printf(" %8d%11d ", rate, freq[rate]);
        if(freq[rate]>largest){
            largest=freq[rate];
            modeValue =rate;
        }
    }
    for(histo=1; histo<=freq[rate]; histo++)printf("*");
    printf("\n");
}

```

```

        for(histo=1; histo<=freq[rate]; histo++)printf("*");
        printf("\n");
    }
    printf("Mode is most frequent value.\n"
        "Here mode %d occurred %d times.\n",
        modeValue, largest);
}

void bubbleSort(int a[]){
    int p, j, temp;
    for(p=1; p< size; p++)
        for(j=0; j< size-1; j++)
            if(a[j]>a[j+1]){
                temp=a[j];
                a[j]=a[j+1];
                a[j+1]=temp;
            }
}

void printArray(const int a[]){
    int j;
    for(j=0; j< size; j++){
        if(j%20 == 0) printf("\n");
        printf("%2d", a[j]);
    }
}

```

```

}

int linearSearch( const int array[], int key, int x){
    int n;
    for(n=0; n< x; ++n)
        if(array[n]==key) return n;
    return -1;
}

int binarySearch( const int b[], int searchKey, int low, int high ){
    int middle;
    while(low<=high){
        middle = (low + high)/2;
        printRow( b, low, middle, high );
        if(searchKey == b[middle]) return middle;
        else if(searchKey < b[middle]) high = middle-1;
        else low = middle+1;
    }
    return -1;
}

void printHeader(){
    int i;
    printf("\nSubscripts:\n");
    for(i=0; i< size1; i++)printf("%3d ",i);
    printf("\n");
}

```

```

printf("\n");
for(i=0; i<4*szel; i++)printf("-");
printf("\n");
}
void printRow(const int b[], int low, int mid, int high ){
    int i;
    for(i=0; i< szel; i++)
        if(i< low || i>high)printf("    ");
        else if(i==mid)printf("%3d*", b[i]);
        else printf("%3d ",b[i]);
    printf("\n");
}

```