ARRAYS

1- D Arrays

An array is a collection of a fixed number of objects all of the same type. These objects are stored sequentially and are called elements.

Declaring Arrays:

array_type array_name[array_size];

Examples:

int quiz[4];
double rate[5];
char name[51];

\[
\begin{array}{cccc}
55 & 95 & 85 & 100 \\
\end{array}
\]

- Each element of an array is numbered by its offset or subscript.

- In an array of size \( N \), the valid offset range (subscript values) is from \( 0 \) to \( N-1 \).

Initializing Arrays

int quiz[4]={55,95,85,100};
double rate[5]={0.075,0.080,0.082,0.085,0.088};

- If you do not list enough values, the compiler will fill the remaining elements with zeros.

int quiz[4]={95,100}

means

- You can not omit the size of the array if you do not initialize the array.

```c
int mid_term[2]={50,80}; /* valid */
int mid_term[]={50,80}; /* valid */
```

```c
int mid_term[2]; /* valid */
int mid_term[]; /* invalid */
```

**Example:**

```c
#include <stdio.h>

void main(void)
{
    int quiz[4]={55,95,85,100},quiz_no;
    printf("\n Enter the quiz number (1-4): ");
    scanf("%d", &quiz_no);
    if (quiz_no>=1) && (quiz_no<=4)
    {
        printf("\n Quiz %d=%d",quiz_no,quiz[quiz_no-1]);
    }
    else
    
        printf("INVALID QUIZ NUMBER");
}
```

**Inputting Array Elements**

```c
for (i=0;i<10;++i)
{
    printf("\n Enter number %2d: ",i+1);
    scanf("%d", &number[i]);
}
```

**Outputting Array Elements**

```c
for (i=0;i<10;++i)
{
    printf("\n Number %2d=%6d",i+1,number[i]);
}
```
Example
Finding the average of 20 integers.
#include <stdio.h>
#define SIZE 20
void main(void)
{
  int i, number[SIZE], sum=0;
  double ave;
  for (i=0; i<SIZE; ++i)
  {
    printf("Enter number %d:", i+1);
    scanf("%d", &number[i]);
    sum+=number[i];
  }
  ave=(double)sum/SIZE;
  printf("The average is: %.2f", ave);
}

- It is a good programming technique to define the size of an array as a symbolic constant.

Finding the largest value in an array.
#include <stdio.h>
#define SIZE 30
void main(void)
{
  int i, max_i, max_number, number[SIZE];
  for (i=0; i<SIZE; ++i)
  {
    printf("Enter number %d:", i+1);
    scanf("%d", &number[i]);
  }
  max_i=0;
  max_number=number[0];
  for (i=0; i<SIZE; ++i)
  {
    if (number[i]>max_number)
    {
      max_number=number[i];
      max_i=i;
    }
  }
  printf("The highest number is %d", max_number);
}
Finding the lowest value in an array.

#include <stdio.h>
#define SIZE 30
void main(void)
{
    int i, min_i, min_number, number[SIZE];
    for (i=0; i<SIZE; ++i)
    {
        printf("\n Enter number %d:", i+1);
        scanf("%d", &number[i]);
    }
    min_i = 0;
    min_number = number[0];
    for (i=0; i<SIZE; ++i)
    {
        if (number[i] < min_number)
        {
            min_number = number[i];
            min_i = i;
        }
    }
    printf("\n The lowest number is %d", min_number);
}
Searching an element in an array.
- Find the quiz number and the corresponding quiz value on which a student achieved at least 85.

```c
#include <stdio.h>
#define QUIZ_SIZE 30
#define MIN_GRADE 85
void main(void)
{
    int quiz[QUIZ_SIZE];
    int quiz_no;

    for (quiz_no=0; quiz_no<QUIZ_SIZE; ++quiz_no)
    {
        printf("n Enter Quiz %d:", quiz_no+1);
        scanf("%d", &quiz[quiz_no]);
    }

    for (quiz_no=0; quiz_no<QUIZ_SIZE; ++quiz_no)
    {
        if (quiz[quiz_no] >= MIN_GRADE)
        {
            printf("n The first grade of at least %d is: ", MIN_GRADE);
            printf("n Quiz %d Grade %d", quiz_no+1, quiz[quiz_no]);
            break;
        }
    }
    printf("Search completed.");
}
```

To Display elements having even-numbered subscripts:

```c
#include<stdio.h>
void main(void)
{
    int quiz[10]={55,85,100,0,95,45,68,17,10,20};
    int i;
    for (i=0; i<10; i+=2)
    {
        printf("n QUIZ[%d]=%3d", i, quiz[i]);
    }
}
```
Output:
QUIZ[0]=55
QUIZ[2]=100
QUIZ[4]=95
QUIZ[6]=68
QUIZ[8]=10

To Display elements having odd-numbered subscripts.
Just change the for loop as:
for (i=1;i<10;i+=2)

Write a program which displays only the values between 40 and 95 (inclusive) of the array quiz[10]={55, 85, 100, 0, 95, 45, 68, 17, 10, 20}.

#include <stdio.h>
void main(void)
{
    int quiz[10]={55, 85, 100, 0, 95, 45, 68, 17, 10, 20};
    int i;
    for (i=1;i<10;i+=2)
    {
        if (quiz[i]>=40 && quiz[i]<=95)
        {
            printf(“\n QUIZ#%d=%2d”,i+1,quiz[i]);
        }
    }

Output:
QUIZ#1=55
QUIZ#2=85
QUIZ#5=95
QUIZ#6=45
QUIZ#7=68