Example 2

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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Using 2-d Arrays

```c
#include <stdio.h>
#include <stdlib.h>
#define SIZE 10
```

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Using 2-d Arrays

```
//----------------------------------------------
// Calculating the average of three numbers
//----------------------------------------------
double avg3(int x, int y, int z)
{
  return (x+y+z) / 3.;
}
```

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Using 2-d Arrays

```
//---------------------------------------------
// Initialize X[4][SIZE] arrays
// by assigning random number grade
//---------------------------------------------
void init_arrays (int X[][SIZE], double A[])
{
  int i;

  // srand(7) makes rand() generate
  // the same random sequence
  // --> easy to debug a program
  srand(7);

  for (i=0; i<SIZE; ++i) {
    X[0][i] = i+1 + 201600; // I
    X[1][i] = rand() % 101; // K
    X[2][i] = rand() % 101; // E
    X[3][i] = rand() % 101; // M
    A[i] = avg3(X[1][i], X[2][i], X[3][i]);
  }
}
```

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Using 2-d Arrays

```c
//--------------------------------------------------
// Print the original table
//--------------------------------------------------
void pr_table (int X[][SIZE], double A[])
{
  int i;

  printf("%10s %10s %10s %10s %10s \n", "StID",
        "Korean", "Enlgish", "Math", "Average");

  for (i=0; i<SIZE; ++i) {
    printf("%10d %10d %10d %10d %10.2f \n",
      X[0][i], X[1][i], X[2][i], X[3][i], A[i]);

  }
}
```

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Using 2-d Arrays

```
//-------------------------------------------------
// Bubble Sort Double Array
//-------------------------------------------------
void DbubbleSort(double a[], int size)
{
  int    p, j;
  double tmp;

  for (p=1; p< size; ++p) {
    for (j=0; j< size-1; ++j) {
      if ( a[j] < a[j+1] )  {
        tmp    = a[j];
        a[j]   = a[j+1];
        a[j+1] = tmp;
      }
    }
  }
}
```

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Using 2-d Arrays

```
//-------------------------------------------------
// Print the Sorted Table
//-------------------------------------------------
void pr_sorted_table (int X[][SIZE], double A[])
{
  int i, j;
  double B[SIZE];  // Backup Array for Sorting

  for (i=0; i<SIZE; ++i)  B[i] = A[i];

  //....................
  DbubbleSort(B, SIZE);
  //....................

  printf("\n\nSorted on a student's average\n\n");
  printf("%10s %10s %10s %10s %10s \n", "StID",
       "Korean", "Enlgish", "Math", "Average");

  for (i=0; i<SIZE; ++i) {
    for (j=0; j<SIZE; ++j) if (B[i] == A[j]) break;

    printf("%10d %10d %10d %10d %10.2f \n",
      X[0][j], X[1][j], X[2][j], X[3][j], A[j]);
  }
}
```

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Using 2-d Arrays

```
//------------------------------------------------
// Average over Integer Array
//------------------------------------------------
double Avg(int M[], int n) {
  int i; double S=0.0;

  for (i=0; i<n; ++i) S+= M[i];
  return S/n;
}
```

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Using 2-d Arrays

```
//-------------------------------------------------
// Average over Doubl Array
//-------------------------------------------------
double DAvg(double N[], int n) {
  int i; double S=0.0;

  for (i=0; i<n; ++i) S+= N[i];
  return S/n;
}
```

Example 2

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Using 2-d Arrays

```
//---------------------------------------------
// Print the Averages
//---------------------------------------------
void pr_averages(int X[][SIZE], double A[]) {
  double A1 =  Avg(X[1], SIZE);
  double A2 =  Avg(X[2], SIZE);
  double A3 =  Avg(X[3], SIZE);
  double A4 = DAvg(A, SIZE);

  printf("%10s %10.2f %10.2f %10.2f %10.2f \n",
        "Average", A1, A2, A3, A4);
}
```

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Using 2-d Arrays

```
//====================================================
// main
//====================================================
int main(void) {
  // X[0][SIZE] -->  I[SIZE];  // ID of a student
  // X[1][SIZE] -->  K[SIZE];  // Grade of Korean
  // X[2][SIZE] -->  E[SIZE];  // Grade of English
  // X[3][SIZE] -->  M[SIZE];  // Grade of Math

  int X[4][SIZE];
  double A[SIZE];  // Average of a student

  init_arrays(X, A);

  pr_table(X, A);

  pr_sorted_table(X, A);

  pr_averages(X, A);
}
```
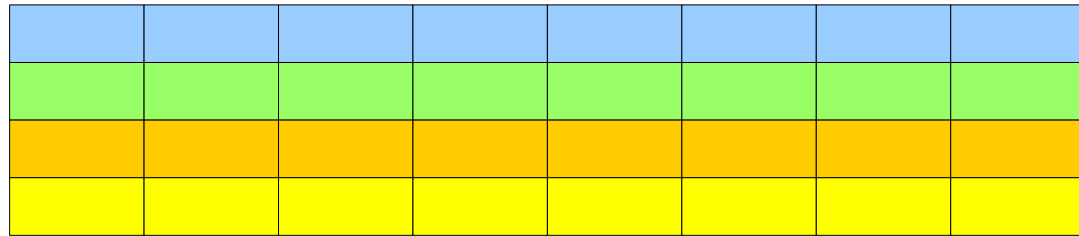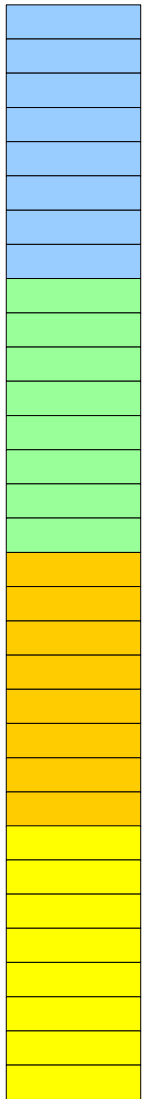
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Using 2-d Arrays

X[i][j]

Student ID

Korean

English

Math

Average   A[j]

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Using 2-d Arrays

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References

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