# Control Flow – Q1

Write a C program that prints the ID and grade of each student in a class. The input contains the student IDs and their marks. The range of the marks is from 0 to 100. The relationships of the marks and grades are given below:

| Grade | Mark |
|---|---|
| A | 100-75 |
| B | 74-65 |
| C | 64-55 |
| D | 54-45 |
| F | 44-0 |

Use the sentinel value –1 for student ID to indicate the end of user input. Write the program using the **switch** statement.

**Enter Student ID:**
***11***
**Enter Mark:**
***56***
**Grade = C**
**Enter Student ID:**
***21***
**Enter Mark:**
***89***
**Grade = A**
**Enter Student ID:**
***31***
**Enter Mark:**
***34***
**Grade = F**
**Enter Student ID:**
***-1***
**Program terminating ...**

# Control Flow – Q1

## Using if-else

Sentinel control

```
#include <stdio.h>
int main()
{
   int studentNumber = 0, mark;

   printf("Enter StudentID: \n");
   scanf("%d", &studentNumber);
   while (studentNumber != -1)
   {
      printf("Enter Mark: \n");
      scanf("%d", &mark);
      if (mark >= 75)
         printf("Grade = A\n");
      else if (mark >= 65)
        printf("Grade = B\n");
      else if (mark >= 55)
         printf("Grade = C\n");
      else if (mark >= 45)
         printf("Grade = D\n");
      else
         printf("Grade = F\n");
      printf("Enter StudentID: \n");
      scanf("%d", &studentNumber);
   }
   printf("Program terminating ...\n");
   return 0;
}
```

## Using switch

Sentinel control

```
#include <stdio.h>
int main() {
   int studentNumber = 0, mark;

   printf("Enter StudentID: \n");
   scanf("%d", &studentNumber);
   while (studentNumber != -1)
   {
      printf("Enter Mark: \n");
      scanf("%d", &mark);
      switch ((mark+5) / 10) {
         case 10:
         case  9:
         case  8: printf("%c\n", 'A');
            break;
         case  7: printf("%c\n", 'B');
            break;
         case  6: printf("%c\n", 'C');
            break;
         case  5: printf("%c\n", 'D');
            break;
         default: printf("%c\n", 'F');
      }
      printf("Enter StudentID: \n");
      scanf("%d", &studentNumber);
   }
   return 0;
}
```

# Control Flow – Q2

Write a C program that reads in several lines of non-negative integer numbers, computes the average for each line and prints out the average. The value –1 in each line of user input is used to indicate the end of input for that line.

**Enter number of lines:**

***2***

**Enter line 1:**

***2 4 6 8 -1***

**Average = 5.000000**

**Enter line 2:**

***1 3 5 7 9 -1***

**Average = 5.000000**

# Control Flow – Q2

```
#include <stdio.h>
int main()
{
   int total, count, lines, input;
   int i;

   printf("\nEnter number of lines: \n");
   scanf("%d", &lines);
   for (i = 0; i < lines; i++) {
      total=0; count=0;
      printf("Enter line %d: \n", i+1);
      scanf("%d", &input);
      while (input != -1)
      {
         total += input;
         count++;
         scanf("%d", &input);
      }
      double average = (double)total/(double)count;
      printf("Average = %f\n", average);
   }
   return 0;
}
```

Counter control

Sentinel control

**Enter number of lines:**

***2***

**Enter line 1:**

***2 4 6 8 -1***

**Average = 5.000000**

**Enter line 2:**

***1 3 5 7 9 -1***

**Average = 5.000000**

# Control Flow – Q3

Write a C program that accepts a positive number *height* between 1 and 10 as its parameter value, and prints a triangular pattern according to *height*. A sample input and output session when the program is called is given below.

For example, *pattern(7)* will print the pattern as shown. Note that only 1, 2 and 3 are used to generate the patterns.

```
Enter the height:
7
Pattern:
1
22
333
1111
22222
333333
1111111
```

# Control Flow – Q3

```
#include <stdio.h>
int main()
{
   int row, col, height;
   int num = 0;
   printf("Enter the height: \n");
   scanf("%d", &height);
   printf("Pattern: \n");
   for (row = 0; row < height; row++)
   {
      for (col=0; col<row+1; col++) //print numbers
         printf("%d",num+1);
      num = (num + 1) % 3; // print up to number 3
      printf("\n");
   }
   return 0;
}
```

**Enter the height:**

***7***

**Pattern:**

**1**

**22**

**333**

**1111**

**22222**

**333333**

**1111111**

**Note:**

- **2-dimensional – row and column – use nested loop**
- **For each row, you need to print the space, and the number;**
- **When printing the number, you also need to use the modulus operator in order to limit the number to be printed**

# Control Flow – Q4

Write a C program that computes the value of $e^x$ according to the following formula:

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots + \frac{x^{10}}{10!}$$

**Please enter the value of x:**

**1**

**Result = 2.718282**

# Control Flow – Q4

```
#include <stdio.h>
int main()
{
   int n, denominator = 1;
   float x, result = 1.0, numerator = 1.0;

   printf("Please enter the value of x: \n");
   scanf("%f", &x);
   for (n = 1; n <= 10; n++)
   {
      denominator *= n;
      numerator *= x;
      result += numerator/denominator;
   }
   printf("Result = %.2f\n",  result);
   return 0;
}
```

**Please enter the value of x:**

**1**

**Result = 2.72**

numerator

$$e^{x} = 1 + \frac{x}{1!} + \frac{x^{2}}{2!} + \frac{x^{3}}{3!} + \ldots\ldots + \frac{x^{10}}{10!}$$

denominator

n = 1 2 3 …… 10

**Initial values: result=1.0; numerator=1.0; denominator=1;**

- **When n=1, result = result+num/den = 1 + (1*x)/(1*n) = 1 + x/1!**
- **When n=2, result = 1 + x/1! + num/den = 1+x/1! + (1*x)*x/(1!*2) = 1+x/1! + x^2/2!**
- **When n=3, result = (1+x/1! + x^2/2!) + (x^2*x)/(2!*3) = 1+x/1! + x^2/2! + x^3/3!**
- **When n=4, result = 1+x/1! + x^2/2! + x^3/3! + x^4/4!**
- **Etc.**