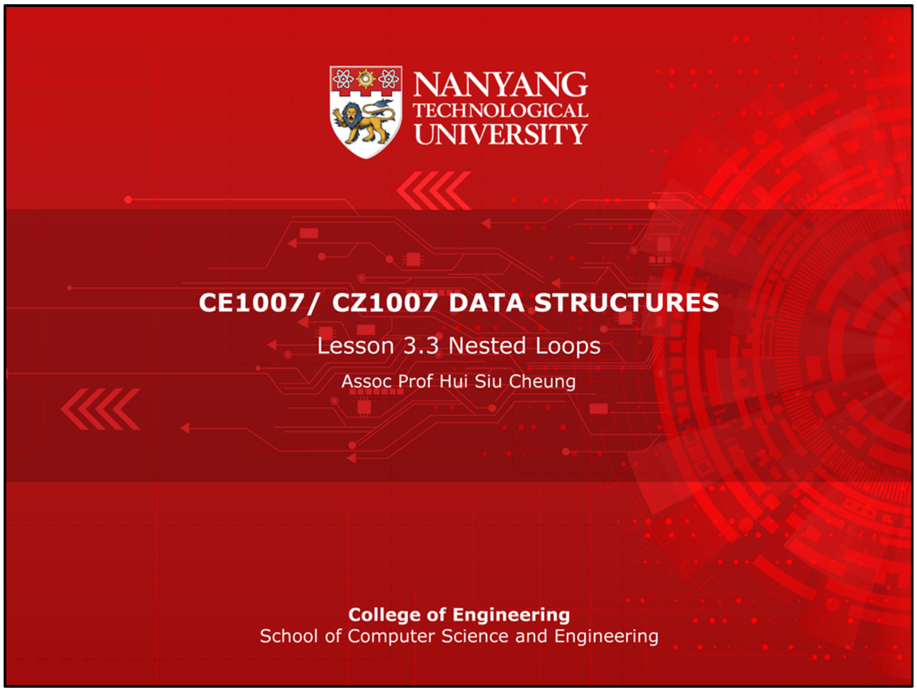

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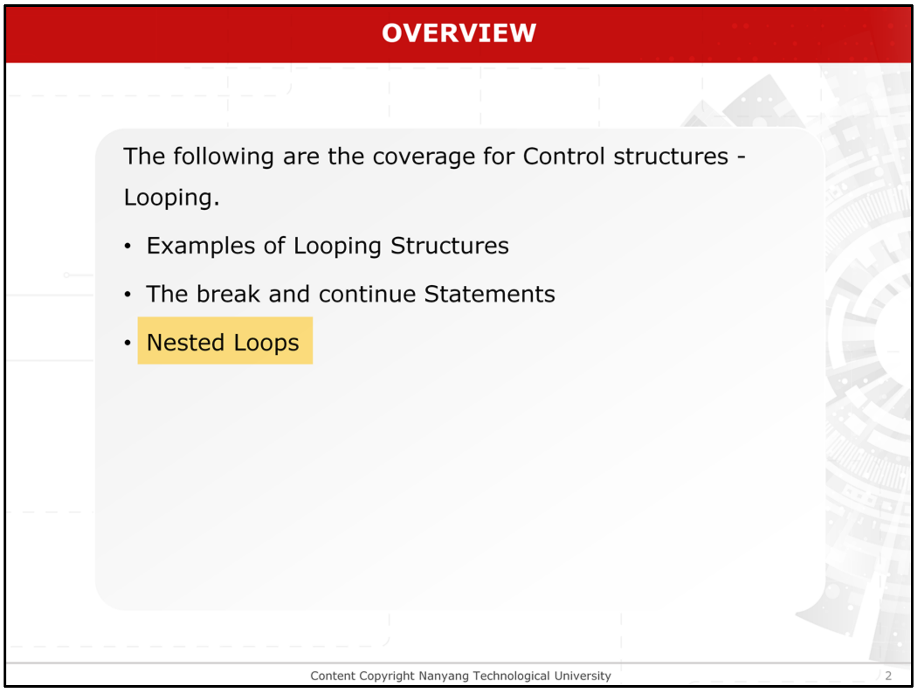
CE1007/ CZ1007 DATA STRUCTURES

Lesson 3.3 Nested Loops

Assoc Prof Hui Siu Cheung

College of Engineering
School of Computer Science and Engineering



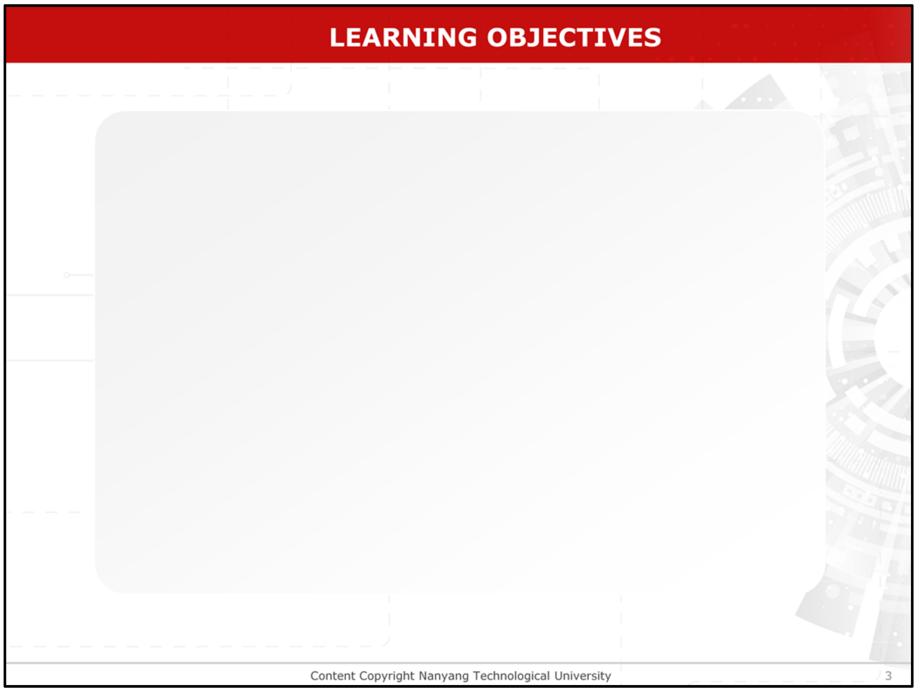
OVERVIEW

The following are the coverage for Control structures - Looping.

- Examples of Looping Structures
- The break and continue Statements
- Nested Loops

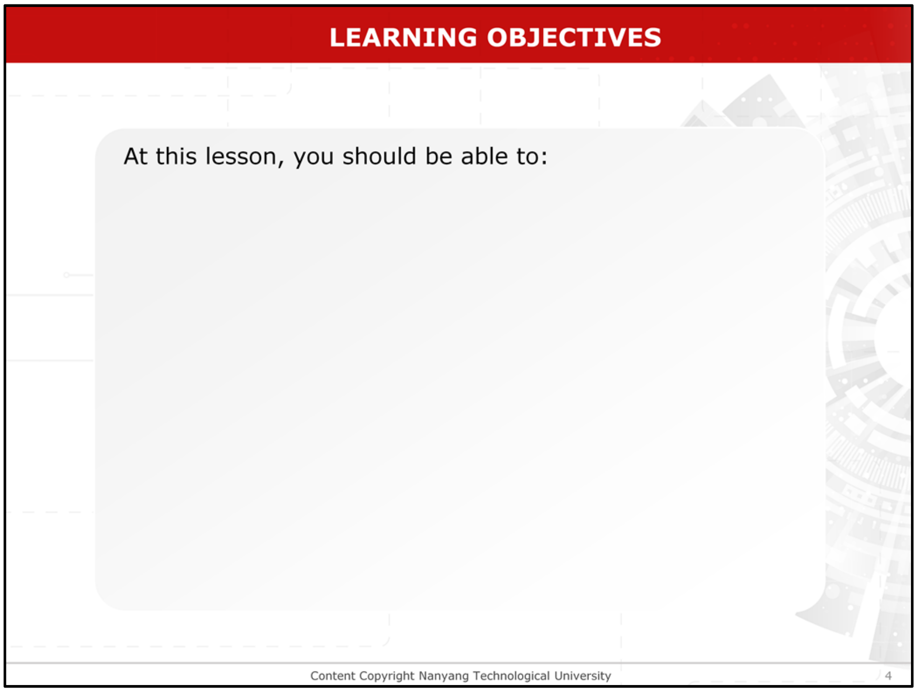
Basic C Programming

There are 3 main sections to cover for Control structures (looping).



LEARNING OBJECTIVES

Learning objectives



LEARNING OBJECTIVES

At this lesson, you should be able to:

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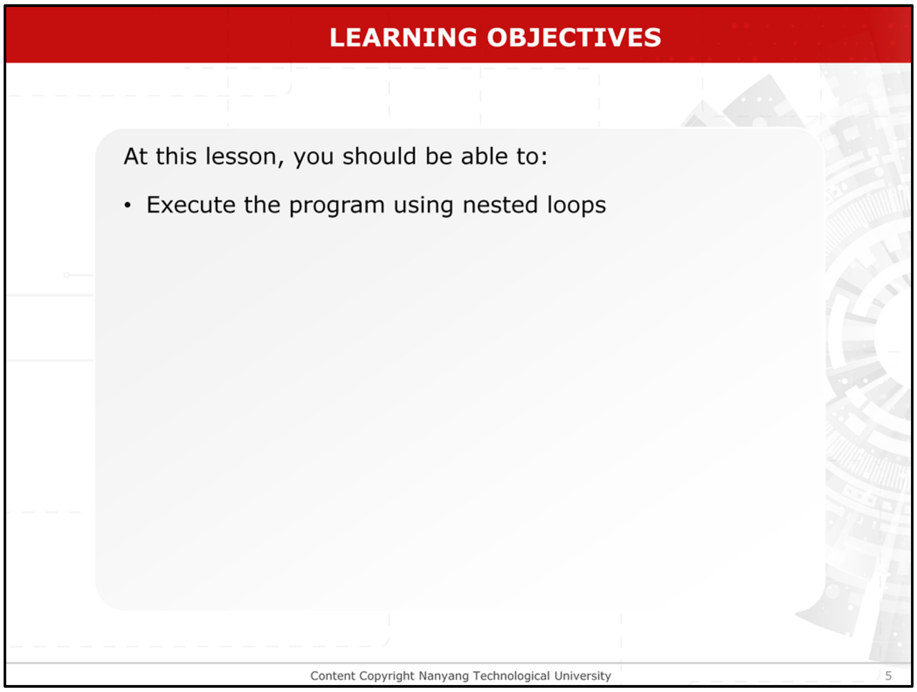
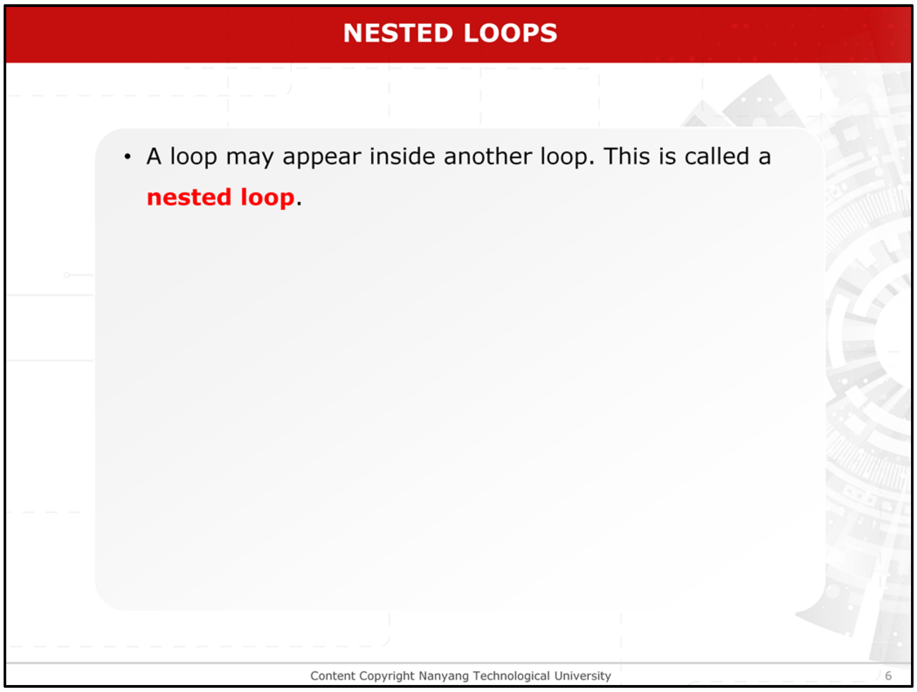


LEARNING OBJECTIVES

At this lesson, you should be able to:

- Execute the program using nested loops

At this lesson, you should be able to:

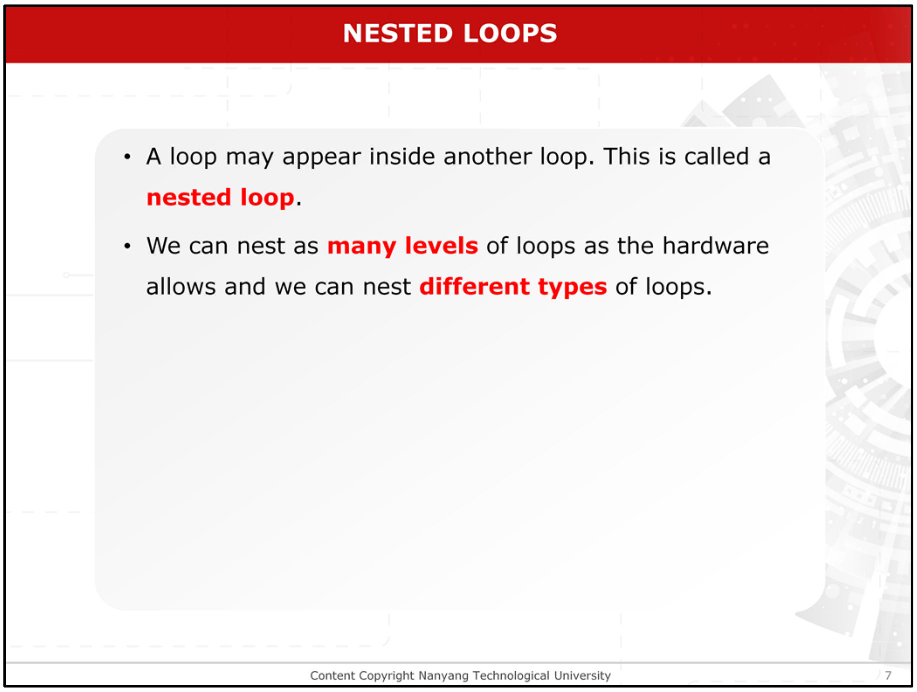


NESTED LOOPS

- A loop may appear inside another loop. This is called a **nested loop**.

Nested Loops

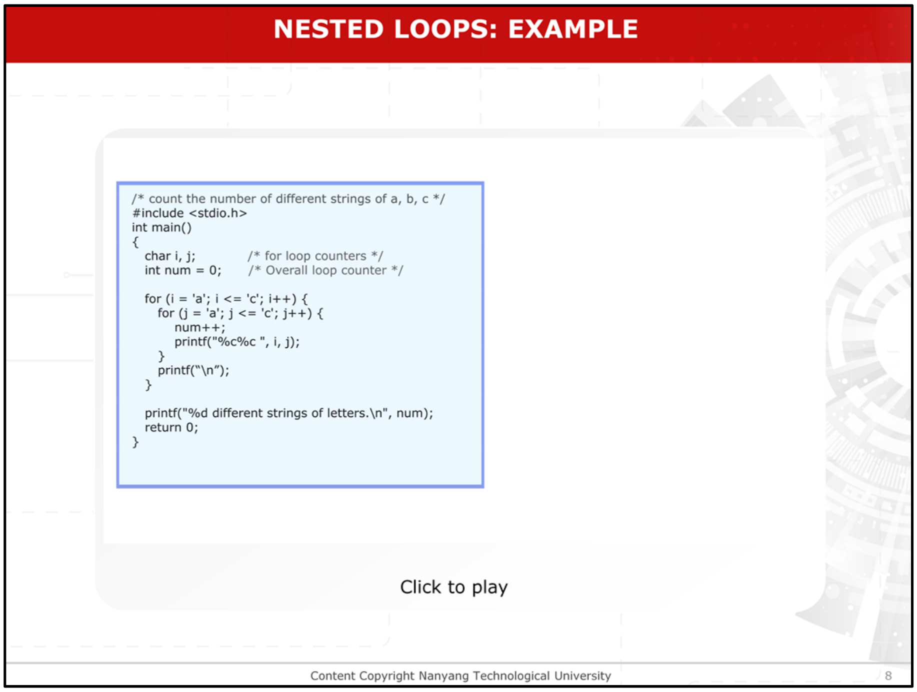
A loop may appear inside another loop. This is called a *nested* loop.



NESTED LOOPS

- A loop may appear inside another loop. This is called a **nested loop**.
- We can nest as **many levels** of loops as the hardware allows and we can nest **different types** of loops.

We can nest as many levels of loops as the system allows. We can also nest different types of loops.



NESTED LOOPS: EXAMPLE

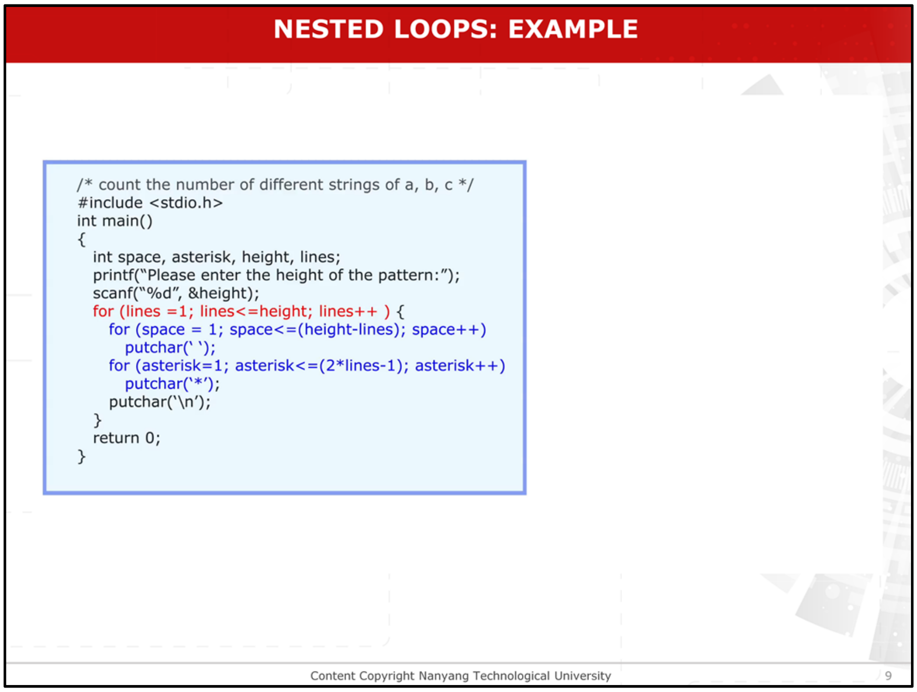
```
/* count the number of different strings of a, b, c */
#include <stdio.h>
int main()
{
   char i, j;          /* for loop counters */
   int num = 0;        /* Overall loop counter */

   for (i = 'a'; i <= 'c'; i++) {
      for (j = 'a'; j <= 'c'; j++) {
          num++;
          printf("%c%c ", i, j);
      }
      printf("\n");
   }

   printf("%d different strings of letters.\n", num);
   return 0;
}
```

Nested Loops: Example

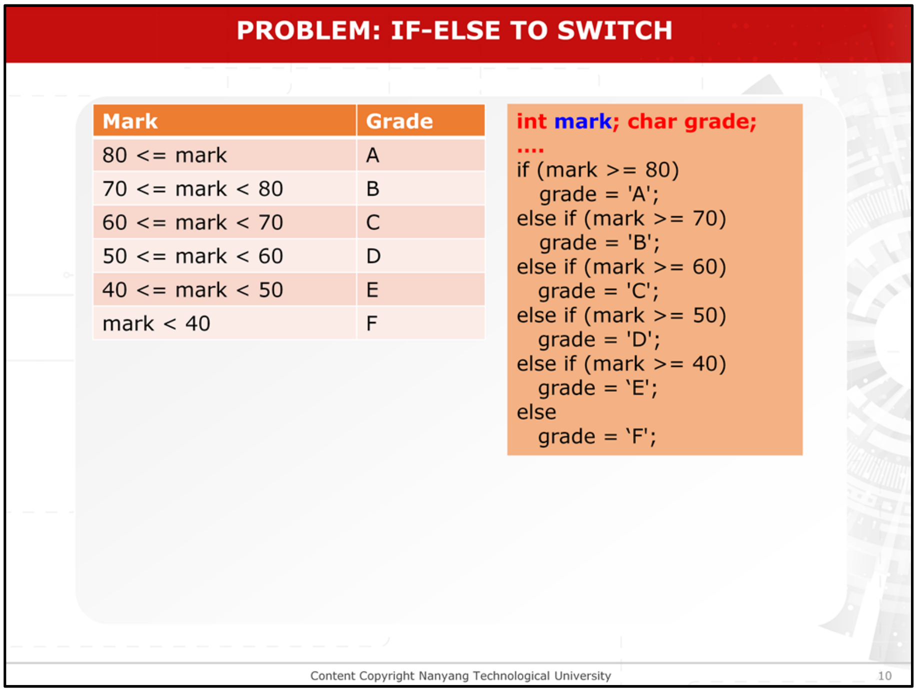
In the program, it generates the different strings of letters from the characters '**a**', '**b**' and '**c**'. The program contains a nested loop, in which one **for** loop is nested inside another **for** loop.



NESTED LOOPS: EXAMPLE

```
/* count the number of different strings of a, b, c */
#include <stdio.h>
int main()
{
   int space, asterisk, height, lines;
   printf(“Please enter the height of the pattern:”);
   scanf(“%d”, &height);
   for (lines =1; lines<=height; lines++ ) {
      for (space = 1; space<=(height-lines); space++)
         putchar(‘ ‘);
      for (asterisk=1; asterisk<=(2*lines-1); asterisk++)
         putchar(‘*’);
      putchar(‘\n’);
   }
   return 0;
}
```

Another example that uses nested loop is given in the following program. A sample input and output of the program is given here.
The program prints a triangular pattern according to the height entered by the user.

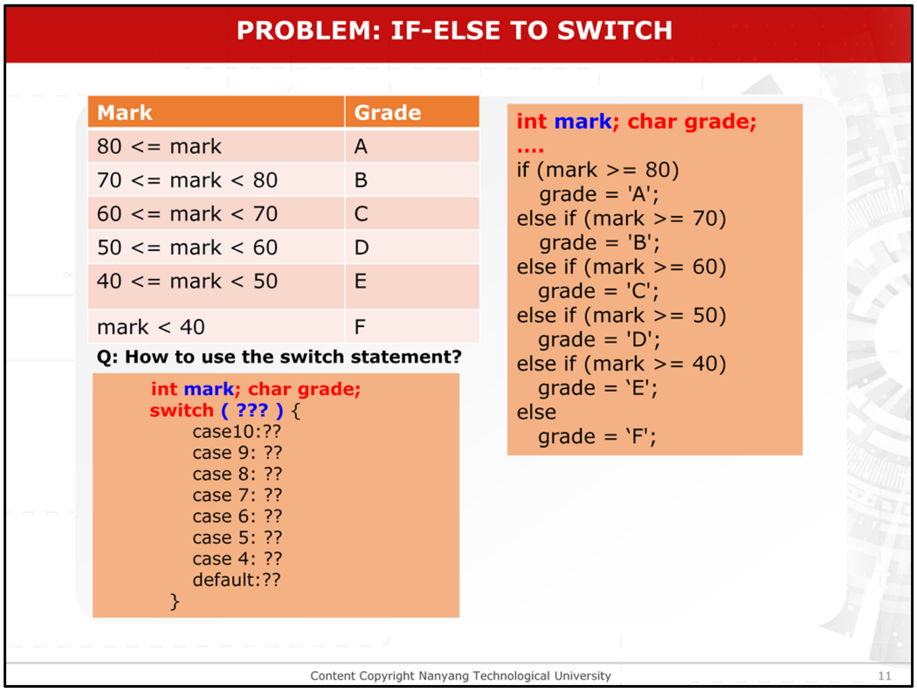


PROBLEM: IF-ELSE TO SWITCH

Mark	Grade
80 <= mark	A
70 <= mark < 80	B
60 <= mark < 70	C
50 <= mark < 60	D
40 <= mark < 50	E
mark < 40	F

```
int mark; char grade;
....
if (mark >= 80)
   grade = 'A';
else if (mark >= 70)
   grade = 'B';
else if (mark >= 60)
   grade = 'C';
else if (mark >= 50)
   grade = 'D';
else if (mark >= 40)
   grade = `E';
else
   grade = `F';
```

The purpose of this program is to convert the **if-else-if-else** statement into a **switch** statement in the mark-to-grade conversion problem. The **if-else-if-else** statement is used to control the grade to be assigned to the variable **grade** according to the input value on **mark**.



PROBLEM: IF-ELSE TO SWITCH

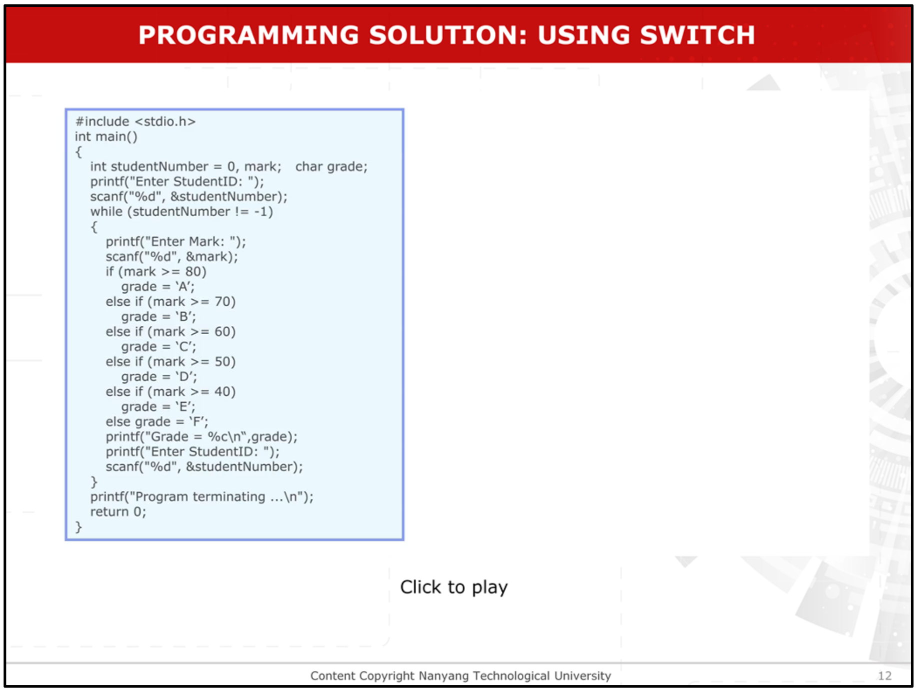
Mark	Grade
80 <= mark	A
70 <= mark < 80	B
60 <= mark < 70	C
50 <= mark < 60	D
40 <= mark < 50	E
mark < 40	F

Q: How to use the switch statement?

```
int mark; char grade;
switch ( ??? ) {
      case10:??
      case 9: ??
      case 8: ??
      case 7: ??
      case 6: ??
      case 5: ??
      case 4: ??
      default:??
   }
```

```
int mark; char grade;
….
if (mark >= 80)
   grade = 'A';
else if (mark >= 70)
   grade = 'B';
else if (mark >= 60)
   grade = 'C';
else if (mark >= 50)
   grade = 'D';
else if (mark >= 40)
   grade = ‘E';
else
   grade = ‘F';
```

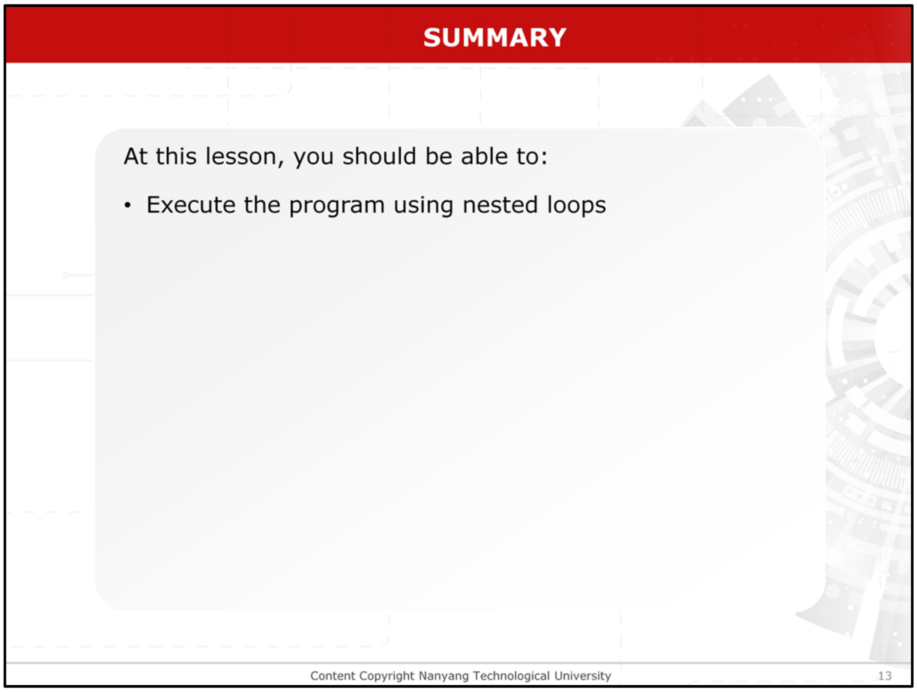
How to use the switch statement?



PROGRAMMING SOLUTION: USING SWITCH

```
#include <stdio.h>
int main()
{
   int studentNumber = 0, mark;   char grade;
   printf("Enter StudentID: ");
   scanf("%d", &studentNumber);
   while (studentNumber != -1)
   {
      printf("Enter Mark: ");
      scanf("%d", &mark);
      if (mark >= 80)
         grade = ‘A’;
      else if (mark >= 70)
         grade = ‘B’;
      else if (mark >= 60)
         grade = ‘C’;
      else if (mark >= 50)
         grade = ‘D’;
      else if (mark >= 40)
         grade = ‘E’;
      else grade = ‘F’;
      printf("Grade = %c\n“,grade);
      printf("Enter StudentID: ");
      scanf("%d", &studentNumber);
   }
   printf("Program terminating ...\n");
   return 0;
}
```

Click to play



SUMMARY

At this lesson, you should be able to:

- Execute the program using nested loops

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In summary, after viewing this video lesson, your should be able to execute the program using nested loops.