

**LAB # 6 Solution**  
**(Relevant Lecture: #12, #13)**

1. Write a program to do the following things **using a switch statement**
  - 1) input an income (integer type) from the keyboard, then
  - 2) calculate the tax (floating point type) on the income, which is  $\text{income} * \text{tax rate}$ . The tax rate is determined based on the following assumptions:
    - a. If  $\text{income} < 1000$ , no tax (or tax rate is 0)
    - b. If  $1000 \leq \text{income} < 2000$ , tax rate = 25%
    - c. If  $\text{income} \geq 2000$ , tax rate = 30%
  - 3) finally display the tax for the income.

Note that you have done this problem in Lab#4 using the two-way selection statements. Here it is required that you develop your program using the switch statement.

Hint: define an integer variable as  $\text{income}/1000$

**Example solution using the switch statement:**

```
#include <stdio.h>
void main(void)
{
    int income=0;
    int temp=0;
    double tax=0;

    printf("Please input your income:\n");
    scanf_s("%d", &income);

    temp=income/1000;
    switch (temp)
    {
        case 0:          tax = 0;
                        break;
        case 1:          tax = income * 0.25;
                        break;
        default:         tax=income*0.3;
    } /*switch ends here*/

    printf("The tax of your income %d is %f", income, tax);
}
```

**Testing using 737, 1600, 2000, 2070:**

```
Microsoft Visual Studio Debug Console
Please input your income:
737
The tax of your income 737 is 0.000000
C:\Users\lxing\source\repos\Lab4-test\Debug\Lab4-test.exe (process 55788) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input your income:
1600
The tax of your income 1600 is 400.000000
C:\Users\lxing\source\repos\Lab4-test\Debug\Lab4-test.exe (process 65084) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input your income:
2000
The tax of your income 2000 is 600.000000
C:\Users\lxing\source\repos\Lab4-test\Debug\Lab4-test.exe (process 47532) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input your income:
2070
The tax of your income 2070 is 621.000000
C:\Users\lxing\source\repos\Lab4-test\Debug\Lab4-test.exe (process 69336) exited with code 0.
Press any key to close this window . . .
```

- Write a program using the **switch** statement. The program can read an integer number from the keyboard, and output “Order breakfast” if the number is 1; output “Order lunch” if the number is 2; output “Order dinner” if the number is 3; and output “Order nothing” if the number is any other value.

Please test your program using the following four values:

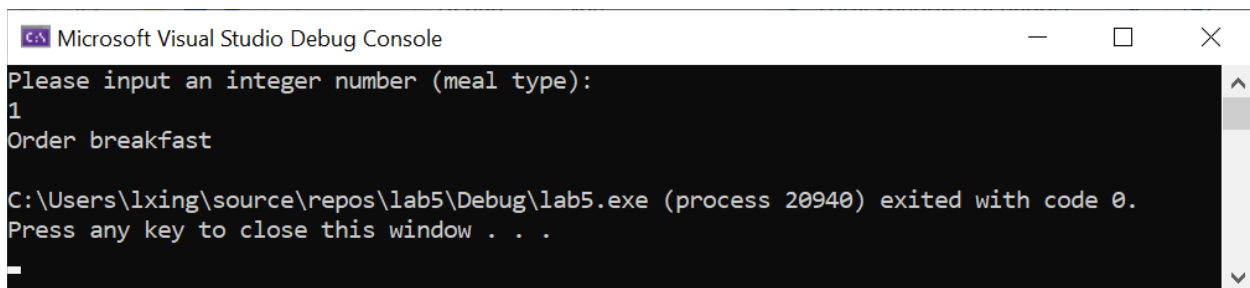
1  
2  
3  
7

### Example Solution:

```
#include <stdio.h>
void main(void)
{
    int option;

    printf("Please input an integer number (meal type): \n");
    scanf_s("%d", &option);
    switch (option)
    {
    case 1:
        printf("Order breakfast\n");
        break;
    case 2:
        printf("Order lunch\n");
        break;
    case 3:
        printf("Order dinner\n");
        break;
    default:
        printf("Order nothing\n");
    }
}
```

### Testing using 1, 2, 3, 7:



```
Microsoft Visual Studio Debug Console
Please input an integer number (meal type):
1
Order breakfast
C:\Users\lxing\source\repos\lab5\Debug\lab5.exe (process 20940) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input an integer number (meal type):
2
Order lunch

C:\Users\lxing\source\repos\lab5\Debug\lab5.exe (process 1820) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input an integer number (meal type):
3
Order dinner

C:\Users\lxing\source\repos\lab5\Debug\lab5.exe (process 23752) exited with code 0.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
Please input an integer number (meal type):
7
Order nothing

C:\Users\lxing\source\repos\lab5\Debug\lab5.exe (process 9716) exited with code 0.
Press any key to close this window . . .
```

3. Write a program that uses loop(s) to print a series of numbers on multiple lines as follows (Refer to the example on Slide 27 in Lecture #13):

```
1 1 1 1 1 1
2 2 2 2 2 2
3 3 3 3 3 3
4 4 4 4 4 4
```

### Example solution 1 (using nested for loops):

```
#include <stdio.h>
void main(void)
{
    int a;
    int b;
    for (a = 1; a <= 4; a++)
    {
        for (b = 1; b <= 6; b++)
            printf("%d", a);
        printf("\n");
    }
}
```

### Example solution 2 (using nested while and for loops):

```
#include <stdio.h>
void main(void)
{
    int a=1;
    int b;
    while (a <= 4)
    {
        for (b = 1; b <= 6; b++)
            printf("%d", a);
        printf("\n");
        a++;
    }
}
```

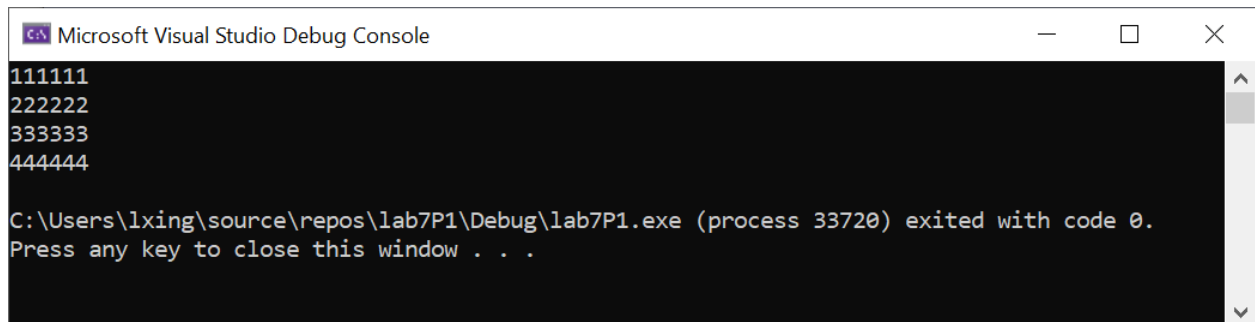
### Example solution 3 (using multiple loops):

```
#include <stdio.h>

void main(void)
{
    int a;
    int b;

    a = 1;
    for (b = 1; b <= 6; b++)
        printf("%d", a);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a);
    printf("\n");
}
```

### Testing:



```
Microsoft Visual Studio Debug Console

111111
222222
333333
444444

C:\Users\lxing\source\repos\lab7P1\Debug\lab7P1.exe (process 33720) exited with code 0.
Press any key to close this window . . .
```

4. Modify the program in Exercise 3 to print a series of numbers on multiple lines as follows:

```
2 2 2 2 2 2
4 4 4 4 4 4
6 6 6 6 6 6
8 8 8 8 8 8
```

#### Example solution 1 (using nested for loops):

```
#include <stdio.h>
void main(void)
{
    int a;
    int b;
    for (a = 1; a <= 4; a++)
    {
        for (b = 1; b <= 6; b++)
            printf("%d", a * 2);
        printf("\n");
    }
}
```

#### Example solution 2 (using nested while and for loops):

```
#include <stdio.h>
void main(void)
{
    int a=1;
    int b;
    while (a <= 4)
    {
        for (b = 1; b <= 6; b++)
            printf("%d", a * 2);
        printf("\n");
        a++;
    }
}
```

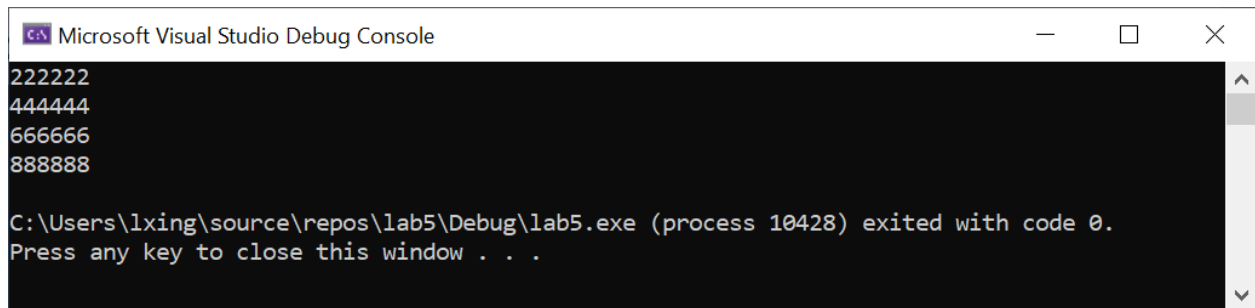
### Example solution 3 (using multiple loops):

```
#include <stdio.h>

void main(void)
{
    int a;
    int b;

    a = 1;
    for (b = 1; b <= 6; b++)
        printf("%d", a * 2);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a * 2);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a * 2);
    printf("\n");
    a++;
    for (b = 1; b <= 6; b++)
        printf("%d", a * 2);
    printf("\n");
}
```

### Testing:



```
Microsoft Visual Studio Debug Console
222222
444444
666666
888888

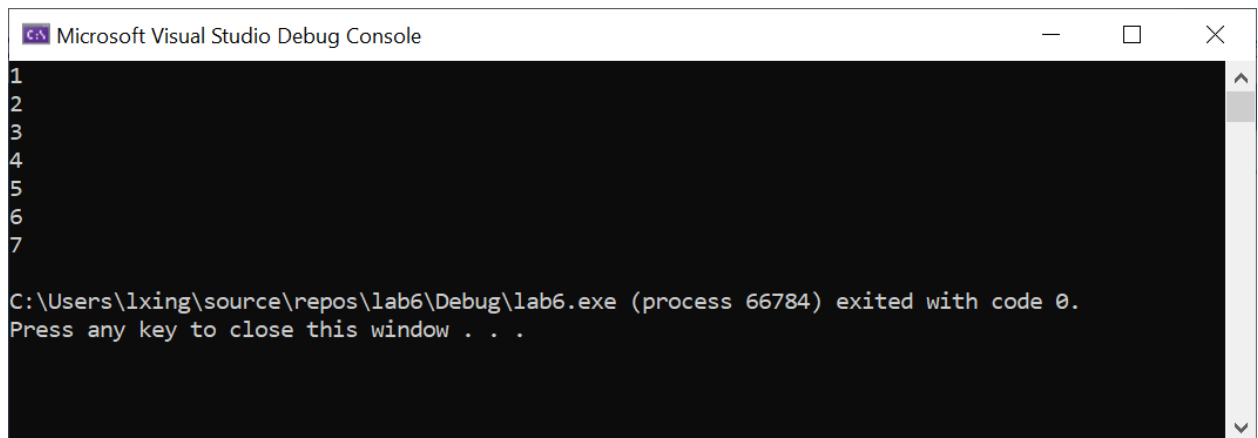
C:\Users\lxing\source\repos\lab5\Debug\lab5.exe (process 10428) exited with code 0.
Press any key to close this window . . .
```



5. To understand the use of `break` and `continue` statements in loops (Refer to Slides 29-34 of Lecture#13), run the following three programs and compare their results. If you have problems with understanding the results, please seek help from the lab assistants.

**Program #5.1:**

```
#include <stdio.h>
void main(void)
{
    int a;
    for (a = 1; a <= 7; a++)
        printf("%d\n", a);
}
```



```
Microsoft Visual Studio Debug Console
1
2
3
4
5
6
7
C:\Users\lxiing\source\repos\lab6\Debug\lab6.exe (process 66784) exited with code 0.
Press any key to close this window . . .
```

**Program #5.2:**

```
#include <stdio.h>
void main(void)
{
    int a;
    for (a = 1; a <= 7; a++)
    {
        if (a == 6)
            break;
        printf("%d\n", a);
    }
}
```

```
Microsoft Visual Studio Debug Console
1
2
3
4
5
C:\Users\lxing\source\repos\lab6\Debug\lab6.exe (process 67056) exited with code 0.
Press any key to close this window . . .
```

**Program #5.3:**

```
#include <stdio.h>
void main(void)
{
    int a;
    for (a = 1; a <= 7; a++)
    {
        if (a == 6)
            continue;
        printf("%d\n",a);
    }
}
```

```
Microsoft Visual Studio Debug Console
1
2
3
4
5
6
7
C:\Users\lxing\source\repos\lab6\Debug\lab6.exe (process 55384) exited with code 0.
Press any key to close this window . . .
```

**Explanation:**

- **break** is used to escape from a loop (causes a loop to terminate).
- **continue** is used to skip the remaining statements in the body of a structure and skip to the next iteration.