

## LAB 8: LOOP STATEMENTS

### **OBJECTIVES FOR THE STUDENT**

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1. To identify `counter` and event controlled loops.  
[*Untuk mengenal pasti counter dan peristiwa gelung kawalan.*]
2. To work with the `for` loop.  
[*Untuk menggunakan gelung for.*]
3. To work with the `while` loop.  
[*Untuk menggunakan gelung while.*]
4. To work with the `do-while` loop.  
[*Untuk menggunakan gelung do-while.*]

### **ASSUMPTIONS**

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1. Students have the knowledge on basic C programming language.  
[*Pelajar mempunyai pengetahuan mengenai asas bahasa pengaturcaraan C.*]
2. Students have the knowledge on input and output statements.  
[*Pelajar mempunyai pengetahuan dalam pernyataan input dan output.*]
3. Students have the knowledge on increment and decrement operators.  
[*Pelajar mempunyai pengetahuan mengenai operator penambahan dan pengurangan.*]
4. Students have the knowledge on Boolean expressions.  
[*Pelajar mempunyai pengetahuan mengenai ungkapan Boolean.*]

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## LAB EXERCISES

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### EXERCISE 1:

[LATIHAN 1]

1. Type in the following program (Program 8.1):  
[Taip aturcara yang berikut (Program 8.1)]:

```
1 //Program 8.1
2 #include <stdio.h>
3 #include <conio.h>
4 int main()
5 {
6     double price1, price2, price3, price4, price5,
7     price6, price7, totalPrice=0;
8     printf("Program To Calculate The Average and Total
9     Price Of The 7 Items \n\n ");
10    printf("Enter price of item:  ");
11    scanf("%lf", &price1);
12    totalPrice += price1;
13    printf("Enter price of item:  ");
14    scanf("%lf", &price2);
15    totalPrice += price2;
16    printf("Enter price of item:  ");
17    scanf("%lf", &price3);
18    totalPrice += price3;
19    printf("Enter price of item:  ");
20    scanf("%lf", &price4);
21    totalPrice += price4;
22    printf("Enter price of item:  ");
23    scanf("%lf", &price5);
24    totalPrice += price5;
25    printf("Enter price of item:  ");
26    scanf("%lf", &price6);
27    totalPrice += price6;
28    printf("Enter price of item:  ");
29    scanf("%lf", &price7);
30    totalPrice += price7;
31
32    printf("\n\nThe Average Price Of The Items Is  %f",
33    totalPrice/7);
34    printf("\nThe Total Price Of The Items Is      %f",
35    totalPrice);
36    printf("\n\nEnd Of Program");
37    getch();
38    return 0;
39 }
```

2. Study Program 8.1 carefully, then compile and execute it.  
[Kaji Program 8.1 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
  - i. What does the program do?  
[Apakah yang dilakukan oleh aturcara tersebut?]
  - ii. Why do you need 7 variables to hold the prices of the items?  
[Mengapa 7 pembolehubah diperlukan untuk menyimpan harga barangan?]
  - iii. Why is the variable `totalPrice` initialized to 0?  
[Mengapa pembolehubah `totalPrice` diberi nilai awal 0?]
  - iv. Identify the set of statements that are repeated many times in the program.  
[Kenalpasti set pernyataan yang diulang beberapa kali dalam aturcara ini.]
  - v. How many times were the set of statements repeated?  
[Berapa kalikah set pernyataan tersebut diulang?]

**EXERCISE 2:**

[LATIHAN 2]

1. Type the following program (Program 8.2):  
[Taipkan aturcara yang berikut (Program 8.2) :]

```
1 //Program 8.2
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     double price, totalPrice=0;
8     int Item;
9     printf("Program To Calculate The Average and Total
10 Price Of The 7 Items \n\n ");
11     for (Item=0; Item<7; Item++)
12     {
13         printf("Enter price of item:  ");
14         scanf("%lf", &price);
15         totalPrice += price;
16
17     printf("\n\nThe Average Price Of The Items
18 Is %f", totalPrice/7);
19     printf("\n\nThe Total Price Of The Items
20 Is %f", totalPrice);
21     printf("\n\nEnd Of Program");
22     getch();
```

21	<pre> return 0; } </pre>
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2. Study Program 8.2 carefully, then compile and execute it.  
*[Kaji Program 8.2 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]*
  - i. What does the program do? In what way is this program different from Program 8.1.  
*[Apakah yang dilakukan oleh aturcara tersebut? Apakah perbezaan antara Program 8.1. dan Program 8.2.]*
  - ii. Identify the body of the loop, and state how many times it is repeated.  
*[Kenalpasti badan gelung, dan nyatakan berapa kalikah ia diulang.]*
  - iii. Why do we now need only one variable to hold the prices of the item.  
*[Mengapa kali ini kita hanya perlu satu pembolehubah untuk menyimpan harga barangan.]*
  - iv. Change the statement `for (Item=0; Item<7; Item++)` in line 8 to the following; and state whether the output of the program remains the same, or if the output changes, what are the changes:  
*[Tukar pernyataan `for (Item=0; Item<7; Item++)` pada baris 8 kepada pernyataan berikut; dan nyatakan sama ada hasil aturcara tetap sama atau berubah. Jika berubah, nyatakan apakah perubahan tersebut:]*
    - a. `for (Item=0; Item <=7: Item ++)`
    - b. `for (Item =0; Item <35: Item +=5)`
    - c. `for (Item =10; Item I<17: Item ++)`
    - d. `for (Item =7; Item >0; Item --)`
3. Modify the program such that it will calculate and print the average and the total prices of 20 items.  
*[Ubahsuai Program 8.2 supaya ia mengira dan mencetak purata dan jumlah harga untuk 20 barangan.]*

**EXERCISE 3:****[LATIHAN 3]**

1. Download Program 8.3:  
[*Muat turun aturcara Program 8.3*]

```
1 //Program 8.3
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     double price, totalPrice=0;
8     int Item, itemCnt;
9     printf("Program To Calculate The Average and
10            Total Price Of Items \n\n ");
11     printf("Enter the number of item :  ");
12     scanf("%d", &itemCnt);
13
14     for (Item=0; Item<itemCnt; Item++)
15     {
16         printf("Enter price of item:  ");
17         scanf("%lf", &price);
18         totalPrice += price;
19
20     }
21
22     printf("\n\nThe Average Price Of The Items
23            Is  %f", totalPrice/ 7);
24     printf("\nThe Total Price Of The Items
25            Is  %f", totalPrice);
26     printf("\n\nEnd Of Program");
27     getch();
28     return 0;
29 }
```

2. Study Program 8.3 carefully, then compile and execute it.  
[*Kaji Program 8.3 dengan teliti, kemudian kompil dan laksana aturcara tersebut.*]
  - i. What does the program do? In what way is this program different from Program 8.2  
[*Apakah yang dilakukan oleh aturcara tersebut? Apakah perbezaan antara Program 8.2. dan Program 8.3*]
  - ii. State how many times the loop is repeated.  
[*Nyatakan berapa kalikah gelung diulang.*]
  - iii. What is the role of variable itemCnt in this program?  
[*Apakah peranan pembolehubah itemCnt dalam aturcara ini?*]
  - iv. Program 8.3 contains 1 logic error that makes the program unreliable. Identify and fix the error.

[Program 8.3 mengandung 1 kesalahan logik yang menjadikan aturcara tersebut tidak boleh diharap. Kenalpasti dan betulkan kesalahan tersebut.]

#### EXERCISE 4:

##### [LATIHAN 4]

1. Download Program 8.4:  
[Muat turun aturcara Program 8.4 :

```

1 //Program 8.4
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     double price, totalPrice=0;
8     int itemCnt=0;
9     // read price of 1 item before entering loop
10    printf("Enter price of item:  ");
11    scanf("%lf", &price);
12
13    while (price>0)
14    {
15        totalPrice += price;
16        itemCnt++;
17        printf("Enter price of item:  ");
18        scanf("%lf", &price);
19    }
20
21    printf("\n\nThe Average Price Of The Items Is  %f",
22           totalPrice/itemCnt);
23    printf("\nThe Total Price Of The Items
24           Is           %f", totalPrice);
25    printf("\n\nEnd Of Program");
26    getch();
27    return 0;
28 }

```

2. Study Program 8.4 carefully, then compile and execute it.  
[Kaji Program 8.4 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
  - i. What type of control is used by the `while` loop in Program 8.4?  
[Apakah jenis kawalan yang diguna oleh gelung `while` dalam Program 8.4?]
  - ii. Does the user know how to tell the program that he has no more item to be read? Modify the program to make it more user-friendly.

*[Apakah pengguna tahu bagaimana untuk memberitahu aturcara bahawa dia tiada lagi barangan untuk dibaca? Ubahsuai aturcara supaya ia lebih ramah-pengguna.]*

- iii. Why do we need to read the price of 1 item (line 11) before the while loop?  
*[Mengapa kita perlu membaca harga satu barangan (baris 11) sebelum gelung while?]*
- iv. Why is variable itemCnt initialized to 0?  
*[Mengapa pembolehubah itemCnt perlu diberi nilai awal 0?]*

### EXERCISE 5:

#### [LATIHAN 5]

1. Download the following program (Program 8.5):  
*[Muat turun aturcara berikut (Program 8.5):]*

```

1 //Program 8.5
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     double price, totalPrice=0, averagePrice;
8     int proceed=1,itemCnt=0;
9     printf("Program To Calculate The Average and Total
10           Price Of Items \n\n");
11
12     while (proceed==1)
13     {
14         printf("Enter price of item:  ");
15         scanf("%lf", &price);
16         totalPrice += price;
17         itemCnt++;
18         printf("Anymore item? Enter 1 for yes OR 0
19               for no:  ");
20         scanf("%d", &proceed);
21     }
22
23     printf("\n\nYou have %d Items ", itemCnt);
24     printf("\n\nThe Average Price Of The Items Is %f",
25           totalPrice/itemCnt);
26     printf("\n\nThe Total Price Of The Items Is %f",
27           totalPrice);
28     printf("\n\nEnd Of Program");
29     getch();
30     return 0;
31 }
```

2. Study Program 8.5 carefully, then compile and execute it.  
[Kaji Program 8.5 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
- i. What type of control is used by the WHILE loop in Program 8.5?  
[Apakah jenis kawalan yang diguna oleh gelung WHILE dalam Program 8.5?]
  - ii. What is the purpose of variable `proceed` in this program, and why it is initialized to 1?  
[Apakah peranan pembolehubah `proceed` dalam aturcara ini, dan mengapakah ia diberi nilai awal 1?]
  - iii. What value of variable `proceed` will exit the loop?  
[Apakah nilai pembolehubah `proceed` yang akan menamatkan pelaksanaan gelung ?]
  - iv. Is this program user friendly? Give reasons to your answer.  
[Adakah aturcara ini ramah pengguna? Beri sebab kepada jawapan anda.]
  - v. Modify Program 8.5 to implement `proceed` as a Boolean flag.  
[ Ubahsuai Program 8.5 supaya `proceed` dilaksana sebagai Boolean flag.]

**EXERCISE 6:****[LATIHAN 6]**

1. Download the following program (Program 8.6):  
[Muat turun aturcara berikut (Program 8.6):]

```

1 //Program 8.6
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     double price, totalPrice=0, averagePrice;
8     int N,itemCnt=0;
9     printf("Program To Calculate The Average and
10           Total Price Of N Items \n\n");
11     printf("How many items do you have?");
12     scanf("%d", &N);
13
14     do
15     {
16         printf("Enter price of item:  ");
17         scanf("%lf", &price);
18         totalPrice += price;
19         itemCnt++;
20     }while (itemCnt<N);

```



20	
21	<code>printf("\n\nYou have %d Items ", itemCnt);</code>
22	<code>printf("\n\nThe Average Price Of The Items Is %f",</code>
23	<code>totalPrice/itemCnt);</code>
24	<code>printf("\nThe Total Price Of The Items</code>
25	<code>Is %f", totalPrice);</code>
	<code>printf("\n\nEnd Of Program");</code>
	<code>getch();</code>
	<code>return 0;</code>
	<code>}</code>

2. Study Program 8.6 carefully, then compile and execute it.  
[Kaji Program 8.6 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
- i. What type of loop is used in Program 8.6, and how does it different from Program 8.5?  
[Apakah jenis gelung yang diguna dalam Program 8.6? Bagaimana ia berbeza dengan Program 8.5?]
  - ii. What is the purpose of variable N in this program?  
[Apakah peranan pembolehubah N dalam aturcara ini?]
  - iii. Why do you need variable `itemCnt` in this program, and why it is initialized to 0?  
[Mengapa pembolehubah `itemCnt` diperlukan dalam aturcara ini, dan mengapa ia perlu diberi nilai awal 0?]
  - iv. Replace `while (itemCnt<N)` with the following, and state it's effect to the program.  
[Tukar pernyataan `while (itemCnt<N)` kepada pernyataan berikut, dan nyatakan kesannya ke atas aturcara.]
    - a. `while (--N)`
    - b. `while (N--N)`

**EXERCISE 7:****[LATIHAN 7]**

1. Download the following program (Program 8.7):  
[Muat turun aturcara berikut (Program 8.7):.]

```
1 //Program 8.7
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     int mark;
8     do
9     {
10         printf("\nEnter marks for test 1:");
11         scanf("%d", &mark);
12     } while (mark<0 || mark>100);
13     printf("\nYour mark for test 1 is %d", mark);
14     printf("\n\nEnd Of Program");
15     getch();
16     return 0;
}
```

2. Study Program 8.7 carefully, then compile and execute it  
[Kaji Program 8.7 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
  - i. What does the program do?  
[Apakah yang dilakukan oleh aturcara tersebut?]
  - ii. We need ONE value for mark in this program. Why do we need the DO-WHILE loop?  
[Kita memerlukan SATU nilai untuk mark dalam aturcara ini.  
Mengapa kita perlu gelung DO-WHILE?]
  - iii. What is a valid value for mark?  
[Apakah nilai yang sah untuk mark?]
3. Modify Program 8.7 such that the data validation is implemented using a DO-WHILE loop,  
[Ubahsuai Program 8.7 supaya pengesahan data dilakukan menggunakan gelung DO-WHILE.]

**EXERCISE 8:****[LATIHAN 8]**

1. Download the following program (Program 8.7):  
[Muat turun aturcara berikut (Program 8.7).]

```
1 //Program 8.8
2 #include <stdio.h>
3 #include <conio.h>
4
5 int main()
6 {
7     int choice=0;
8     printf("\nWELCOME TO CYBER BREAKFAST\n");
9     printf("\n1:   Nasi Lemak with Kopi O  ");
10    printf("\n2:   Roti Canai with Teh Tarik  ");
11    printf("\n3:   Scramble Egg with Iced Milo  ");
12    printf("\n4:   Mixed Cereals with Strawberry
13           Shake  ");
14    printf("\n5:   No thank you, I'm overweight..!
15           \n\n");
16
17    while (choice<1 || choice>5)
18    {
19        printf("Enter your choice:  ");
20        scanf("%d", &choice);
21    }
22
23    switch (choice )
24    {
25        case 1:    printf("\nThat will be RM 6:50 ");
26                  break;
27        case 2:    printf("\nThat will be RM 4:50 ");
28                  break;
29        case 3:    printf("\nThat will be RM 5:00 ");
30                  break;
31        case 4:    printf("\nThat will be RM 8:50 ");
32                  break;
33        default:   printf("\nYou look just great..! ");
34    }
35    printf("\nPlease take a seat and make yourself
36           comfortable.  ");
37    printf("\n\nEnd Of Program");
38    getch();
39    return 0;
40 }
```

2. Study Program 8.8 carefully, then compile and execute it.  
[Kaji Program 8.8 dengan teliti, kemudian kompil dan laksana aturcara tersebut.]
  - i. What does the program do?  
[Apakah yang dilakukan oleh aturcara tersebut?]

- ii. How do you exit the loop?  
[*Bagaimana untuk keluar dari gelung?*]
  - iii. Why is the variable `choice` initialized to 0 ? What other possible values can be used instead?  
[*Mengapa pembolehubah `choice` diberi nilai awal 0? Apakah nilai lain yang boleh digunakan menggantikan 0?*]
  - iv. Experiment with entering (invalid) value for `choice`. How does this effect the execution of the program?  
[*Uji dengan memberikan nilai tidak sah untuk `choice`. Apakah kesannya terhadap pelaksanaan aturcara?*]
3. Modify Program 8.8 such that the data validation is implemented using a `do-while` loop.  
[*Ubahsuai Program 8.7 supaya pengesahan data dilakukan menggunakan gelung `do-while`.*]

**EXERCISE 9:**

[LATIHAN 9]

1. Translate the flowchart given in Figure 2 to a complete C program.  
[*Tukar carta alir yang diberi dalam Gambar Rajah 2 kepada aturcara C yang lengkap.*]

**EXERCISE 10:**

[LATIHAN 10]

Analyze the given problems, design their solutions using pseudocode or flowchart and/or structure charts; and implement them using a C program.

[*Analisa masalah yang diberi. Buat rekabentuk penyelesaian menggunakan kod `sudo` atau carta alir dan/atau carta struktur. ]*

1. The cost of renting a car is RM100 for the first day, RM 70 per day for the next 3 days and RM 50 per day thereafter. If the input is the number of days the car was rented, compute the cost of renting the car. Allow the user to repeat the calculations as many times as needed and enter a zero to stop.  
[*Bayaran sewa kereta untuk hari pertama ialah RM100, RM70 sehari untuk 3 hari berikutnya, dan RM50 untuk setiap hari yang seterusnya. Aturcara hendaklah membaca jumlah hari kereta telah disewa, dan kira berapakah jumlah sewa yang perlu dibayar. Aturcara hendaklah membenarkan pengguna untuk mengulangi proses tersebut sebanyak yang ia kehendaki. Pengguna hendaklah memasukkan nilai 0 untuk memberhentikan pengulangan. ]*

2. A customer named PetrolUpHere wants you to write a program for customer fueling. It must display a nice greeting, ask the user if they would like unleaded or diesel fuel and how many whole litres they wish to purchase; it then calculates the cost and displays it to the screen on the pump. There is a small keypad on the pump for the customer to input their choices. The price of unleaded is RM1.98 per gallon; diesel is RM1.29. The program must use 4 modules: the greeting, input, calculation, and output. You do not need to perform error checking.

*[Pelanggan bernama PetrolUpHere mahu anda menulis satu aturcara untuk pengguna mengisi petrol. Aturcara hendaklah mempamer mesej selamat datang yang menarik, menanya pengguna jika mereka mahu petrol tanpa plumbum atau diesel, dan berapa jumlah yang diperlu dibeli. Kemudian aturcara akan mengira berapa litres yang akan diberikan dan mempamernya di skrin. Pengguna boleh menggunakan papan kekunci yang disediakan di setiap pam untuk memasukkan pilihan mereka. Harga petrol tanpa plumbum ialah RM1.98 setiap liter, dan harga diesel ialah RM1.29 setiap liter. Aturcara hendaklah menggunakan 4 modul: pamer selamat datang, baca input dari pengguna, pengiraan jumlah liter, dan output. Pengesahan data tidak perlu dilakukan.]*

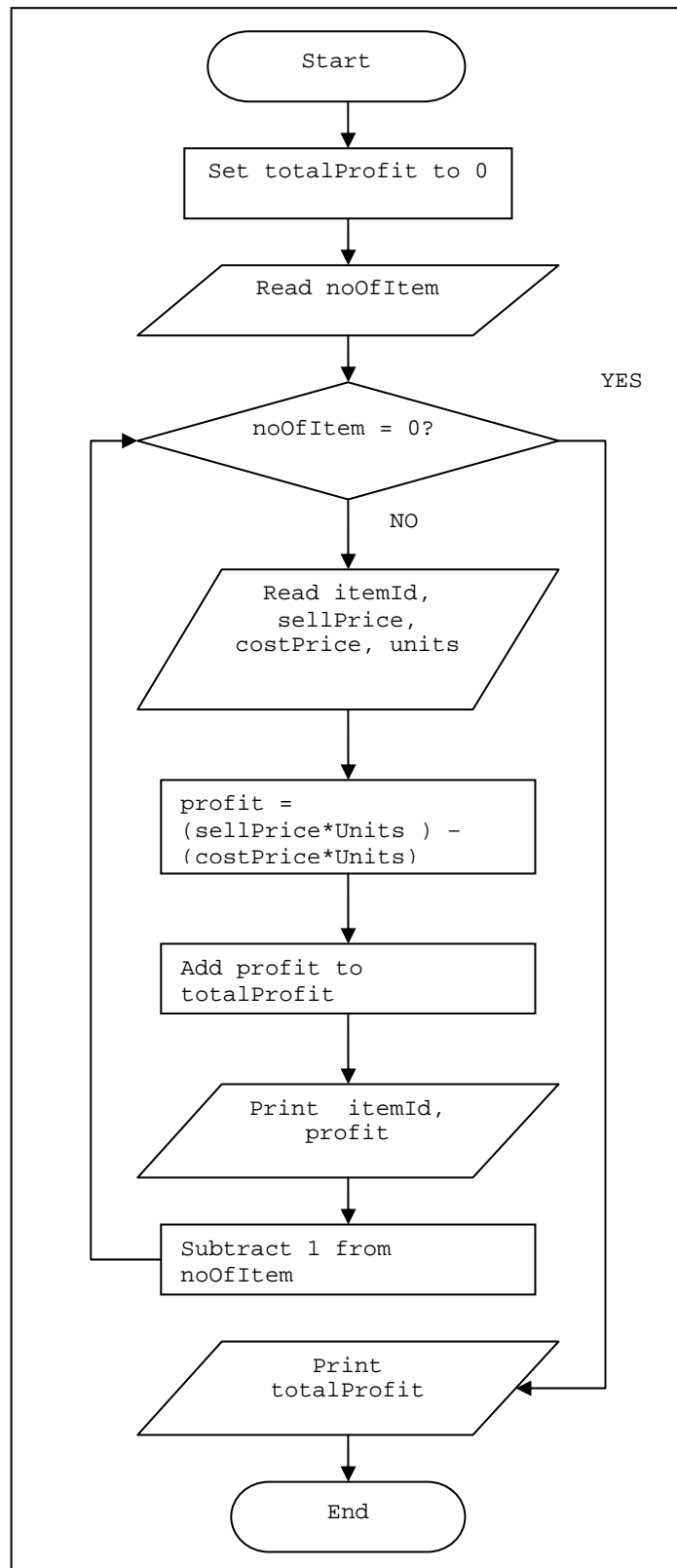


Figure 8.1