**Hong Kong Institute of Vocational Education**

**IT114105 HD in Software Engineering**

**IT124106 HD in Computer Systems Administration**

**ITP3914 Programming**

**Topic 3: Basic Program Structures**

# **Lab 7 – Repetition Part 1**

**Intended Learning Outcomes**

Upon completion of this tutorial/lab, you should be able to:

* Use loops to perform searching on a text string.
* Use different types of loops to calculate sum of series.

Exercise 1

Determine the output of the following Java programs.

(a)

public static void main( String[] args ) {  
 double balance = 1000; // initialize to $1000  
 double interestRate = 0.1;  
 int years = 0; // number of years  
 do {  
 balance = ( 1 + interestRate ) \* balance;  
 years += 1;  
 } while ( balance <= 1200 );  
 System.out.println( years );  
}

|  |  |  |  |
| --- | --- | --- | --- |
| # | balance | years | Cond (balance <= 1200) |
|  | 1000 | 0 |  |
| 1 | 1100 | 1 | true |
| 2 | 1210 | 2 | false |

2

(b)

public static void main( String[] args ) {  
 int j = 2;  
 String s = "";  
 while ( j <= 8 ) {  
 s += "\*";  
 j += 2;  
 }  
 System.out.println( j + " " + s );  
}

|  |  |  |  |
| --- | --- | --- | --- |
| # | Cond(j <= 8) | j | s |
|  |  | 2 | “” |
| 1 | True | 4 | \* |
| 2 | True | 6 | \*\* |
| 3 | True | 8 | \*\*\* |
| 4 | True | 10 | \*\*\*\* |
| 5 | false |  |  |

10 \*\*\*\*

(c)

public static void main( String[] args ) {  
 int i;  
 for ( i=-9; i<=-1; i+=3 )  
 System.out.print( i + " " );  
}

|  |  |  |  |
| --- | --- | --- | --- |
| # | Cond(i <= -1) | i | Print? |
| 1 | True | -9 | print |
| 2 | True | -6 | print |
| 3 | True | -3 | print |
| 3 | False | 0 | Not print |

-9 -6 -3

Exercise 2

Identify and correct the error(s) in the program fragment below.

(a) To find the product of 1\*2\*3\*4\*5

int c=1, product=1;

while (c <= 5) { 1 product = 1\*1 = 1

product \*= c; 2 product = 1\* 2 = 2

++c; 3 product = 2 \* 3 = 6

4 product = 6 \* 4 = 24

} 5 product = 24 \* 5 = 120

(b) To find the sum of numbers between 1 to 10 inclusively.

int x=1, total=0;

while (x <= 10) {

total += x;

x++;

}

System.out.print(total);

(c) To print the numbers from 100 to 1.

for (int x=100; x >= 1; x--){

System.out.println(x);

}

Exercise 3

What will be the value of variable x after executing the following program fragment?

int x=1, y=9;

for (int i=0; i<y; i+=3)

x++;

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Cond(i < y) | i | y | x |
| 1 | true | 0 | 9 | 2 |
| 2 | true | 3 | 9 | 3 |
| 3 | true | 6 | 9 | 4 |
| 4 | false | 9 | 9 |  |

4

Exercise 4

What will be printed by the program fragments below?

(a)

int x=12;

do {

System.out.print(x + " ");

x--;

} while (x > 7);

|  |  |  |  |
| --- | --- | --- | --- |
| # | x | print | Cond (x > 7) |
|  | 12 |  | True |
| 1 | 12 | 12 |  |
| 2 | 11 | 12 11 | true |
| 3 | 10 | 12 11 10 | true |
| 4 | 9 | 12 11 10 9 | true |
| 5 | 8 | 12 11 10 9 8 | true |
| 4 | 7 |  | false |
|  |  |  |  |

12 11 10 9 8

(b)

for (int i=10; i<=25; i+=5)

System.out.print( (i/5) + " ");

|  |  |  |  |
| --- | --- | --- | --- |
| # | Cond(i < =25) | i | print |
|  | true | 10 |  |
| 1 | true | 10 | 2 |
| 2 | true | 15 | 2 3 |
| 3 | true | 20 | 2 3 4 |
| 4 | true | 25 | 2 3 4 5 |
| 5 | false | 30 |  |

2 3 4 5

Exercise 5

What will be printed by the program below?

public class Question {

public static void main(String [] args) {

int y, x=1, total=0;

while (x <= 5) {

y = x \* x;

System.out.println(y);

total += y;

x++;

}

System.out.println("Total is " + total);

}

}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Cond(x <= 5) | x | y | total |
| 1 | true | 1 | 1 | 1 |
| 2 | true | 2 | 4 | 1 + 4 =5 |
| 3 | true | 3 | 9 | 5+ 9 = 14 |
| 4 | true | 4 | 16 | 14 + 16 = 30 |
| 5 | true | 5 | 25 | 30 + 25 = 55 |
| 6 | false | 6 |  |  |

1

4

9

16

25

Total is 55

Exercise 6

Rewrite the following programs with while loops.

(a)

public static void main( String[] args ) {  
 int i;  
 for ( i=-9; i<=-1; i+=3 )  
 System.out.println( i );  
 System.out.println( "After loop, i=" + i );  
}

public static void main( String[] args ) {  
 int i=-9;

while (i <= -1){

System.out.println(i);

i+=3;

}

System.out.println(“After loop, i=” + i);

(b)

public static void main( String[] args ) {  
 int i = 5;  
 do {  
 System.out.println( i-- );  
 } while ( i >= 0 );  
 System.out.println( "After loop, i=" + i );  
}

public static void main( String[] args ) {  
 int i = 5;

While ( i >= 0){

System.out.println( i-- );

}

System.out.println( "After loop, i=" + i );  
}

Exercise 7 – Programming Exercise

Write a program to ask the user to input an int value. The program then prints the corresponding number of ‘\*’ on screen.

Shown below are two sample executions of the program. Those in **bold underline** are user inputs.

e:\> java PrintStar

Number of stars? **5**

\*\*\*\*\*

e:\> java PrintStar

Number of stars? **9**

\*\*\*\*\*\*\*\*\*

Exercise 8 – Programming Exercise

Write a program to calculate n! where n is an integer value entered by the user.

NOTE: n! = n × (n-1) × (n-2) × (n-3) × …× 1

For example, 5! = 5 × 4 × 3 ×2 × 1

Shown below are two sample executions of the program. Those in **bold underline** are user inputs.

e:\> java Factorial

n? **3**

3! = 6

e:\> java Factorial

n? **6**

6! = 720

Exercise 9 – Programming Exercise

Rewrite your program in Exercise 8 so that the output becomes:

e:\> java Factorial2

n? **3**

3 x 2 x 1 = 6

e:\> java Factorial2

n? **6**

6 x 5 x 4 x 3 x 2 x 1 = 720

Exercise 10 – Programming Exercise

Write a program to perform the followings:

* Ask the user the number of values to enter
* Read the values from the user
* Calculate and print the average of the values.

Shown below is a sample execution of the program. Those in **bold underline** are user inputs.

e:\> java AvgValues

How many values to enter? **4**

Value? **10**

Value? **24**

Value? **20**

Value? **9**

Average = 15.75

Exercise 11 – Programming Exercise

Rewrite your program in Exercise 10. The program keeps reading values from user until a 0 or a negative number is entered. The 0 or negative number is not included when calculating the average.

Shown below is a sample execution of the program. Those in **bold underline** are user inputs.

e:\> java AvgValues2

Value? **10**

Value? **24**

Value? **20**

Value? **9**

Value? **0**

Average = 15.75

Exercise 12 – Programming Exercise

Write a program to ask the user to enter 5 int values using a for-loop. The program then reports the number of odd and even values.

Shown below is a sample execution of the program. Those in **bold underline** are user inputs.

e:\> java OddEven

Value? **4**

Value? **9**

Value? **13**

Value? **8**

Value? **7**

Number of odd values = 3

Number of even values = 2

**END.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | value | sum | counter | Cond(value >0) |
| 1 | 10 | 10 | 1 | true |
| 2 | 24 | 34 | 2 | true |
| 3 | 20 | 54 | 3 | true |
| 4 | 9 | 54+9 | 4 | true |
| 5 | 0 | 54+9+0 | 5 | false |