CS162 – Introduction to Computer Science 2

Lab 02
Pointer

Department of Software Engineering-FIT-VNU-HCMUS

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Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

Name of your submission, for example: **18125001_W01_07.zip**

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Content

In this lab, we will review the following topics:

- What is pointer?
- How does it work?

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Assignments

A: YY: 00 problems / assignments.

H: YY: 30 problems / assignments.

Write down your answers on a Word document. And then, convert it to a PDF file before submitting it to Moodle.

For the following assignments, you need to give short explanations for your answers.

You should draw on paper to find out the answers. Don't just write code in the editor, run it, write down the answers without any understanding.

Remember, the main objective of this lab is to find out how does it work.

Due to the numerous variations in the implementation of C++ compilers, the output generated by these compilers can be significantly diverse. Therefore, it is essential for students to explicitly mention both the ouput and the specific compiler they ultilized. Additionaly, students are advised to seek clarification from ChatGPT regarding any discrepancies and to carefully review their explanations.

3.1 Assignment 1

What is printed out? Are there any problems (errors)?

```
int a = 3;
int *b = &a;

cout << b << endl;
cout << *b << endl;
cout << &b << endl;

cout << a << endl;
cout << &a << endl;
```

3.2 Assignment 2

What is printed out? Are there any problems (errors)?

```
int x,z;
float y;
char ch, *chp;
```

```
int *ip1, *ip2;
float *fp;

x = 100;
y = 20.0;
z = 50;
ch = 'Z';

ip1 = &x;
ip2 = &z;
fp  = &y;
chp = &ch;

ip2 = ip1;
ip1 = &z;
*ip1 = *ip2;

*ip1 = 200;
*ip1 = *ip2 + 300;
*fp = 1.2;

cout << x << endl;
cout << y << endl;
cout << z << endl;

cout << ip1 << endl;
cout << *ip1 << endl;
cout << &ip1 << endl;

cout << ip2 << endl;
cout << *ip2 << endl;
cout << &ip2 << endl;

cout << fp << endl;
cout << *fp << endl;
cout << &fp << endl;

cout << chp << endl;
cout << *chp << endl;
cout << &chp << endl;
```

3.3 Assignment 3

What is printed out? Are there any problems (errors)?

```
int *a = new int;
int *b = new int;
*a = 2;
b = a;
cout << *a << endl;
cout << *b << endl;
delete a;
delete b;
```

3.4 Assignment 4

What is printed out? Are there any problems (errors)?

```
int a = 3;
int *p = &a;
cout << *p << endl;
p = new int(5);
cout << *p << endl;
```

3.5 Assignment 5

```
1. int v = 8, *r, *s;
2. int *p;
3. int q = 100;
4. p = &q;
5. r = p;
6. *p = 20;
7. p = new int;
8. *r = 30;
9. q = v;
10. s = p;
11. *s = 50;
```

What are the last values of ***p**, **q**, ***r**, **v** and ***s**?

3.6 Assignment 6

Q2 = Given the following codes:

```
1. int *p , *q , v , nom[5];
2. p = &v;
3. *p = 12;
4. q = p;
5. nom[0] = *q;
6. p = nom;
7. p++;
8. nom[2] = 12;
9. *p = 13;
10. *q = 10;
11. v = 11;
12. *(p+3) = 16;
13. p = &nom[3];
14. *p = 10;
15. p--;
```

What are the last values of ***p**, ***q**, **v** and **nom** ?

3.7 Assignment 7

1. Point out the compile time error in the program given below.

```
#include<stdio.h>

int main()
{
    int *x;
    *x=100;
    return 0;
}
```

A. Error: invalid assignment for x

B. Error: suspicious pointer conversion

C. No error

D. None of above

3.8 Assignment 8

21. What will be the output of the program ?

```c
#include<stdio.h>
#include<string.h>

int main()
{
    int i, n;
    char *x="Alice";
    n = strlen(x);
    *x = x[n];
    for(i=0; i<=n; i++)
    {
        printf("%s ", x);
        x++;
    }
    printf("\n", x);
    return 0;
}
```

A. Alice

B. ecilA

C. Alice lice ice ce e

D. lice ice ce e

3.9 Assignment 9

16. What will be the output of the program ?

```c
#include<stdio.h>

int main()
{
    char str[] = "peace";
    char *s = str;
    printf("%s\n", s++ +3);
    return 0;
}
```

A. peace

B. eace

C. ace

D. ce

3.10 Assignment 10

22. What will be the output of the program ?

```
#include<stdio.h>

int main()
{
    int i, a[] = {2, 4, 6, 8, 10};
    change(a, 5);
    for(i=0; i<=4; i++)
        printf("%d, ", a[i]);
    return 0;
}
void change(int *b, int n)
{
    int i;
    for(i=0; i<n; i++)
        *(b+1) = *(b+i)+5;
}
```

A. 7, 9, 11, 13, 15

B. 2, 15, 6, 8, 10

C. 2 4 6 8 10

D. 3, 1, -1, -3, -5

3.11 Assignment 11

23. If the size of integer is 4bytes, What will be the output of the program?

```c
#include<stdio.h>

int main()
{
    int arr[] = {12, 13, 14, 15, 16};
    printf("%d, %d, %d\n", sizeof(arr), sizeof(*arr), sizeof(arr[0]));
    return 0;
}
```

A. 10, 2, 4

B. 20, 4, 4

C. 16, 2, 2

D. 20, 2, 2

3.12 Assignment 12

14. What will be the output of the program ?

```
#include<stdio.h>

int main()
{
    char *str;
    str = "%d\n";
    str++;
    str++;
    printf(str-2, 300);
    return 0;
}
```

A. No output

B. 30

C. 3

D. 300

3.13 Assignment 13

2. The operator used for dereferencing or indirection is _____

a) *

b) &

c) ->

d) –>>

3.14 Assignment 14

3. Choose the right option

   string* x, y;

a) x is a pointer to a string, y is a string

b) y is a pointer to a string, x is a string

c) both x and y are pointers to string types

d) none of the mentioned

3.15 Assignment 15

4. Which one of the following is not a possible state for a pointer.
a) hold the address of the specific object
b) point one past the end of an object
c) zero
d) point to a tye

3.16 Assignment 16

5. Which of the following is illegal?

a) int *ip;

b) string s, *sp = 0;

c) int i; double* dp = &i;

d) int *pi = 0;

3.17 Assignment 17

6. What will happen in this code?

```
1.    int a = 100, b = 200;
2.    int *p = &a, *q = &b;
3.    p = q;
```

a) b is assigned to a
b) p now points to b
c) a is assigned to b
d) q now points to a

3.18 Assignment 18

7. What is the output of this program?

```
1.      #include <iostream>
2.      using namespace std;
3.      int main()
4.      {
5.          int a = 5, b = 10, c = 15;
6.          int *arr[ ] = {&a, &b, &c};
7.          cout << arr[1];
8.          return 0;
9.      }
```

a) 5
b) 10
c) 15
d) it will return some random number

3.19 Assignment 19

9. What is the output of this program?

```
1.      #include <iostream>
2.      using namespace std;
3.      int main()
4.      {
5.          char arr[20];
6.          int i;
7.          for(i = 0; i < 10; i++)
8.              *(arr + i) = 65 + i;
9.          *(arr + i) = '\0';
10.         cout << arr;
11.         return(0);
12.     }
```

a) ABCDEFGHIJ
b) AAAAAAAAAA
c) JJJJJJJJ
d) None of the mentioned

3.20 Assignment 20

10. What is the output of this program?

```
1.      #include <iostream>
2.      using namespace std;
3.      int main()
4.      {
5.          char *ptr;
6.          char Str[] = "abcdefg";
7.          ptr = Str;
8.          ptr += 5;
9.          cout << ptr;
10.         return 0;
11.     }
```

a) fg
b) cdef
c) defg
d) abcd

3.21 Assignment 21

MCQ: A pointer can be initialized with

A. Null
B. Zero
C. Address of an object of same type
D. All of them

3.22 Assignment 22

MCQ: Which from following is not a correct way to pass a pointer to a function?

A. Non-constant pointer to non-constant data
B. A non-constant pointer to constant data
C. A constant pointer to non-constant data
D. All of them

3.23 Assignment 23

MCQ: A qualifier that enables programmers to inform compiler that value of a particular variable should not be modified?

A. ptr
B. const
C. stsrt
D. None of them

3.24 Assignment 24

MCQ: Which operator returns address of unallocated blocks in memory?

A. The delete operator
B. The empty operator
C. The new operator
D. All of them

3.25 Assignment 25

MCQ: Referencing a value through a pointer is called

A. Direct calling
B. Indirection
C. Pointer referencing
D. All of them

3.26 Assignment 26

MCQ: Which unary operator is used for determining size of an array?

A. sizeof
B. size_array
C. s_array
D. size_ofarray

3.27 Assignment 27

MCQ: What is a Pointer?

A. Pointer contains an address of a variable
B. It's an operator
C. It?s a function
D. None of them

3.28 Assignment 28

MCQ: There are how many values that can be used to initialize a pointer

A. 1
B. 2
C. 3
D. 4

3.29 Assignment 29

MCQ: A unary operator that returns address of its operands, are called

A. Pointer operator
B. Relationship operator
C. Address operator
D. Both A and B

3.30 Assignment 30

1. What will be the output of the following program?

```
#include <iostream>
using namespace std;

int main()
{
    int a = 32, *ptr = &a;
    char ch = 'A', &cho = ch;

    cho += a;
    *ptr += ch;
    cout << a << ", " << ch << endl;
    return 0;
}
```

Options:

a. 32, A

b. 32, a

c. 129, a

d. 129, A

3.31 Assignment 31

2. What will be the output of the following program?

```
#include <iostream>
using namespace std;

int main()
{
    const int i = 20;
    const int* const ptr = &i;
    (*ptr)++;
    int j = 15;
    ptr = &j;
    cout << i;
    return 0;
}
```

Options:

a. 20

b. 21

c. 15

d. Compile error

3.32 Assignment 32

3. What will be the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int num[5];
    int* p;
    p = num;
    *p = 10;
    p++;
    *p = 20;
    p = &num[2];
    *p = 30;
    p = num + 3;
    *p = 40;
    p = num;
    *(p + 4) = 50;
    for (int i = 0; i < 5; i++)
        cout << num[i] << ", ";
    return 0;
}
```

Options:

a. 10, 20, 30, 40, 50

b. 10, 20, 30, 40, 50,

c. compile error

d. runtime error

3.33 Assignment 33

4. What will be the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int arr[] = { 4, 5, 6, 7 };
    int* p = (arr + 1);
    cout << *arr + 10;
    return 0;
}
```

Options:

a. 12

b. 15

c. 14

d. error

3.34 Assignment 34

5. What will be the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int a = 10, *pa, &ra;
    pa = &a;
    ra = a;
    cout << "a=" << ra;
    return 0;
}
```

Options:

a. 10

b. no output

c. compile error

d. runtime error

3.35 Assignment 35

1. **Question 1**

   What will be the output?

```c
#include<stdio.h>

int main()
{
    int a[] = { 1, 2, 3, 4, 5} ;
    int *ptr;
    ptr = a;
    printf(" %d ", *( ptr + 1) );

    return 0;
}
```

3.36 Assignment 36

2. **Question 2**

What will be the output?

```c
#include<stdio.h>

int main()
{
    int a = 5;
    int *ptr ;
    ptr = &a;
    *ptr = *ptr * 3;
    printf("%d", a);

    return 0;
}
```

3.37 Assignment 37

3. **Question 2**

What will be the output?

```c
#include<stdio.h>

int main()
{
    int i = 6, *j, k;
    j = &i;
    printf("%d\n", i * *j * i + *j);
    return 0;
}
```

3.38 Assignment 38

4. Question 4

What will be the output?

```c
#include<stdio.h>

int main()
{
    int x = 20, *y, *z;

    // Assume address of x is 500 and
    // integer is 4 byte size
    y = &x;
    z = y;
    *y++;
    *z++;
    x++;
    printf("x = %d, y = %d, z = %d \n", x, y, z);
    return 0;
}
```

3.39 Assignment 39

5. Question 5

What will be the output?

```c
#include<stdio.h>

int main()
{
    int x = 10;
    int *y, **z;
    y = &x;
    z = &y;
    printf("x = %d, y = %d, z = %d\n", x, *y, **z);
    return 0;
}
```

3.40 Assignment 40

Question 1 : What will be the output of following program?

```c
#include "stdio.h"
int main()
{
    char a[] = { 'A', 'B', 'C', 'D' };
    char* ppp = &a[0];
    *ppp++; // Line 1
    printf("%c %c ", *++ppp, --*ppp); // Line 2
}
```

OPTIONS:

a)C B

b)B A

c)B C

d)C A

3.41 Assignment 41

Question 2 : What will be the output of following program?

```c
#include <stdio.h>
int main()
{
    int* ptr;
    *ptr = 5;
    printf("%d", *ptr);
    return 0;
}
```

OPTIONS:

a) compilation error

b) Runtime error

c) 5

d) linker error

3.42 Assignment 42

Question 3 : What will be the output of following program?

```c
#include <stdio.h>
int main()
{
    int a = 36;
    int* ptr;
    ptr = &a;
    printf("%u %u", *&ptr, &*ptr);
    return 0;
}
```

OPTIONS:

a) Address Value

b) Value Address

c) Address Address

d) Compilation error

3.43 Assignment 43

Question 4 : What will be the output of following program?

```c
#include <stdio.h>
int main()
{
    int num = 10;
    printf("num = %d addresss of num = %u", num, &num);
    num++;
    printf("\n num = %d addresss of num = %u", num, &num);
    return 0;
}
```

OPTIONS:

a) Compilation error

b) num = 10 address of num = 2293436

num = 11 address of num = 2293438

c) num = 10 address of num = 2293436

num = 11 address of num = 2293440

d) num = 10 address of num = 2293436

num = 11 address of num = 2293436

3.44 Assignment 44

Question 5 : What will be the output of following program?

```c
#include <stdio.h>
int main()
{
    int i = 25;
    int* j;
    int** k;
    j = &i;
    k = &j;
    printf("%u %u %u ", k, *k, **k);
    return 0;
}
```

OPTIONS:

a) address address value

b) address value value

c) address address address

d) compilation error

3.45 Assignment 45

QUE.1 What would be printed from the following C++ program?

```
#include <iostream>
#include <stdlib.h>
using namespace std;
int main()
{
    float x = 5.999;
    float* y, *z;
    y = &x;
    z = y;
    cout << x << ", " << *(&x) << ", " << *y << ", " << *z << "\n";
    return 0;
}
```

a) 5.999, 5.999, 5.999, 5.999

b) 5.999, 5.9, 5.000, 5.900

c) Address of the elements

d) compilation error

3.46 Assignment 46

QUE.2 What would be printed from the following C++ program?

```
#include <iostream>
using namespace std;

int main()
{
    int track[] = { 10, 20, 30, 40 }, *striker;

    striker = track;
    track[1] += 30;
    cout << "Striker>" << *striker << " ";
    *striker -= 10;
    striker++;
    cout << "Next@" << *striker << " ";
    striker += 2;
    cout << "Last@" << *striker << " ";
    cout << "Reset To" << track[0] << " ";

    return 0;
}
```

a) 10, 20, 30, 40

b) Striker>10 Next@50 Last@40 Reset To0

c) Striker>10 Next@40 Last@50 Reset To0

d) Striker> Next@ Last@ Reset To

3.47 Assignment 47

QUE.3 What would be printed from the following C++ program?

```
#include <iostream>
using namespace std;

int main()
{
    int a = 32, *ptr = &a;

    char ch = 'A', &cho = ch;
    cho += a;
    *ptr += ch;
    cout << a << ", " << ch << endl;
    return 0;
}
```

OPTION

a) 97, A

b) 128, A

c) 97, a

d) 129, a

3.48 Assignment 48

QUE.4 What is the output of the following C++ program?

```
#include <iostream>
using namespace std;

int main()
{
    const int i = 20;
    const int* const ptr = &i;
    (*ptr)++;
    int j = 15;
    ptr = &j;
    return 0;
}
```

a) Address of the elements

b) run time error

c) Compilation error

d) none of this

3.49 Assignment 49

QUE.5 What is the output of the following C++ program?

```
#include <iostream>
using namespace std;
#include <stdio.h>
int main()
{
    char* str[] = { "AAAAA", "BBBBB", "CCCCC", "DDDDD" };
    char** sptr[] = { str + 3, str + 2, str + 1, str };
    char*** pp;

    pp = sptr;
    ++pp;
    printf("%s", **++pp + 2);
    return 0;
}
```

a) BBBBB

b) CCCCC

c) BBB

d) Error

3.50 Assignment 50

QUE.1 What would be printed from the following C++ program?

```
#include <iostream>
using namespace std;
int main()
{
    int x[5] = { 1, 2, 3, 4, 5 };
    // p points to array x
    int* p = x;
    int i;
    // exchange values using pointer
    for (i = 0; i < 2; i++) {
        int temp = *(p + i);
        *(p + i) = *(p + 4 - i);
        *(p + 4 - i) = temp;
    }
    // output the array x
    for (i = 0; i < 5; i++)
        cout << x[i] << " ";
    return 0;
}
```

a) 5 4 3 2 1

b) 1 2 3 4 5

c)Address of the elements

d) Can't say