

# STRUCTS REFERENCES

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Problem Solving with Computers-I

C++

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

int main()
{
    cout << "Hola Facebook!";
    return 0;
}
```



# References in C++

```
int main() {  
    int d = 5;  
    int &e = d;  
}
```

A reference in C++ is an alias for another variable

# References in C++

```
int main() {  
    int d = 5;  
    int & e = d;  
    int f = 10;  
    e = f;  
}
```

How does the diagram change with this code?



D. Other or error

## Pointers and references: Draw the diagram for this code

```
int a = 5;  
int & b = a;  
int* pt1 = &a;
```

What are three ways  
to change the value of  
'a' to 42?

## Call by reference: Modify to correctly swap a and b

```
void swapValue(int x, int y){  
    int tmp = x;  
    x = y;  
    y = tmp;  
}  
  
int main() {  
    int a=30, b=40;  
    swapValue( a, b);  
    cout<<a<<" "<<b<<endl;  
}
```

## Call by reference: Modify to correctly swap a and b

```
void swapValue(int&x, int&y){  
    int tmp = x;  
    x = y;  
    y = tmp;  
}  
  
int main() {  
    int a=30, b=40;  
    swapValue( a, b);  
    cout<<a<<" "<<b<<endl;  
}
```

# C++ structures (lab05)

A **struct** is a data structure composed of simpler data types.

```
struct Point {  
    double x; //member variable of Point  
    double y; //member variable of Point  
};
```

Think of Point as a new data type

```
Point p1;           // Declare a variable of type Point  
Point p1 = { 10, 20}; //Declare and initialize
```

# C++ structures (lab05)

- A **struct** is a data structure composed of simpler data types.

```
struct Point {  
    double x; //member variable of Point  
    double y; //member variable of Point  
};
```

- Access the member variables of p1 using the dot '.' operator

```
Point p1;  
p1.x = 5;  
p1.y = 10;
```

- Access via a pointer using the -> operator

```
Point* q = &p1;  
(*q).x = 5;  
(*q).y = 10;
```



Which of the following is/are incorrect statement(s) in C++?

```
struct Point {  
    double x;  
    double y;  
};
```

```
struct Box {  
    Point ul; // upper left corner  
    double width;  
    double height;  
};
```

A. `ul.x = 10;`

B. `Box b1 = {{500, 800}, 10, 20};`

C. `Box b1, b2; b1.ul = {500, 800};`

☒ D. A and C

E. None of the above are incorrect

# Passing structs to functions

- Write a function that prints the x and y coordinates of a `Point`

# Passing structs to functions by reference

- Write a function that takes a `Point` as parameter and initializes its x and y coordinates

## Pointer Arithmetic Question

How many of the following are invalid?

- I. pointer + integer ( $\text{ptr} + 1$ )
- II. integer + pointer ( $1 + \text{ptr}$ )
- III. pointer + pointer ( $\text{ptr} + \text{ptr}$ )
- IV. pointer – integer ( $\text{ptr} - 1$ )
- V. integer – pointer ( $1 - \text{ptr}$ )
- VI. pointer – pointer ( $\text{ptr} - \text{ptr}$ )
- VII. compare pointer to pointer ( $\text{ptr} == \text{ptr}$ )
- VIII. compare pointer to integer ( $1 == \text{ptr}$ )
- IX. compare pointer to 0 ( $\text{ptr} == 0$ )
- X. compare pointer to NULL ( $\text{ptr} == \text{NULL}$ )

#invalid

A: 1

B: 2

C: 3

D: 4

E: 5

## Pointer Arithmetic Question

How many of the following are invalid?

- I. pointer + integer (ptr+1)
- II. integer + pointer (1+ptr)
- ~~III. pointer + pointer (ptr + ptr)~~
- IV. pointer - integer (ptr - 1)
- ~~V. integer - pointer (1 - ptr)~~
- VI. pointer - pointer (ptr - ptr)
- VII. compare pointer to pointer (ptr == ptr)
- ~~VIII. compare pointer to integer (1 == ptr)~~
- IX. compare pointer to 0 (ptr == 0)
- X. compare pointer to NULL (ptr == NULL)

#invalid

A: 1

B: 2

C: 3

D: 4

E: 5