16-681A: Project Course 1
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Task 7.1: Programming Familiarization Part 1 (C++)

Part 1. Practice Problems

Given the following structs, answer question 1. You may assume that all pointers are initialized and are valid.

```
struct A { float data; };
struct B {A a;};
struct C {B* b;};
struct D {C c;};
```

1. Given a pointer to struct D called "d", what expression will access "data", the member of struct A?

Ans.

d -> c.b -> a.data

2. Given the following structs, predict the memory layout of a struct A named "stack".

You may assume that it is a 32-bit machine.

```
struct A {
float a, b,c;
B* ptr;
B mem;
};
struct B { float d, e; };
A stack;
```

Ans.

Address	**Expression**
A+0x0	Stack, stack.a
A+0x4	Stack.b
A+0x8	Stack.c
A+0xC	Stack.ptr
A+0x10	Stack.mem, Stack.mem.d
A+0x14	Stack.mem.b

3. Given the functions below, what is the value stored in the points a and b after calling foo?

```
struct point
{
float x, y;
};
void foo(point& p1, point p2)
{
point p3;
p3.x = p1.x +
p2.x; p3.y = p1.y+ p2.y;
bar(p3);
p1.x -= p3.x;
p1.y -= p3.y;
}
void bar(point p3)
{
p3.x *= .5f;
p3.y *= .5f;
}
point a, b;
a.x = b.y = 1;
a.y = b.x = 0;
foo(a, b);
```

Ans.

a.x = 0

a.y = -1