

Midterm Exam

COMP3220 – Principle of Programming Languages

2016 Spring

1 Read My Code

1. Show me the outputs.

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

int main() {
    const char foo[10] = "1234";
    cout << foo << endl;
    const char bar[10] = "12340abcd";
    cout << bar << endl;
}
```

2. Show me the outputs.

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

int main() {
    int end = 5;
    for (int i = 0; i < end; ++i, --end)
        cout << i << endl;
}
```

3. Show me the outputs.

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

int func(int a) {
    static int b = a;
    return b--;
}

int main() {
    for (int i = 0; i < 3; ++i)
        cout << func(i) << endl;
}
```

4. Show me the outputs.

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

int main() {
    enum class Color {Red, Yellow, Green};
    cout << int(Color::Red) << endl;
    cout << int(Color::Yellow) << endl;
    cout << int(Color::Green) << endl;
}
```

5. Show me the outputs. *Hint: char is 8-bit.*

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

int main() {
    union U {
        char a;
        unsigned char b;
    };

    U u;
    u.a = -1;
    cout << int(u.b) << endl;
}
```

2 About Variables

1. There are two special words in programming languages, *keywords* and *reserved words*.
 - (a) Explain what is keyword and what is reserved word.
 - (b) Please discuss the pros and cons of using reserved words.

2. Consider the following code snippet.

```
namespace foo {  
extern int foo_a;  
}  
  
int g_a;  
  
namespace foo {  
  
int foo_a = 3;  
  
void func(int p) {  
    // [[1]]  
    int a = 3;  
    // [[2]]  
}  
}  
  
int main() {  
    {  
        int b = 3;  
    }  
    // [[3]]  
}
```

What is the reference environment for each of the three positions?

3. Consider the following code snippet.

```
#include <stdio>

int x;

void h() {
    printf("%d\n",x);
}

void f() {
    int x = 13;
    h();
}

void g() {
    int x = 12;
    h();
}

int main() {
    x = 14;
    f();
    g();
}
```

- (a) If static scoping is used, what are the outputs?
(b) If dynamic scoping is used, what are the outputs?

4. Consider the following code snippet.

```
int* foo() {  
    int* a = new int{3};  
    return a;  
}  
  
int main() {  
    int* p = foo();  
    delete p;  
}
```

- (a) What is the scope of **a** and **p**?
(b) What is the lifetime of **a** and **p**?