



DISCUSSION SESSION WEEK 4

C++ REFERENCES

A reference variable is an alias, that is, another name for an already existing variable.

- A reference variable **must** be initialized at the time of declaration.

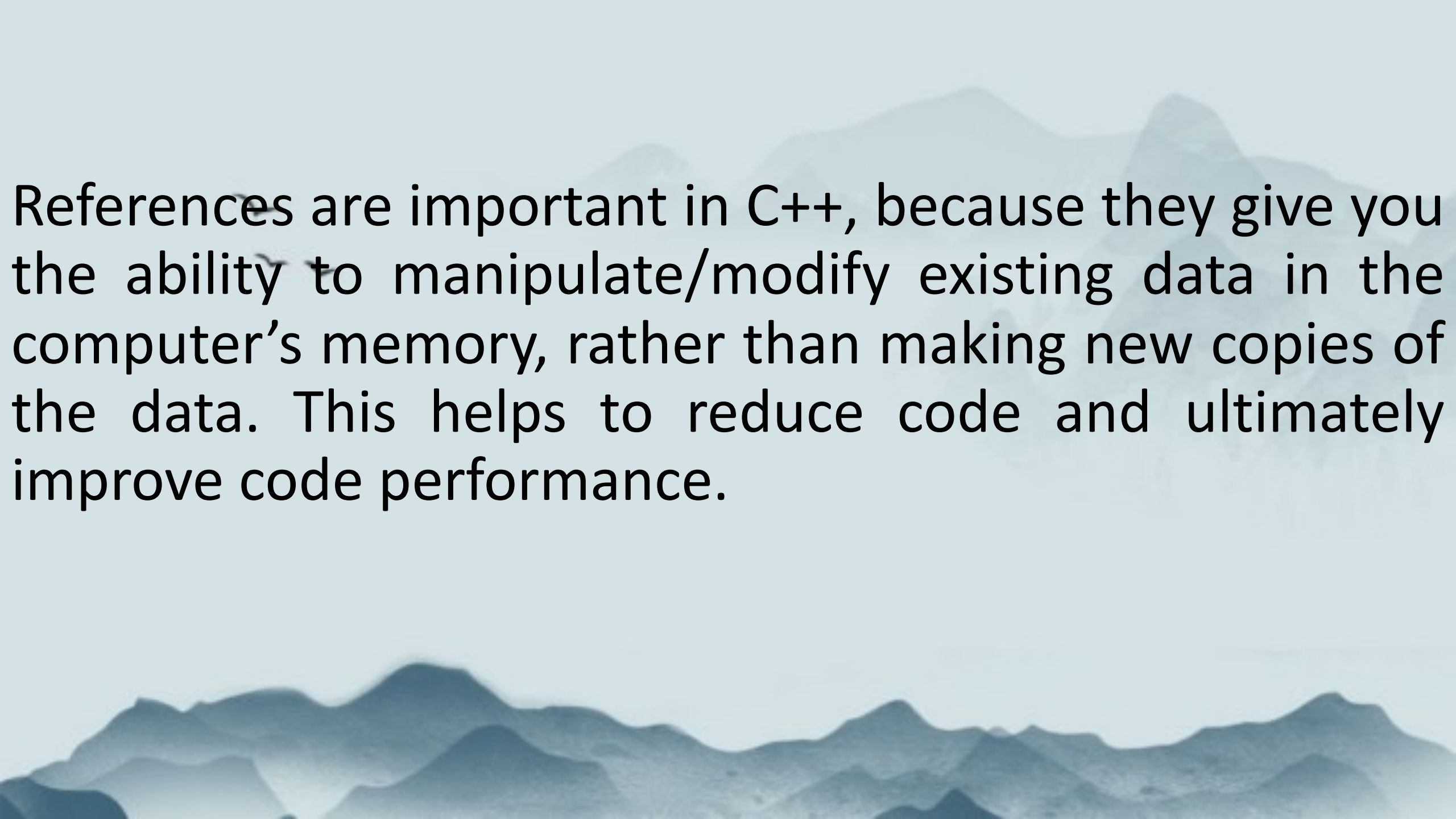
```
int a = 5, b = 6;
```

```
int& c; // this is not valid
```

```
int& c = a; // valid!
```

- Once a reference variable has been initialized, it **cannot** be changed to reference another variable.

```
c = b; // c is already referencing a
```

The background of the slide features a soft, out-of-focus image of a mountain range. The mountains are layered, with some appearing closer and more detailed in shades of blue and grey, while others are further away, creating a sense of depth and atmosphere. The overall color palette is cool and muted, with light blues and greys dominating the scene.

References are important in C++, because they give you the ability to manipulate/modify existing data in the computer's memory, rather than making new copies of the data. This helps to reduce code and ultimately improve code performance.

Applications of References

There are multiple applications for references in C++. A few of them are:

- Used to modify values of arguments in function calls. That is, you can use reference to get data out of a function without using the **return** keyword.
- Used to prevent/avoid duplicate data.
- Used in Range-based For loop to modify all objects.

The background features a soft, painterly illustration of misty, layered mountains in shades of blue and grey. Several small, dark birds are depicted in flight, scattered across the upper and middle portions of the scene.

```
void func(int& x, int y) {
```

```
    x /= 10;
```

```
    y -= 10;
```

```
}
```

```
int main( ) {
```

```
    int a = 200, b = 100;
```

```
    func(a, b);
```

```
    std::cout << a << " " << b << std::endl;
```

```
}
```

The background features a soft, painterly illustration of a mountain range in shades of blue and grey. Several birds are depicted in flight, scattered across the upper half of the image. The overall aesthetic is calm and scenic.

```
std::string city = "Boston";
```

```
    for(char letter : city) {  
        letter = 'a';  
    }
```

```
std::cout << city << std::endl;
```

The background features a soft, painterly illustration of a mountain range in shades of blue and grey. Several birds are depicted in flight, scattered across the upper half of the image. The overall aesthetic is calm and scenic.

```
std::string city = "Boston";
```

```
for(char& letter : city) {  
    letter = 'a';  
}
```

```
std::cout << city << std::endl;
```

```
int main( ) {  
    int a = 5, b = 10, c = 15;  
    int& x = a;  
    int& y = b;  
    int& z = c;  
    x = y + c;  
    b = pow(x, 2) / 25 * 2;  
    z = y - a;  
    x += c;  
    y -= a;  
    a *= 2;  
}
```

What are the final values of **a**, **b** and **z** after this code executes?



```
void intermediateUpdate(int& a, int& b) {
```

```
    int& temp = a;
```

```
    a = b - temp;
```

```
    b += temp;
```

```
    temp++;
```

```
}
```

```
void func1(int& x, int& y) {
```

```
    int temp = x * y;
```

```
    x += temp;
```

```
    y -= temp;
```

```
    intermediateUpdate(x, y);
```

```
}
```

```
void func2(int& x, int y, int& z) {
```

```
    z = x * y;
```

```
    x *= z;
```

```
    intermediateUpdate(y, z);
```

```
}
```

```
int main( ) {
```

```
    int a = 2, b = 3, c = 4;
```

```
    func1(a, b);
```

```
    func2(a, b, c);
```

```
    std::cout << a << " " << b << " " << c << std::endl;
```

```
}
```