

CSE 333 – SECTION 4

C++ References, const and classes

Reminders

- **HW2 due Thursday, 26th Oct**
- Midterm on Friday, 3rd Nov
- Review section, Thursday, 2nd

This or that?

- Consider the following code:

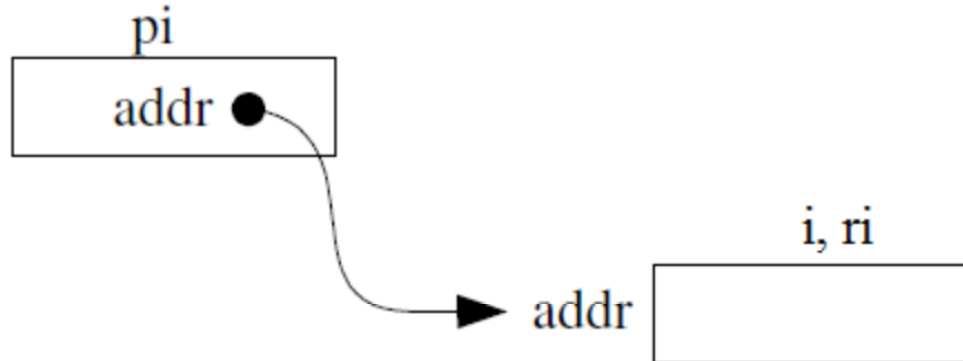
Pointers:

```
int i;  
int *pi = &i;
```

References:

```
int i;  
int &ri = i;
```

In both cases,



The difference lies in how they are used in expressions:

```
*pi = 4;
```

```
ri = 4;
```

References Example

```
// Part 1
```

```
int i = 0, j = 4;
```

```
int *pi = &i;
```

```
// Part 2
```

```
int &ri = i;
```

```
// Part 3
```

```
*pi = 3;
```

```
// Part 4
```

```
ri = j;
```

Pointers and References

- Once a reference is created, it cannot be later made to reference another object.
 - Compare to pointers, which are often reassigned.
- References can't be initialized to *null*, whereas pointers can.
- References can never be uninitialized. It is also impossible to reinitialize a reference.
- Demo: `experiments.cc`

C++ const declaration

- As a declaration specifier, `const` is a type specifier that makes objects unmodifiable.

```
const int m = 255;
```

- Reference to constant integer:

```
int n = 100;
```

```
const int &ri = n; // ri becomes read only
```

- Demo: `const.cc`

When to use?

- **Pointers:** may point to many different objects during its lifetime. Pointer arithmetic (++ or --) enables moving from one address to another. (Arrays, for e.g.)
- **References:** can refer to only one object during its lifetime.
- **Style Guide Tip:**
 - use const reference parameters to pass input
 - use pointers to pass output parameters
 - input parameters first, then output parameters last

C++ Classes

/* Note: This code is unfinished! Beware! */

```
class Point {
```

```
public:
```

```
    Point(const int x, const int y); // constructor
```

```
    int get_x() const { return x_; } // inline member function
```

```
    int get_y() const { return y_; } // inline member function
```

```
    double distance(const Point &p) const; // member function
```

```
    void setLocation(const int x, const int y); //member function
```

```
private:
```

```
    int x_; // data member
```

```
    int y_; // data member
```

```
}; // class Point
```


Complex example

- Code Review and Demo: `complex_example` (lec11-code)
- Note the friend functions
- Friend functions are
 - NOT member functions
 - declared within a class definition with keyword **friend**
 - have the right to access private and protected members of the class

Section Exercise

- Define a class `Rectangle` whose instance variables are a pair of `Point` objects (upper left, lower right).
- Include at least one constructor. Make sure you get `const` right in the right places.
- Methods:
 - **`getul()`, `getlr()`** - returns upper and lower points.
 - **`intersect(Rectangle &r)`** – returns a `Rectangle` representing the overlap.
 - **`area()`** - returns the `Rectangle`'s area.
 - **`contains(Point &p)`** - returns true or false depending on whether point `p` is inside the rectangle.
- The C++ Primer text and cplusplus.com contain good reference material.