CSE 333 – SECTION 3

References, const and classes

This or that?

- Consider the following code:

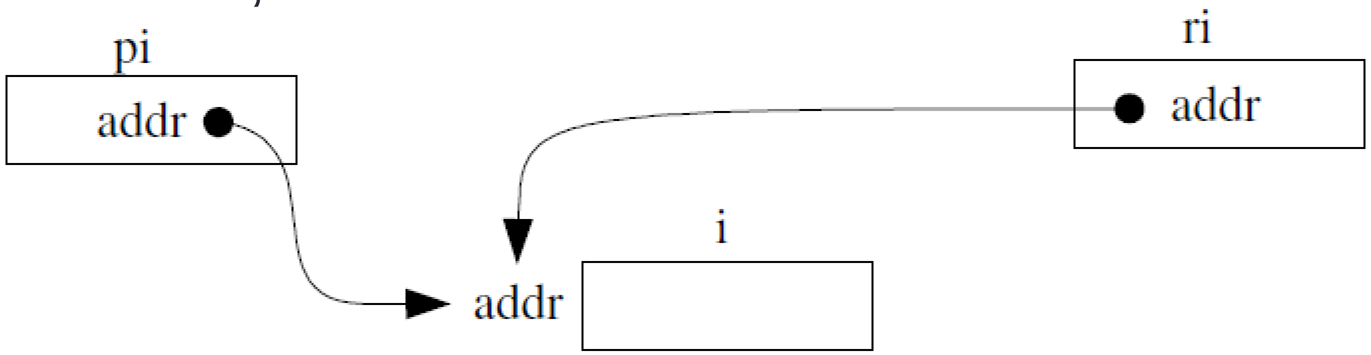
Pointers:

```
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;
```

Pointers and References

- Once a reference is created, it cannot be later made to reference another object. This is often done with pointers.
- References cannot be *null*, whereas pointers can.
- References cannot be uninitialized. It is impossible to reinitialize a reference.

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
```

When to use?

- Function parameter types and return types and functions that declare overloaded operators.
- **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

```
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
```

Section Exercise – Part I

- 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.
  - **cornerPoints()** – to obtain the corner points.
  - **area()** - returns the Rectangle's area.
  - **contains(Point &p)** - returns true or false depending on whether point p is inside the rectangle.

Part II

- Add a second constructor that takes 4 coordinates (minx, maxx, miny, maxy) and creates the upper left/lower right Point instance variables.
- Make the first constructor smart enough so the points can be any two diagonal corners and the constructor figures out what the top/bottom/left/right coordinates are and constructs upper left/lower right instance Point instance variables accordingly
- Additional Methods:
  - **Intersects(Rectangle &other) -** returns true if this rectangle intersects the other one.
  - **BoundingBox(Rectangle &other) -** returns a new rectangle that tightly encloses both this rectangle and other.