CSE 333 – SECTION 6

References, const and classes

HW3

- Due tonight by 11:59 pm.
- Revisit hw2 and ex04
- Questions?

This or that?

- Consider the following code:

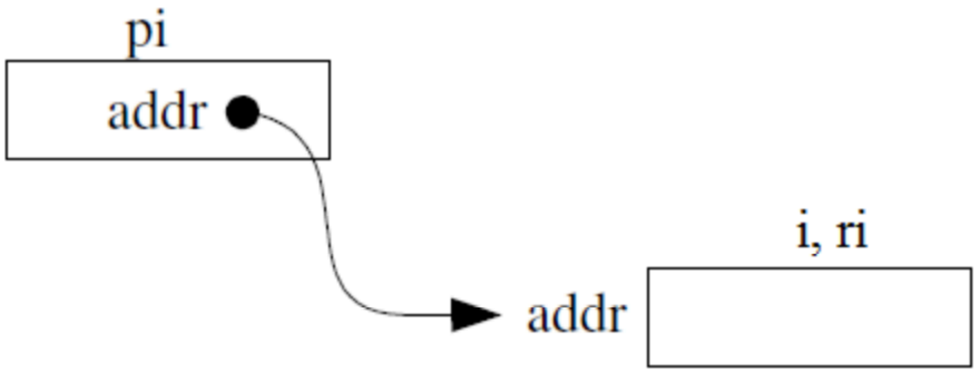
Pointers:

```
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 cannot be *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?

- 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

```
#ifndef _POINT_H
#define _POINT_H

class Point {
 public:
  Point(const int x, const int y);
  int get_x() const { return x_; }
  int get_y() const { return y_; }
  double distance(const Point &p) const;
  void setLocation(const int x, const int y);

 private:
  int x_;
  int y_;
};

#endif
```

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.
  - **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.
- The C++ Primer text and cplusplus.com contain good reference material.