Pointers & References

Lab Sections

1. Objectives
2. Introduction
3. Definitions
4. Declaration Syntax
5. Experiments

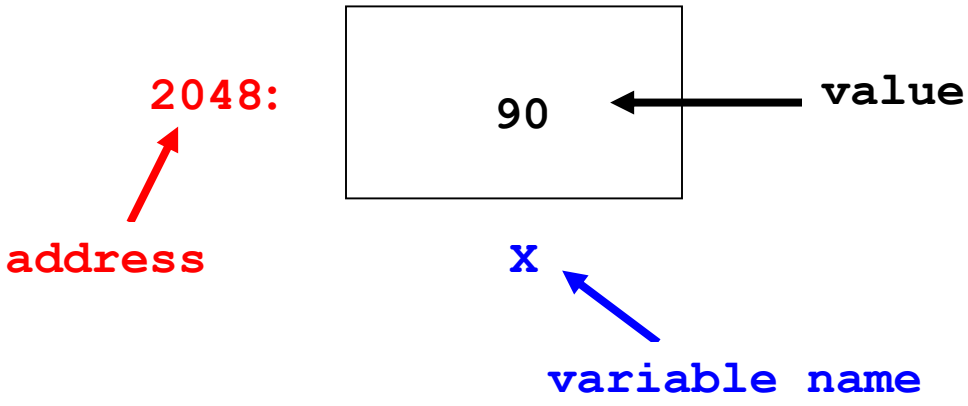
Pointers & References – The Basics

1. Objectives

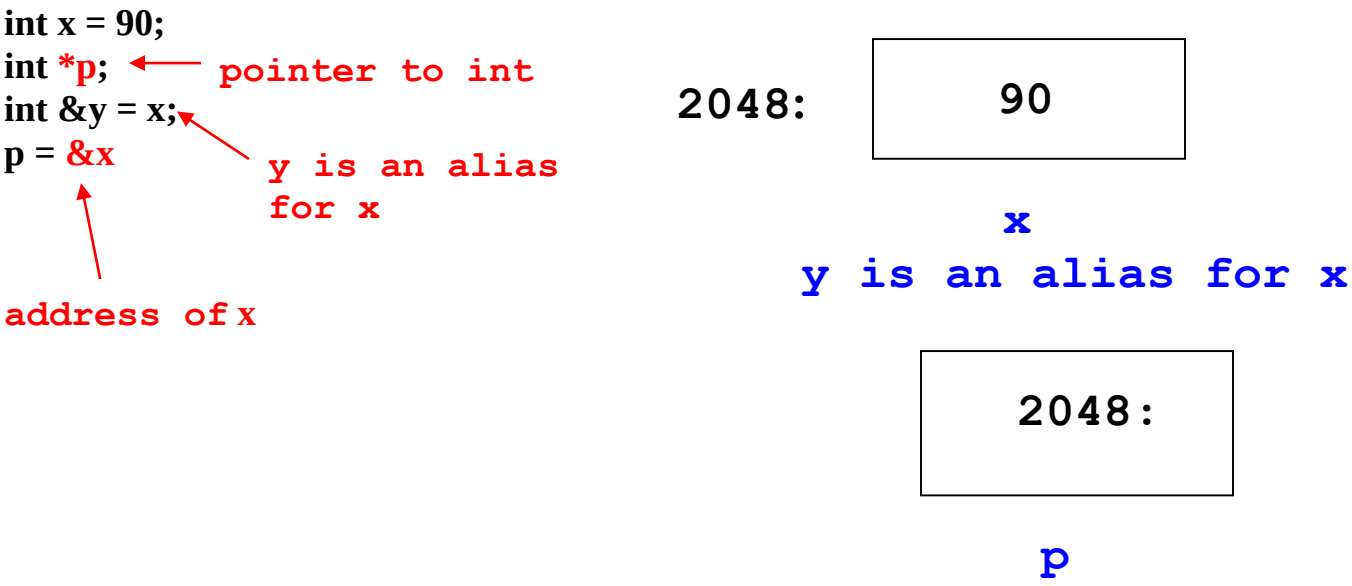
After you complete this experiment you will be able to declare and use pointers and references in a C++ program.

2. Introduction

Variables name the memory locations where values are stored. Declarations tell the compiler how much memory to use when assigning values to a variable, and what operations can be performed on a variable. Consider the following figure:



A pointer holds the address of a memory location. In other words, a pointer contains a reference to another variable. A reference in C++ is a variable that references a memory address. References are often referred to as "aliases" of other variables. Consider the following figure:



3. Definitions

We will define several terms to help you understand pointers. They are as follows:

1. **Pointers** hold memory addresses.
2. When you **de-reference** a pointer, you retrieve the contents of the memory address that is stored in the pointer.
3. A **reference** is an alias for memory that is allocated elsewhere.
4. The "*****" operator is used to declare and de-reference a pointer. Please pay close attention to the context in which the operator is used.
5. The "**&**" operator is called the "address of" operator.
6. The "**&**" operator is also used to declare references in C++.

4. Declaration Syntax

Declaration for a pointer:

```
type  * pointer_name;
```

Declaration for a reference:

```
type & reference_name;
```

More information on pointers can be found in your course textbook and on the web.

5. Experiments

Step 1: In this experiment you will investigate the use of pointers and references in a C++ program. Enter, save, compile and execute the following program in MSVS. Call the new project "PtrsAndRefsExp1" and the program "ptrsAndrefs1.cpp". Answer the questions below:

```
#include <iostream>

using namespace std;

int main()
{
	int i;
	int *p;

	cout<<&i<<endl;
	cout<<p<<endl;
	cout<<&p<<endl<<endl;

	i=90;
	p = &i;

	cout<<i<<endl;
	cout<<(*p)<<endl;
```

```
        return 0;
}
```

Question 1: Please discuss the output (if any), and any errors or warnings your compiler gives. (Hint: Describe how the different operators are being used in different statements. Be as complete as possible in your description.)

Step 2: In this experiment you will investigate the use of pointers and references in a C++ program. Enter, save, compile and execute the following program in MSVS. Call the new project "PtrsAndRefsExp2" and the program "ptrsAndrefs2.cpp". Answer the questions below:

```
#include <iostream>

using namespace std;

int main()
{
        int i;
        int *p=0;
        int &temp=i;

        cout<<&i<<endl;
        cout<<p<<endl;
        cout<<&temp<<endl<<endl;

        i=90;
        p = &i;

        cout<<i<<endl;
        cout<<(*p)<<endl;
        cout<<temp<<endl;

        return 0;
}
```

Question 2: Please discuss the output (if any), and any errors or warnings your compiler gives. (Hint: Describe how the different operators are being used in different statements. Be as complete as possible in your description.)