Structs

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Chapter 7

pp. 391 - 401

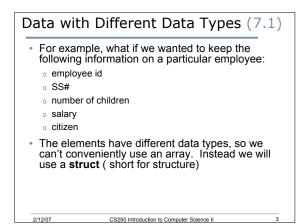
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Arrays and Data Types

- Useful for storing a collection of data elements of the **same** data type (float, int, string).
 - char myName[5]; //All elements chars
 float salaries[NUM_EMP]; //All elements floats
 char vowels[]={`A','E','I','O','U'};

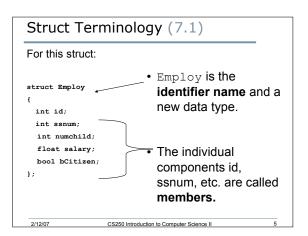
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• What about storing a collection of data elements of **different** data types?



S	Structure Declaration (7.1)	
Т	o store this information	: We would begin by defining a structure :
	employee id SS# number of children salary citizen	<pre>struct Employ { int id; int ssnum; int numchild; float salary; bool bCitizen; };</pre>
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Notes on Structures (7.1)

- A semicolon is required after the closing brace of the structure declaration
- The structure declaration does not create a variable
- It just tells the compiler what that structure is made of

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• The struct declaration is usually placed above the main

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Variable Declaration (7.1)

 As with all data types, in order to use our new data type Employ we must allocate storage space by declaring variables of this data type:

Employ sEngineer, sTech;

- This will allocate space for two variables called sEngineer and sTech, each containing the previously described members id, ssnum, etc.
- Each of these variables is a separate instance of Employ

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Dot Operator (7.2)

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- To access a struct member, we use the dot operator (period between struct variable name and member name).
- In the variable sEngineer of data type Employ we can make the assignments:

sEngineer.id = 12345;

sEngineer.ssnum = 534334343; sEngineer.numchild = 2;

sEngineer.salary = 45443.34;

sEngineer.bCitizen = true;

Notes on Structures (7.2)

• You cannot output the entire contents of a struct variable by simply using its name

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```
o cout << sEngineer; // ERROR!</pre>
```

• Similarly, you cannot compare two struct variables by using their name

o if(sEngineer == sTech) // ERROR!

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Example

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- Write a C++ struct data type RealNum that will have members number, realPart, and intPart
- Declare a variable **sNumInfo** of that type
- Place the value 3.14159 in the field number

Structs as function arguments

• Structs can be passed to functions by reference or value in the same manner that other data types have been passed

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 Generally, passing structs by reference is preferred since passing by value requires a local copy of the struct to be created within the function's variables

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Example

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- Write a C++ function **split** that accepts a variable of type **RealNum**
- Assign the integer part of the number to the member variable intPart and the real part of the number to the member variable realPart
- See the function prototype on the next slide

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Example

• Function prototype:

```
void split(RealNum &);
```

Function call:

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- split (sNuminfo);
- Function definition?

Initializing Structs (7.3)

- Use an initializer list
- Employ manager (12345, 534334356, 1, 76899, true);

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- You can initialize only some of the members in a struct, but members that follow a non initialized member must also be not initialized
 - $_{\odot}$ Employ manager(12345, 534334356, 1;

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• Employ manager(12345,,,, true);

```
Initializing Structs (7.3)

• You cannot initialize structures in the
declaration
struct Employ
{
    int id = 12345;
    int ssnum = 534334356;
    int numchild = 1; ERROR!
    float salary = 75000;
    bool bCitizen = true;
};

• Why?
```

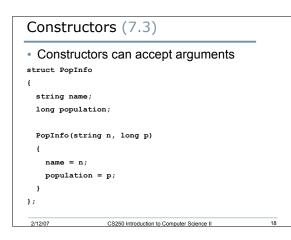
Using a Constructor (7.3)

- It is possible to initialize a structure during declaration
- Use a constructor
- Constructor: A special function that can be used to construct, or set up and initialize a structure
- Looks like a regular function, but it's name is is the same name as the name of the structure

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Constructo	r Example (7.3)	
struct Employ		
{		
int id;		
int ssnum;		
int numchild;		
float salary;		
<pre>bool bCitizen;</pre>		
Employ()		
{		
id = 0;		
ssnum = 0;		
numchild = 0;		
<pre>salary = 0;</pre>		
bCitixen = true;		
}		
};		
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Constructors (7.3)

• This allows as to initialize structure variables as they are defined

PopInfo forestGrove("Forest Grove", 19000); PopInfo portland("Portland", 556000);

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Constructors (7.3)

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- But, what if we didn't want to initialize the struct variable
 - o PopInfo city;
- Adding empty parenthesis is incorrect:

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o PopInfo city(); // ERROR!