CS50 Section

Week 3

Structs

Defining a Struct

```
typedef struct
{
    string name;
    string number;
}
person;
```

Using a Struct

```
person p;

p.name = "Alice";

p.number = "617-555-0100";
```

Recursion

Recursion

- Solve a problem by first solving a smaller version of the same problem.
- Every recursive function should have:
  - Base case: when to stop running the function
  - Recursive call: a call to the function again to solve a smaller version of the problem

Recursive Function

```c
void count_up_to(n)
{
    if (n == 0)
    {
        return;
    }
    count_up_to(n - 1);
    printf("%i\n", n);
}
```

Bubble Sort

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 3 | 1 | 6 | 4 | 7 | 8 | 2 | 5 |

| 3 | 1 | 4 | 6 | 7 | 8 | 2 | 5 |

| 3 | 1 | 4 | 6 | 7 | 2 | 8 | 5 |

| 3 | 1 | 4 | 6 | 7 | 2 | 5 | 8 |

| 1 | 3 | 4 | 6 | 7 | 2 | 5 | 8 |

| 1 | 3 | 4 | 6 | 2 | 7 | 5 | 8 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 3 | 4 | 2 | 6 | 5 | 7 | 8 |

| 1 | 3 | 4 | 2 | 5 | 6 | 7 | 8 |

| 1 | 3 | 2 | 4 | 5 | 6 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Selection Sort

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 6 | 3 | 4 | 7 | 8 | 2 | 5 |

| 1 | 2 | 3 | 4 | 7 | 8 | 6 | 5 |

| 1 | 2 | 3 | 4 | 5 | 8 | 6 | 7 |

| 1 | 2 | 3 | 4 | 5 | 6 | 8 | 7 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Merge Sort

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

6	3	4	1	8	7	5	2

6	3	4	1	8	7	5	2
3							

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | | | | | | |

6	3	4	1	8	7	5	2

3	6						

6	3	4	1	8	7	5	2

3	6						

6	3	4	1	8	7	5	2

3	6						

6	3	4	1	8	7	5	2

3	6						

6	3	4	1	8	7	5	2

3	6	1					

6	3	4	1	8	7	5	2

3	6	1	4				

6	3	4	1	8	7	5	2
3	6	1	4				

6	3	4	1	8	7	5	2

3	6	1	4				

6	3	4	1	8	7	5	2

3	6	1	4				

6	3	4	1	8	7	5	2

3	6	1	4				

1							

6	3	4	1	8	7	5	2

3	6	1	4				

1	3						

6	3	4	1	8	7	5	2

3	6	1	4				

1	3	4					

6	3	4	1	8	7	5	2

3	6	1	4				

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4				

1	3	4	6				

6	3	4	1	8	7	5	2
3	6	1	4				
1	3	4	6				

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | | | | |

| 1 | 3 | 4 | 6 | | | | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | | | | |

| 1 | 3 | 4 | 6 | | | | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | | | | |

| 1 | 3 | 4 | 6 | | | | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | | | | |

| 1 | 3 | 4 | 6 | | | | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | | | |

| 1 | 3 | 4 | 6 | | | | |

6	3	4	1	8	7	5	2

3	6	1	4	7	8		

1	3	4	6				

6	3	4	1	8	7	5	2
3	6	1	4	7	8		
1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8		

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8		

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8		

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8		

1	3	4	6				

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | |

| 1 | 3 | 4 | 6 | | | | |

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6				

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2			

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5		

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | | | | | | | |

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

1	2						

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 2 | 3 | | | | | |

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

1	2	3	4				

6	3	4	1	8	7	5	2

3	6	1	4	7	8	2	5

1	3	4	6	2	5	7	8

1	2	3	4	5			

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 | | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 6 | 3 | 4 | 1 | 8 | 7 | 5 | 2 |

| 3 | 6 | 1 | 4 | 7 | 8 | 2 | 5 |

| 1 | 3 | 4 | 6 | 2 | 5 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

CS50 Section

Week 3