

ECE 2400 Computer Systems Programming

Topic 3: C Types

<http://www.cs1.cornell.edu/courses/ece2400>
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Please do not ask for solutions. Students should compare their solutions to solutions from their fellow students, discuss their solutions with the instructors during lab/office hours, and/or post their solutions on Ed for discussion.

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Problem 1. Short Answer

Carefully plan your solution before starting to write your response. Please be brief and to the point; if at all possible, limit your answers to the space provided.

Part 1.A Unsigned Integer Addition

Consider the following C program. The add function takes two unsigned integers as parameters and returns the sum of these two integers.

```
1 typedef unsigned int uint_t;
2
3 uint_t add( uint_t x, uint_t y )
4 {
5     return x + y;
6 }
7
8 int main( void )
9 {
10    uint_t a = add( 5, -100 );
11    return 0;
12 }
```

What is the value of the variable a after the execution of line 10?

- A. The C programming language standard specifies this program is illegal
- B. -95
- C. 105
- D. A very large positive number
- E. A very small negative number

Please justify your answer.

Part 1.B Complex Multiplication

The following `cmul` function takes two complex numbers as parameters and returns the (complex) multiplication of these two numbers. **Draw the state diagram that corresponds to the execution of this C program.** You must clearly label all variables in your diagram.

```

0001 // User-defined type for complex numbers
0002
0003 typedef struct
0004 {
0005     double re; // real part
0006     double im; // imaginary part
0007 }
0008 complex_t;
0009
0010 // Function for complex multiplication
0011
0012 complex_t cmul( complex_t x, complex_t y )
0013 {
0014     complex_t z;
0015     z.re = ( x.re * y.re ) - ( x.im * y.im );
0016     z.im = ( x.re * y.im ) + ( x.im * y.re );
0017     return z;
0018 }
0019
0020 // Main function
0021
0022 int main( void )
0023 {
0024     complex_t a;
0025     a.re = 2.0;
0026     a.im = 0.5;
0027
0028     complex_t b;
0029     b.re = 10.0;
0030     b.im = 8.0;
0031
0032     complex_t c;
0033     c = cmul( a, b );
0034     return 0;
0035 }

```

