ECE 2400 Computer Systems Programming

Topic 3: C Types

http://www.csl.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.

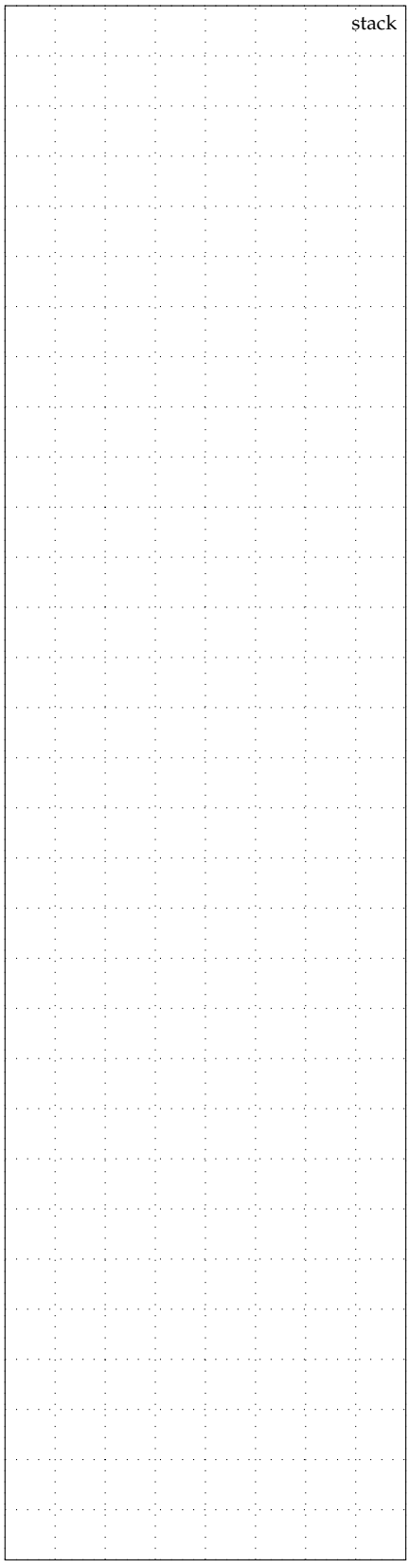
```
1  typedef unsigned int uint_t;
2
3  uint_t add( uint_t x, uint_t y )
4  {
5    return x + y;
6  }
7
8  int main( void )
9  {
10   uint_t a = add( 5, -100 );
11   return 0;
12 }
```

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.

```
01 // User-defined type for complex numbers
02
03 typedef struct
04 {
05   double re; // real part
06   double im; // imaginary part
07 }
08 complex_t;
09
10 // Function for complex multiplication
11
12 complex_t cmul( complex_t x, complex_t y )
13 {
14   complex_t z;
15   z.re = ( x.re * y.re ) - ( x.im * y.im );
16   z.im = ( x.re * y.im ) + ( x.im * y.re );
17   return z;
18 }
19
20 // Main function
21
22 int main( void )
23 {
24   complex_t a;
25   a.re =  2.0;
26   a.im =  0.5;
27
28   complex_t b;
29   b.re = 10.0;
30   b.im =  8.0;
31
32   complex_t c;
33   c = cmul( a, b );
34   return 0;
35 }
```