EECS 22: Advanced C Programming Lecture 10

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Lecture 10: Overview

- Course Administration
 - Midterm course evaluation
- Midterm Course Review
 - Syntax and semantics of C programs
 - Types, expressions, statements, functions
 - Recursion, modules, Makefile, debugging
- Practice
 - Review Quiz
 - Programming Problem

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Course Administration

- Midterm Course Evaluation
 - One week, starting this Sunday!
 - Sunday, Oct. 28, noon Sunday, Nov. 4, noon
 - Online via EEE Evaluation application
- Feedback from students to instructors
 - Completely voluntary
 - Completely anonymous
 - Very valuable
 - · Help to improve this class!
- Mandatory Final Course Evaluation
 - expected for week 10 (TBA)

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Midterm Course Review

- L1: Introduction, course setup, Linux
- L2: Tokens, basic types, operators, formatted I/O
- L3: Control-flow statements, conditionals, loops
- L4: Arrays, accesses, pass by value/reference
- L5: Functions, call graph, stack, recursion
- L6: Scope, variable lifetime, storage classes
- L7: Compiler components, translation units
- L8: Make, Makefile, rules, targets and dependencies
- L9: Assertions, debugging, GDB/DDD commands

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- Which of the following variable declarations is valid in ANSI-C?
 - (Check all that apply! 2 pts.)
 - a) double xyz;
 - b) double x, y, z;
 - C) double x = 1.0;
 - d) double x = 1.1, y = 2.2, z = 3.3;
 - e) double x,y,z = 1.0,2.0,3.0;

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Quiz: Question 21

- Which of the following variable declarations is valid in ANSI-C?
 - (Check all that apply! 2 pts.)
 - a) double xyz;
 - b) double x, y, z;
 - C) double x = 1.0;
 - d) double x = 1.1, y = 2.2, z = 3.3;
 - e) double x,y,z = 1.0,2.0,3.0;

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- Which of the following data types has the largest range of representable numbers?
 - a) char
 - b) short int
 - C) long long int
 - d) unsigned int
 - e) signed long int

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Quiz: Question 22

- Which of the following data types has the largest range of representable numbers?
 - a) char
 - b) short int
 - C) long long int
 - d) unsigned int
 - e) signed long int

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- Which of the following data types can store the greatest value?
 - a) long int
 - b) long long int
 - c) unsigned long long int
 - d) float
 - e) double

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Quiz: Question 23

- Which of the following data types can store the greatest value?
 - a) long int
 - b) long long int
 - C) unsigned long long int
 - d) float
 - e) double

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 Assuming that x is a variable of type int, which values of x satisfy the following condition?

x % 2 == 1

- a) no value
- b) any value
- c) any value less than 2
- d) any odd value
- e) any even value

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Quiz: Question 24

 Assuming that x is a variable of type int, which values of x satisfy the following condition?

x % 2 == 1

- a) no value
- b) any value
- c) any value less than 2
- d) any odd value
 - e) any even value

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 Assume that x is an integer in the range of 1 through 10 inclusively. Which of the following expressions can be used as a test for x being an even number?

(Check all that apply! 2 pts.)

- a) x % 2 == 0
- b) x / 2 > 1
- c) x % 2 == 1
- d) x / 2 * 2 == x
- e) x==2 || x==4 || x==6 || x==8 || x==10

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Quiz: Question 25

 Assume that x is an integer in the range of 1 through 10 inclusively. Which of the following expressions can be used as a test for x being an even number?

(Check all that apply! 2 pts.)

- 📥 a) 🗴 % 2 == 0
 - b) x / 2 > 1
 - C) x % 2 == 1
 - d) x / 2 * 2 == x
- \Rightarrow e) x==2 || x==4 || x==6 || x==8 || x==10

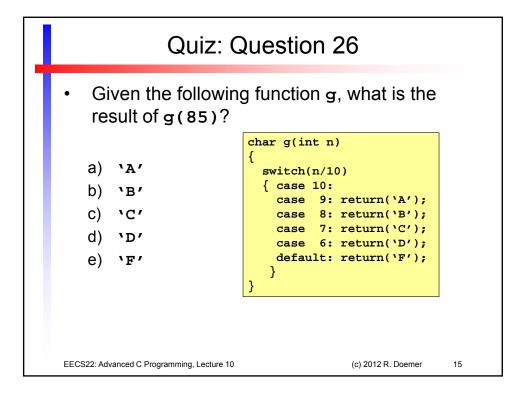
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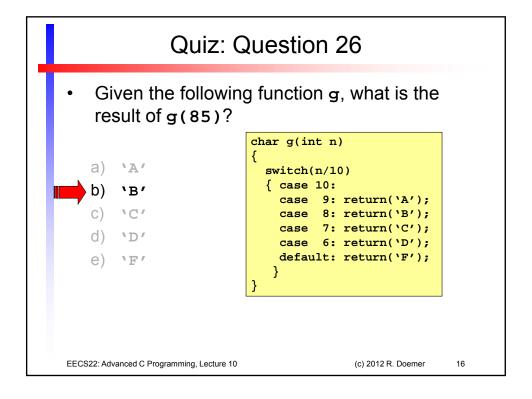
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 What is the value of x after the following code fragment is executed?

```
int x = 0;
for(x = 1; x <= 10; x++)
{ }</pre>
```

- a) 0
- b) 1
- c) 9
- d) 10
- e) 11

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Quiz: Question 27

 What is the value of x after the following code fragment is executed?

```
int x = 0;
for(x = 1; x <= 10; x++)
{ }</pre>
```

- a) 0
- b) 1
- c) 9
- d) 10

e) 11

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- Given the following program fragment, what is printed when it gets executed?
 - a) nothing
 - b) 0
 - c) 10
 - d) 20
 - e) 30

```
int i = 1;
int s = 0;
while (1)
    { i++;
    if (i >= 10)
        { break; }
    if (i % 2 == 1)
        { continue; }
    s += i;
    }
printf("%d", s);
```

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Quiz: Question 28

- Given the following program fragment, what is printed when it gets executed?
 - a) nothing
 - b) 0
 - c) 10
- d) 20
- e) 30

```
int i = 1;
int s = 0;
while (1)
    { i++;
        if (i >= 10)
            { break; }
        if (i % 2 == 1)
            { continue; }
        s += i;
        }
printf("%d", s);
```

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 Given the following code fragment, which of the following statements are true?

(Check all that apply!)

- a) Function f is declared.
- b) Function g calls function £
- c) Variable **z** is a local variable of function **g**
- d) Function g is declared and defined.
- e) y is a parameter of function g.

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double f(int x);
void g(int x, int y)

z = f(x) + 2*y;return z;

int z;

double f(int x);
void g(int x, int y)

z = f(x) + 2*y;return z;

int z;

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Quiz: Question 29

 Given the following code fragment, which of the following statements are true?

(Check all that apply!)

a) Function **f** is declared.

b) Function g calls function £

c) Variable **z** is a local variable of function **g**

d) Function g is declared and defined.

e) y is a parameter of function g.

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- Given the following program fragment, what is the value of g(2,f(3,4))?
 - a) 8
 - b) 9
 - c) 10
 - 11
 - 12 e)

```
int x = 7;
int f(int x, int y)
  return x + y;
int g(int x, int y)
 return f(y, x);
```

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Quiz: Question 30

- Given the following program fragment, what is the value of g(2,f(3,4))?

 - 9
 - 10
 - 11
 - 12

int x = 7; int f(int x, int y) return x + y; int g(int x, int y) return f(y, x);

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Programming Problem

- Task:
 - Write a program than calculates the square root of a positive number entered by the user
- Instructions:
 - Write a main module (file Main.c) that prompts the user for a value and prints the calculated square root
 - Write a square root module (files sqrt.c and sqrt.h)
 which implements a function with the signature double sqrt(double)
 - Write a corresponding Makefile to compile the program
- Hint:
 - Use a binary search algorithm to calculate the square root (see next page)

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Binary Search Algorithm For Square Root

- Approximation Algorithm:
 - Input: positive real number N
 - Output: square root of N
 - Approximate the square root by use of a range $\{L, R\}$, where $L \leq sqrt(N) \leq R$
 - Start with the range {0, N}
 - Calculate the middle of the range M = L + (R-L)/2
 - If the square root of N lies in the lower half of the range,
 use {L, M} as new range; otherwise use {M, R}
 - Repeat the bisection until the range is smaller than 1*10⁻⁵
 - Output M
- Hint:
 - $L \le sqrt(N) \le R \Leftrightarrow L^*L \le N \le R^*R$

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