Computer Science 217

Midterm Exam

Fall 2012

November 1, 2012

Name: _____

ID: _____

Class Time (Circle One): 1:00pm 3:00pm

Instructions:

- Neatly print your name and ID number in the spaces provided above.
- Pick the **best answer** for each multiple choice question.
- Answer each question by writing the correct answer in the space provided. **Answer all multiple choice questions using UPPER CASE letters.**
- This exam consists of 10 pages, including the cover. Before answering any questions count the pages and ensure that they are all present.
- You have 1 hour 30 minutes to complete this exam.
- Unless noted otherwise, each question is worth one mark.
- This exam is closed book. You are not permitted to use any electronic devices or reference materials.
- **DO NOT TURN PAST THIS PAGE UNTIL YOU ARE INSTRUCTED TO BEGIN**

1. (12 marks) Consider a right angle triangle, with sides *a*, *b* and *c*. By Pythagorean theorem, the length of side *c* is $\sqrt{a^2 + b^2}$. Your task is to write a program that reads an integer, *n*, from the user, and finds and displays all triangles where 1 <= *a* <= *n* and 1 <= *b* <= *n* and *a*, *b*, and *c* are all integers. Your program should also display a count of how many triangles are found.

   Hint: To determine if a number is an integer, compute the remainder when you divide it by 1. If the remainder is 0 then the number is an integer. Otherwise it is not.

   Your program must include appropriate prompts and output messages, which should match the sample executions shown below. In the sample executions user input is shown in **bold**:

   Sample 1:

   Enter an integer: **2**
   Found 0 triangle(s)

   Sample 2:

   Enter an integer: **4**
   Triangle 3 4 5
   Triangle 4 3 5
   Found 2 triangle(s)

   Sample 3:

   Enter an integer: **15**
   Triangle 3 4 5
   Triangle 4 3 5
   Triangle 5 12 13
   Triangle 6 8 10
   Triangle 8 6 10
   Triangle 8 15 17
   Triangle 9 12 15
   Triangle 12 5 13
   Triangle 12 9 15
   Triangle 15 8 17
   Found 10 triangle(s)

   Place you answer on the next page.

Don't use this space.
No, really, don't do it!

0

Place your answer to the programming question on this page.

2. Which of the following was used first to aid with mathematical computations?

    A. Babbage Difference Engine
    B. ENIAC
    C. Transistor
    D. Vacuum Tube
    E. Wii

    Answer: _____

3. The area of computer science that concentrates on techniques for determining how efficiently problems can be solved in terms of time and space is:
    A. Computer Vision
    B. Distributed Systems
    C. Human Computer Interaction
    D. Information Security
    E. Theory of Computation

    Answer: _____

4. List **three** examples of components of a computer that connect to the CPU through the South Bridge:

5. Within Bloom's Taxonomy, the level of competence that is characterized by the ability to compare two or more distinct solutions and identify their strengths and weaknesses is:

6. The output of top-down design is:
    A. a collection of high-level programming language statements
    B. a collection of low-level programming language statements
    C. a flowchart
    D. an algorithm
    E. an executable file

    Answer: _____

7. (2 marks) The following variable names are being considered for use in a Python program. Some of the names are legal names that can be used in a Python program, while others are illegal. Circle all of the **legal** variable names. Note that you should only consider whether or not the name is legal. A name may still be legal even if it is stylistically poor.

pir8	F5	for
NES	1_2_3	if-else
Loch Ness Monster	_x	PRINT

8. In the classic game The Legend of Zelda for the Nintendo Entertainment System, the player is restricted to carrying a maximum of 255 rupees (the game's currency). Given this information, it is most likely that the player's rupee total is being stored in a:
    A. bit
    B. byte
    C. double word
    D. half word
    E. word

    Answer: _____

9. Consider the following code segment:

```
a = 5
b = "9"
print(a+b)
```

    When the program is run, it will display:
    A. 5
    B. 9
    C. 14
    D. 59
    E. None of the above answers are correct

    Answer: _____

10. Consider the following code segment:

```
a = "5.0"
b = "10.0"
x = float(a / b)
print(x)
```

    When it runs, the output will be:
    A. 0
    B. 0.5
    C. 2
    D. 2.0
    E. None of the above answers are correct

    Answer: _____

11. The operator with highest precedence is:
    A. +
    B. =
    C. >=
    D. and
    E. not

    Answer: _____

12. Which type of Python error will always be caught when you execute your program, regardless of the input values that are provided?
    A. Semantic errors
    B. Logic errors
    C. Runtime errors
    D. Syntax errors
    E. More than one of the above answers is correct

Answer: _____

13. Convert 123 base 10 to binary:

Answer: _____

14. Convert 11322_4 to hexadecimal:

Answer: _____

15. (2 marks) Convert 73 base 12 to base 6:

Answer: _____

Consider the following Python program:

```
x = int(input("Enter x: "))
y = int(input("Enter y: "))

if x >= 1:
  x = x + 1
  y = y - 1
  z = 0
if x == 2:
  x = x + 1
  y = y * 2
  z = 1
if y < 4:
  x = x + 1
  y = y + 1
  z = -1

print(x, y, z)
```

16. If the user enters 5 for x and 1 for y, then the output will be: _____

17. If the user enters 1 for x and 4 for y, then the output will be: _____

18. If the user enters 5 for x and 5 for y, then the output will be: _____

19. Provide an example of integer values for x and y that will cause the program to crash (saying that the program will crash because of non-integer input is not a valid answer to this question):

    x = _____

    y = _____

20. Name **one** of the two logical operators which are functionally complete: _____

21. Complete the truth table for the expression `B or not A and not B`. **Draw a box around the column that represents your result so that it is clear which column we are supposed to mark.**

A	B	
0	0	
0	1	
1	0	
1	1	

Consider the following Python program:

```
a = int(input("Enter a: "))

if a < 0:
  a = a + 1
  print("A")
  if a == 0:
    print("B")
    a = a - 1
  else:
    print("C")
    a = a + 1
elif a == 0:
  print("D")
  a = a - 1

print("E")
```

22. If the user enters 0 for a, then the output will be: _____

23. If the user enters -1 for a, then the output will be: _____

24. If the user enters -2 for a, then the output will be: _____

25. What level of white-box test coverage must be achieved in order to prove that your program does not contain any bugs?
    A. Condition coverage
    B. Graph coverage
    C. Heuristic coverage
    D. Path coverage
    E. None of the above answers are correct

Answer: _____

Consider the following code segment:

```
a = 0
for i in range(4,8):
  if i % 2 == 0:
    a = a + i
print(a)
```

26. The output of this program is: _____

Consider the following code segment:

```
a = float(input("Enter a: "))
c = 0

while a < 5:
  c = c + 1
  b = a * 2
  while b < 3:
    b = b + 1
    c = c * 2
  a = a + 1

print(c)
```

27. If the user enters 0 for a then the output will be: _____

28. If the user enters 3 for a then the output will be: _____

29. If the user enters 5 for a then the output will be: _____

30. How many copies of the letter X does the following program display?

```
for i in range(0,10):
  j = 0
  print("X")
  while (j < 50):
    print("X")
    j = j + 1
```

Answer: _____

31. What is the minimum number of times that a pre-tested loop will execute? _____

32. (4 marks) The following program is supposed to read integers from the user until a negative number is entered. After the negative number is entered the program should report how many non-negative numbers were entered, the largest number entered, and the smallest non-negative number entered. For example, if the user enters the values 5, 2, 7, 0, 6, -3, the program should report a count of 5, a largest value of 7, and a smallest non-negative value of 0.

    Unfortunately the program contains (at least) 4 bugs. The comments are all correct, and describe what the program is supposed to do. Circle each of the 4 bugs (and only the bug) and write 1 sentence or less next to each bug indicating what you would need to do to fix it. Note that in this context a bug is defined to be something that will stop the program from generating a correct result, or causes the program to crash. It does **not** include stylistic issues, differences in output messages, spelling mistakes in prompts, etc.

```
# read the first input value from the user
x = int(input("Enter a number: "))

# create and initialize variables for count, minimum and maximum
count = 0
mn = 0
mx = 0

# continue reading values until a negative number is entered
while x > 0:
  if x < mn:           # if a new smallest value is found,
    mn = x             # record it
  if x > mx:           # if a new largest value is found,
    mx = x             # record it
  count = count + 1    # count all of the values entered

  # read the next input value from the user
  x = input("Enter another number: ")

# Display the results
if count != 0:
  # provide a meaningful message if no values were entered
  print("No values were entered.")
else:
  # display the count, minimum non-negative value and maximum value
  print(count,"values were entered")
  print("The largest value is: ",mx)
  print("The smallest non-negative value is: ",mn)
```