Introduction to Computing Test 1

Question 1. (8 points) What is the role of the CPU/processor within a computer?

It fetches, decodes, and executes instructions of a program.

Question 2. (12 points) Indicate the resulting value and type (int, float, Boolean, long int) of evaluating each of the following expressions. For partial credit, list the order of operations.

a) \( \frac{4.0}{10.0 - 2.0 \times 3} \)
   Result: \( 6.4 \)  Type: float

b) \( \frac{11 \div 3 + 7 \div 3}{3 \div 2} \)
   Result: \( 4 \)  Type: int

c) \( \text{not } (4.0 \div 10.0) \text{ or } 5 \times 1.2345 \)
   Result: True  Type: Boolean

Question 3. (10 points) Complete a simple program (without user-defined functions) that allows the user to enter the lengths of three sides of a triangle (a, b, c) and calculates the triangle area by the following formulas:

\[
 s = \frac{a+b+c}{2} \\
 \text{area} = \sqrt{s(s-a)(s-b)(s-c)}
\]

import math  # From the math module use the math.sqrt( ) function

a = input("Enter side one: ")
b = input("Enter side two: ")
c = input("Enter side three: ")

s = \( \frac{a+b+c}{2.0} \)

area = math.sqrt(s \times (s-a) \times (s-b) \times (s-c))

print "The area is", area
Question 4. (10 points) Consider running the following program three times with different inputs. Show the expected output for each of the inputs:

```python
a = input( 'Enter a: ')
b = input( 'Enter b: ')
c = input( 'Enter c: ')
if a > b:
    print "Who?"
    if b > c:
        print "Up"
    else:
        print "Down"
elif b > c:
    print "What?"
    if a == c:
        print "One"
    elif a < b:
        print "Two"
    elif c == b:
        print "Three"
else:
    print "Where?"
    if a == b:
        print "Dog"
    else:
        print "Cat"
print "Done"
```

<table>
<thead>
<tr>
<th>Expected Output if inputs are: a = 3, b = 4, and c = 5</th>
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<td>Where?</td>
</tr>
<tr>
<td>Cat</td>
</tr>
<tr>
<td>Done</td>
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</tbody>
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Question 5. (10 points) What is a sentinel value and how is it used to control looping?

A sentinel is a special input value used to signal the end of data so the loop should terminate.

Question 6. (5 points) What decimal (base-10) value is represented by the binary number 0110012?

16 + 8 + 1 = 25_{10}
Question 7. (15 points) Consider the following program that takes as input a test score (0 to 100) and tries to determine the grade according to the standard 90-80-70-60 cutoffs.

```python
testScore = input("Enter a test score: ")
if testScore >=90:
    grade = 'A'
if testScore >=80:
    grade = 'B'
if testScore >=70:
    grade = 'C'
if testScore >=60:
    grade = 'D'
else:
    grade = 'F'
print grade
```

a) Does this program work correctly (i.e., produces the correct grade)? (Justify your answer.)

No, since the if statements are not nested, the test score of 100 would be assigned a grade of 'D'.

b) How could you improve the above program? (Justify your answer)

make the 2nd, 3rd, and 4th if's elif's.
Thus, only one grade would be assigned.

Question 8. (15 points) Write a program to print a randomly generated string of 10 lower-case letters. (Recall that the ord function returns the ASCII value of a character, and the chr function returns the character given an ASCII value argument.)

```python
randomString = ""
for count in xrange(10):
    randomString = randomString + chr(randint(ord('a'), ord('z')))
print randomString
```
Question 9. (15 points) Write a program that:
- allows the user to enter two integer numbers,
- calculates the sum of all integers between these numbers (the sum should not include the
  user-entered numbers themselves), and
- prints the sum in a meaningful statement.
A sample interaction would look like:

```
This program sums all the integers between two integers.
Enter the first integer: 3
Enter the second integer: 7
The sum of integers between 3 and 7 is 15.
```

```python
print "This program sums all the integers between ",
print "two integers."

number1 = input ("Enter the first integer : ")
number2 = input ("Enter the second integer : ")

if number1 > number2:
    temp = number1
    number1 = number2
    number2 = temp

sum = 0
for number in xrange(number1+1, number2):
    sum += number

print "The sum of integers between ",
print number1, " and ", number2, " is ", sum, ", ",
```