Computer Science 217

Midterm Exam

March 5, 2014

Exam Number 1

First Name: _____

Last Name: _____

ID: _____

Class Time (Circle One): 12:00pm 2:00pm

Instructions:

- Neatly print your names 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 12 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) Create a program that finds the smallest factors of a collection of integers entered by the user. When the program runs the user will be prompted to enter an integer. If the integer is 2 or greater then the program should display the smallest factors of the integer, with one factor appearing on each line. If the integer entered by the user is less than 2 then the program should terminate. The program should allow the user to continue entering integers until a value less than 2 is entered. The last line of output in your program should be a meaningful message that indicates how many numbers were factored.

   The smallest factors of an integer, n, can be determined using the following steps:

```
Initialize factor to two
As long as factor is less than or equal to n
  If n is evenly divisible by factor then
    Conclude that factor is a factor of n
    Divide n by factor
  Otherwise
    Increase factor by one
```

   Sample input and output (user input is shown in bold):

```
Enter an integer (less than 2 to quit): 12
2
2
3
Enter an integer (less than 2 to quit): 77
7
11
Enter an integer (less than 2 to quit): 3880800
2
2
2
2
2
3
3
5
5
7
7
11
Enter an integer (less than 2 to quit): 0
3 numbers were factored successfully.
```

   Print your answer on the next page. Do not try to print your answer on this page.

0

Print your answer to question 1 on this page.

2. The type of electronic switch commonly used in computers today is known as a:
    A. Bridge
    B. Bus
    C. Relay
    D. Transistor
    E. Vacuum Tube

Answer: _____

3. The Dining Philosopher's Problem demonstrates a challenge that occurs in which area of computer science?
    A. Computer Vision
    B. Distributed Systems
    C. Human Computer Interaction
    D. Information Security
    E. Theory of Computation

Answer: _____

4. Which of the following is an example of an artificial intelligence system?
    A. Abacus
    B. Babbage
    C. Bloom
    D. ENIAC
    E. Watson

Answer: _____

5. List two of the three components that connect directly to the central processing unit in a modern computer architecture. Note that "motherboard" and "bus" are **not** acceptable answers. You must indicate a component, not the connection to the component.

6. Consider the following statement:

"The complexity for minimum component cost has increased at a rate of roughly a factor of two per year … Certainly over the short term this rate can be expected to continue, if not increase. Over the longer term, the rate of increase is a bit more uncertain, although there is no reason to believe it will not remain nearly constant for at least 10 years."

This statement is known as: _____

7. Which of the following answers best describes the ability you would expect to have at a synthesis level of competence?
    A. The ability to combine two distinct ideas to solve a problem
    B. The ability to compare the costs and benefits of two different solutions
    C. The ability to predict the consequences of an action
    D. The ability to separate a system into distinct components
    E. The ability to solve a problem by following a known pattern

Answer: _____

8. A finite sequence of effective steps that solve a problem is known as:
    A. a computer program
    B. a flowchart
    C. a recipe
    D. an algorithm
    E. an executable file

    Answer: _____

9. Provide an example of an illegal variable name. Explain why the name you have provided is illegal in one sentence or less. Note that you should only consider whether or not Python will allow you to use the variable name. A name may still be legal even if it is stylistically poor.

    Illegal variable name: _____

    Explanation:

10. In the classic game Warcraft II, the unit editor allowed you to assign up to 65535 (2^{16}-1) hit points to a unit. Given this information, it is most likely that the number of hit points was being stored in a:
    A. bit
    B. byte
    C. double word
    D. half word
    E. word

    Answer: _____

11. Consider the following code segment:

```
a = input("Enter a: ")
b = input("Enter b: ")
c = a + b
print(c)
```

    What will be displayed if the user enters 3 for a and 4 for b?
    A. 3
    B. 4
    C. 7
    D. 34
    E. None of the above answers are correct

    Answer: _____

12. Assume that a variable named `pi` has been created and initialized to 3.14159265359. Which of the following statements will display 3.1416?
    A. print("%.4f" % pi)
    B. print("%.4pi")
    C. print("%4.f" % pi)
    D. print("%4f" % pi)
    E. print(pi)

Answer: _____

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

Answer: _____

14. Which type of Python error does **not** result in an error message being reported by Python?
    A. Logic errors
    B. Runtime errors
    C. Syntax errors
    D. Type errors
    E. Value errors

Answer: _____

15. Convert 162 base 10 to binary:

Answer: _____

16. Convert 101010100001011111_2 to hexadecimal:

Answer: _____

17. (2 marks) Convert AA base 13 to base 5:

Answer: _____

18. Which of the following is the truth table for the logical expression A and not B or not A and not B?

A.

A	B	Result
0	0	0
0	1	0
1	0	1
1	1	0

B.

A	B	Result
0	0	0
0	1	1
1	0	1
1	1	0

C.

A	B	Result
0	0	1
0	1	0
1	0	0
1	1	0

D.

A	B	Result
0	0	1
0	1	0
1	0	1
1	1	0

E.

A	B	Result
0	0	0
0	1	1
1	0	1
1	1	0

Answer: _____

19. How many rows will there be in the truth table for the logical expression not A and not B and not C?

A. 3
B. 7
C. 8
D. 15
E. 16

Answer: _____

20. Which of the following code segments is an example of a nested if statement?

A.
```
if a == b :
  print(a)
```

B.
```
if a == b :
  print(a)
if a == c :
  print(c)
```

C.
```
if a == b :
  print(a)
  if c == d :
    print(c)
```

D.
```
if a > 0:
  a = a - 1
elif a < 0:
  a = a + 1
```

E.
```
if a == b :
   print(a)
else :
   print(b)
```

Answer: _____

Consider the following Python program:

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

if w < x:
  w = x + 1
if x < w:
  x = w + 1

print(w, x)
```

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

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

23. If the user enters 2 for w and 2 for x, then the output will be: _____

24. Which type of loop always executes one or more times?
    A. For loop
    B. Post-tested loop
    C. Pre-tested loop
    D. While loop
    E. More than one of the above answers is correct

Answer: _____

Consider the following Python program:

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

if a < 0:
  a = a + 1
  if a == 0:
    a = a + 1
  elif a > 0:
    a = a + 2
elif a > 0:
  a = a - 1
  if a == 0:
    a = a - 1
  else:
    a = a - 2

print(a)
```

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

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

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

Consider the following loop:

```
j = 10
while j >= 5:
   print("X")
   j = j - 1
```

28. Which of the following for loops will generate the same output as the loop shown previously?

A.
```
for j in range(10, 5):
    print("X")
```

B.
```
for j in range(10, 5, -1):
    print("X")
```

C.
```
for j in range(10, -1, -2):
    print("X")
```

D.
```
for j in range(0, 5):
    print("X")
```

E.
```
for j in range(-1, -5, -1):
    print("X")
```

Answer: _____

Consider the following code segment:

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

i = 0
j = 1

while i < a:
  if i % 3 != 0:
    print(i)
  else:
    j = j * 2
  i = i + 1

print(j)
```

29. If the user enters 1 for a then the output will be: _____

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

31. If the user enters 6 for a then the output will be: _____

Consider the following code segment:

```
a = int(input("Enter an integer: "))
i = 2
count = 1

while i <= a:
  b = True
  for j in range(2, i // 2 + 1):
    if i % j == 0:
      b = False
  if b == False:
    count = count + 1
  else:
    print(i)
  i = i + 1

print(count)
```

32. If the user enters 1 for a then the output will be: _____

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

34. If the user enters 6 for a then the output will be: _____

35. (4 marks) The following program is supposed to read floating point numbers from the user until zero is entered. After the zero is entered the program should display the average of the entered values along with the distance from the smallest value to the largest value. For example, if the user enters the values 5.5, 2, -2.5, -1 and 0 then the program should report an average of 1.0 and a distance of 8.0.

    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 one 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 value
value = int(input("Enter a number (0 to quit): "))

# Initialize the largest and smallest values using the first input
largest = value
smallest = value

# Initialize the count and the total
count = -1
total = 0

# Process each value entered, until the user enters zero.
while value != 0.0 :
   # Keep track of the number of values entered and the total
   count = count + "1"
   total = total + value

   # Keep track of the largest and smallest values entered so far
   if value > largest:
      largest = value
   if value < smallest:
      smallest = value

   # Read the next input value
   value = float(input("Enter a number (0 to quit): "))

# Compute and display the results.
if count == 0:
   # Handle the case where no values are entered
   print("No values were entered.")
else:
   # Display the average and distance from the smallest value to
   # the largest value
   print("The average of the values is", total / count)
   print("The distance between the largest and smallest values is", \
         largest + smallest)
```