

Computer Science 217

Midterm Exam

July 19, 2019

First Name: _____

Last Name: _____

ID: _____

Instructions:

- Neatly print your names and ID number in the spaces provided above.
- Neatly print your names and ID on the provided answer sheet, and shade the circles for your student ID number.
- Answer question 1 in this exam booklet. Record your answers for questions 2 to 39 on the provided answer sheet.
- Pick the **best answer** for each multiple choice question.
- This exam consists of 14 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. Extra time will **not** be provided to record your answers on the answer sheet. Ensure that all of your answers have been recorded before the time limit is reached.
- 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]** On a 24-hour clock the hours range from 0 to 23 and the minutes within each hour range from 0 to 59. 24-hour clocks do not include an am/pm indication because each hour number only occurs once during the day.

Write a program that reads an hour and minute from the user in 24-hour format. Use two separate input statements to read these values. Then display each of the 5 minutes that immediately follow the entered time. Ensure that your program works correctly when those minutes roll over into the next hour (and possibly into the next day). Your program should continue reading times from the user and displaying the next 5 minutes until the user enters a time that includes an invalid hour and/or an invalid minute value.

Three sample runs of the program are shown below. Values entered by the user are shown in bold. The output from your program should match the samples shown below. Note that Sample Run #2 does not include any output (beyond the prompts for input) because the first time entered was invalid.

Sample Run #1:

```
Enter the hour: 14
Enter the minute: 30
The 5 minutes following are:
Next time: 14:31
Next time: 14:32
Next time: 14:33
Next time: 14:34
Next time: 14:35
Enter the hour: 06
Enter the minute: 57
The 5 minutes following are:
Next time: 06:58
Next time: 06:59
Next time: 07:00
Next time: 07:01
Next time: 07:02
Enter the hour: 23
Enter the minute: 58
The 5 minutes following are:
Next time: 23:59
Next time: 00:00
Next time: 00:01
Next time: 00:02
Next time: 00:03
Enter the hour: -1
Enter the minute: 30
```

Sample Run #2:

```
Enter the hour: 12
Enter the minute: 60
```

Sample Run #3:

```
Enter the hour: 09
Enter the minute: 59
The 5 minutes following are:
Next time: 10:00
Next time: 10:01
Next time: 10:02
Next time: 10:03
Next time: 10:04
Enter the hour: 23
Enter the minute: 55
The 5 minutes following are:
Next time: 23:56
Next time: 23:57
Next time: 23:58
Next time: 23:59
Next time: 00:00
Enter the hour: 23
Enter the minute: 59
The 5 minutes following are:
Next time: 00:00
Next time: 00:01
Next time: 00:02
Next time: 00:03
Next time: 00:04
Enter the hour: 12
Enter the minute: -1
```

Your program must make effective use of loops – do not write out the same code 5 times to display the next 5 minutes! Do not write your own functions when solving this problem (you may call Python's built-in functions). Do not use break or continue in your solution.

The following print statement can be used to display a time with nice formatting, where h and m are the hour and minute that you want to display respectively.

```
print("Next time: %02d:%02d" % (h, m))
```

Use the remainder of this page to answer Question #1.

**Answer the questions on this page on the provided answer sheet.
Answers recorded in this exam booklet will NOT be graded.**

2. In which year was the Babbage difference engine successfully completed?
 - A. 1492
 - B. 1849
 - C. 1946
 - D. 1991
 - E. 2019

3. Moore's Law states, in part: "The complexity for minimum component costs has increased at a rate of roughly a factor of two per year ...". In this statement, complexity refers to the number of:
 - A. Input switches
 - B. Programmers
 - C. Relays
 - D. Transistors
 - E. Vacuum tubes

4. The area of computer science that includes aspects of biology and behavioral sciences is:
 - A. Computer Vision
 - B. Distributed Systems
 - C. Human Computer Interaction
 - D. Information Security
 - E. Theory of Computation

5. Which of the following levels of competence indicates the greatest depth of understanding?
 - A. Analysis
 - B. Comprehension
 - C. Elicitation
 - D. Knowledge
 - E. Synthesis

6. Which of the following statements is most correct?
 - A. An algorithm cannot include instructions that loop back to a previous step
 - B. An algorithm may include lines, arrows and pictures
 - C. An algorithm must be written in a rigid, fixed, format
 - D. Exactly two of the above statements are correct
 - E. Answers A, B and C are all correct

7. Programming is:
 - A. The process of converting an algorithm into an electronic circuit
 - B. The process of converting a Python program into a form that can be directly executed by the central processing unit in the computer
 - C. The process of creating an algorithm
 - D. The process of identifying hidden relationships within a complex system
 - E. None of the above answers are correct

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8. Consider the following four languages that can be used to express the solution to a problem:

- i) Human language (Human)
- ii) Low level programming language (Low Level)
- iii) Machine language (Machine)
- iv) Python programming language (Python)

Which of the following answers lists these languages from lowest level of abstraction to highest level of abstraction?

- A. Human, Python, Low Level, Machine
- B. Low Level, Machine, Python, Human
- C. Low Level, Machine, Human, Python
- D. Machine, Low Level, Python, Human
- E. Machine, Low Level, Human, Python

9. Consider the follow program:

```
a = input("Enter an integer: ")  
b = input("Enter an integer: ")  
  
print("The sum is", a - b)
```

What output is will be displayed if the user enters 4 for a and 3 for b?

- A. The sum is
- B. The sum is 1
- C. The sum is 4
- D. The sum is 4 - 3
- E. None of the above answers are correct

10. By convention, Python programmers use a name that is in ALL CAPS to denote a(n):

- A. Constant value
- B. Error message
- C. Function name
- D. Reserved word
- E. Type name

11. Magic numbers should be avoided because:

- A. A program that uses magic numbers executes more slowly
- B. A program that uses magic numbers is more difficult to debug and enhance
- C. A program that uses magic numbers is longer than a program that does not
- D. Exactly two of the above answers are correct
- E. Answers A, B and C are all correct

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12. What does the // operator denote in Python?

- A. Exponentiation
- B. Formatting
- C. Integer division
- D. Remainder
- E. Rounding

13. Consider the following expression.

```
x = "and" * (3 + 2) > "or" + "4"
```

What is the **type** of value that is computed by this expression?

- A. Boolean
- B. Character
- C. Float
- D. Integer
- E. String

14. Consider the following program:

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

if a =< 0:
    print(a, "is less than or equal to 0")
else:
    print(a, "is greater than 0")
```

When it is executed it immediately displays an error message indicating that =< is not a legal operator in Python. Based on this information, the error in the program would best be classified as a(n):

- A. Initialization error
- B. Logic error
- C. Path error
- D. Runtime error
- E. Syntax error

15. Which of the following is an example of a format specifier:

- A. %.2f
- B. DESIRED_GRADE = "A+"
- C. v = 4 % a
- D. y = m * x + b
- E. More than one of the above answers is correct

**Answer the questions on this page on the provided answer sheet.
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16. A value, together with the context to which it applies is best described as a(n):
- A. Boolean value
 - B. Encoded value
 - C. Piece of data
 - D. Piece of information
 - E. Variable value
17. Which of the following pairs of numeric bases permit direct conversion from one base to the other (using a table) without performing any multiplication or division?
- A. 2 and 8
 - B. 3 and 6
 - C. 5 and 15
 - D. Exactly two of the above answers are correct
 - E. Answers A, B and C are all correct
18. What value is 135 base 7 equal to in base 10?
- A. 71
 - B. 75
 - C. 245
 - D. 452
 - E. 542
19. What value is 231 base 10 equal to in base 13?
- A. 14A
 - B. A14
 - C. 1014
 - D. 1410
 - E. 4101
20. While many programs use 8 bits for each of the red, green and blue levels within a color, some programs shrink the total number of bits used to represent a color from 24 bits to 16 bits by using 5 bits to represent the red level, 6 bits to represent the green level, and 5 bits to represent the blue level. How many different green levels can be represented in such a program?
- A. 6
 - B. 31
 - C. 32
 - D. 63
 - E. 64

**Answer the questions on this page on the provided answer sheet.
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21. Base 16 is also known as:

- A. Binary
- B. Decimal
- C. Duodecimal
- D. Hexadecimal
- E. Octal

22. Consider the following sequence of bits which represents UTF-8 encoded characters.

1110 0010 1000 0000 1001 1100 0101 0100 0110 1000 0110 0101

The number of characters represented by this sequence of bits is:

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

23. Which of the following statements is most correct?

- A. The Boolean operators available in Python are denoted by not, and, or and xor
- B. Only one Boolean operator can be included in the condition of an if statement or while loop
- C. All of Python's Boolean operators combine two Boolean values and produce a single Boolean result
- D. More than one of the above answers are correct
- E. None of the above answers are correct

24. Which column in the following table represents the result of the logical expression Y and (not X) or X and (not Y)?

X	Y	Column A	Column B	Column C	Column D	Column E
0	0	0	0	0	1	1
0	1	0	1	1	1	1
1	0	0	1	1	1	1
1	1	0	0	1	0	1

- A. Column A
- B. Column B
- C. Column C
- D. Column D
- E. Column E

**Answer the questions on this page on the provided answer sheet.
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Consider the following code segment for the next 4 questions:

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

if a <= 0:
    b = b + 1
else:
    a = a + 1

if a > 0 and b > 0:
    print("W")
elif a > 0:
    print("X")

if b > 0:
    print("Y")
else:
    print("Z")
```

25. What letters will be printed if the user enters 0 for a and 0 for b?
- A. Only W
 - B. Only X
 - C. Only Y
 - D. W and X
 - E. W, X and Y
26. What letters will be printed if the user enters 1 for a and 1 for b?
- A. W and X
 - B. W and Y
 - C. X and Y
 - D. X and Z
 - E. W, X and Y
27. What letters will be printed if the user enters -1 for a and -1 for b?
- A. Only W
 - B. Only X
 - C. Only Y
 - D. Only Z
 - E. No letters are printed by the code segment
28. What letters will be printed if the user enters 1 for a and 0 for b?
- A. W and Y
 - B. W and Z
 - C. X and Y
 - D. X and Z
 - E. W, X and Z

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29. Consider the following code segment. It is supposed to display a message that correctly indicates whether a non-negative integer value entered by the user is even or odd.

```
x = int(input("Enter an integer: "))    # Line 1

if x % 2 == 1:                          # Line 2
    print("even")                        # Line 3
else:                                    # Line 4
    print("odd")                          # Line 5
```

The previous code segment may contain an error. What needs to be changed, if anything, so that the program will correctly report whether the value entered by the user is even or odd?

- A. The call to the `int` function on Line 1 should be replaced with a call to the `float` function
- B. The `%` on Line 2 should be replaced with a `/`
- C. The `1` on Line 2 should be replaced with a `0`
- D. The `else` on Line 4 should be replaced with `elif x % 2 == 0`
- E. Nothing is wrong with the program – it already works as intended

30. Consider the following code segment:

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

if a != 0:
    print("X")
    if b != 0:
        print("Y")
else:
    print("Z")
```

What letters will be printed if the user enters 1 for a and 0 for b?

- A. X
- B. Z
- C. XY
- D. XZ
- E. XYZ

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31. Which numbers should be placed in the blanks in the follow statement?

Python includes _____ type(s) of pre-tested loop(s) and _____ type(s) of post-tested loop(s).

- A. 0 and 2
- B. 1 and 1
- C. 1 and 2
- D. 2 and 0
- E. 2 and 1

32. Consider the following program:

```
import math

for i in range(1, 10):
    print(i, math.sqrt(i))
```

It is supposed to compute and display the integers from 1 to 10 and their square roots but it only displays the values for the integers from 1 to 9. The error in this program would be best described as a(n):

- A. Formatting error
- B. Initialization error
- C. Off-by-one error
- D. Runtime error
- E. Syntax error

33. Consider the following code segment:

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

while a < 15:
    a = a + b
    b = b + 1
    print(a)
```

What numbers are displayed when it executes if the user enters 2 for a and 2 for b?

- A. 3 4 5
- B. 3 4 5 6
- C. 4 7 11
- D. 4 7 11 16
- E. 16

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34. Consider the follow code segment:

```
for i in range(1, 5):  
    print("i")
```

What values are displayed when it executes?

- A. 2 3 4
- B. 1 2 3 4
- C. 2 3 4 5
- D. 1 2 3 4 5
- E. None of the above answers are correct

Consider the following code segment for the next two questions:

```
a = int(input("Enter an integer: "))  
b = int(input("Enter an integer: "))  
c = int(input("Enter an integer: "))  
  
for i in range(a, b, c):  
    if i == 3 and i == 5:  
        print("X")  
    print(i)  
print("Y")
```

35. What characters will be displayed if the user enters 3, 7 and 2 for a, b and c respectively?

- A. 3 5 Y
- B. X 3 X 5 Y
- C. X 3 X 5 7 Y
- D. X 3 Y X 5 Y
- E. X 3 Y X 5 Y 7 Y

36. What characters will be displayed if the user enters 7, 3 and -2 for a, b and c respectively?

- A. 7 5 Y
- B. 7 5 3 Y
- C. 7 X 5 Y
- D. 7 Y X 5 Y
- E. 7 X 5 X 3 Y

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37. Consider the following code segment:

```
for i in range(3):  
    for j in range(i, i+2):  
        print(j)
```

What numbers are displayed when it executes?

- A. 0 1 1 2 2 3
- B. 0 1 1 2 2 3 3 4
- C. 0 1 2 1 2 3 2 3 4
- D. 0 1 2 1 2 3 2 3 4 3 4 5
- E. None of the above answers are correct

38. Consider the following code segment:

```
i = 0  
while i < 10:  
    j = 1  
    while j < 10:  
        print("X")  
        j = j + 1  
    i = i + 1
```

How many copies of the letter X are printed when it executes?

- A. 9
- B. 10
- C. 90
- D. 100
- E. None of the above answers are correct

**Answer the questions on this page on the provided answer sheet.
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39. Which of the following code segments contain an example of a nested loop?

A.

```
for i in range(10):  
    print(i)  
    for j in range(10):  
        print(j)
```

B.

```
for i in range(10):  
    print(i)  
    for j in range(10):  
        print(j)
```

C.

```
for i in range(10):  
    print(i)  
    while i < 20:  
        print(i)  
        i = i + 1
```

- D. Exactly two of the above answers contain an example of a nested loop
E. Answers A, B, and C all contain an example of a nested loop