

You have 60 minutes.

Show your work and explain your answers. Good work often earns partial credit. A correct answer with no explanation often earns little or no credit.

If you are asked to write code but you do not know the exact Python required, then try to write code that is approximately correct. If you think that your code does not demonstrate that you understand the solution, then describe your idea in English as well. Be precise enough that I cannot misinterpret your solution.

Good luck.

0. A. Imagine that you are sitting in your room at Carleton. It's dinner time, and you're hungry. There is no food in your room. In English, give a realistic algorithm for solving this problem. Your algorithm must involve at least five steps.

B. Pick any one of the steps you wrote in Part A, and break it into substeps.

1. A. Implement `encipherRot13()` and `encipherCaesar()` in terms of `encipherRepeatedPad()`. That is, suppose that you already have a working `encipherRepeatedPad()`; use it to complete the following function definitions. Hint: They are short. Docstrings are not required.

```
def encipherRot13(s):
```

```
def encipherCaesar(s, p):
```

B. Do there exist short implementations of `encipherRot13()`, `encipherCaesar()`, and/or `encipherRepeatedPad()` in terms of `encipherSubstitution()`? Explain.

2. The game of Plot Four is similar to Tic Tac Toe, in that two players alternate turns, with each player placing one piece on each turn, with the goal of forming a vertical, horizontal, or diagonal line of his pieces. Unlike Tic Tac Toe, Plot Four is played on a 7×6 grid, the line of pieces must have length four (or more), and the two players are called 'red' and 'black'.

A. In Tic Tac Toe there are 8 ways to win. How many ways to win are there in Plot Four?

B. Of those ways to win, how many use one or more pieces along the middle column?

C. Give a heuristic for Plot Four. If you cannot, then at least define the term *heuristic*.

D. Assume that the board is represented in Python as a list of 7 lists, each of length 6. Pick any one way to win. Give a Boolean expression for whether 'red' has won that way.

3. For each of the three programming concepts below, give one example from our course.

module

class

method

4. First, what output is produced by the following code? Second, write your own code, that uses a `for` loop and produces the same output, but more efficiently.

```
for i in range(50):
    if i % 10 == 0:
        print i
```

5. Examine the following code. It is in three sections, with a comment explaining each. In the spaces provided, write what the three comments should say, and what value is returned for the input string ''.

```
def myfunc(string):
    """Takes a string as input. Returns something!?""""
    # COMMENT0
    k = 0
    while string[k:k + 4] != 'href':
        k += 1
    # COMMENT1
    while string[k] != '':
        k += 1
    # COMMENT2
    k += 1
    result = ''
    while string[k] != '':
        result += string[k]
        k += 1
    return result
```

COMMENT0: _____

COMMENT1: _____

COMMENT2: _____

returned: _____