CSE 160 Section 10 Solutions

1. Note that since these questions are asking you to make some design decisions, there are multiple possible solutions!
    a. We can still use a dictionary to store the contacts, but instead of mapping a name to a single `PhoneNumber` we'll map each name to a list of `PhoneNumber`, so our dictionary keys are strings and the values are lists of `PhoneNumbers`.

        Why use these data structures? The dictionary lets us easily access all of the phone numbers for a particular contact using `self.contacts[contact_name]`. Although it doesn't matter for this problem, it might eventually be useful to have the phone numbers stored in some kind of order, and lists are ordered.

    b. We don't need to modify the constructor, since we're still storing the contacts in a dictionary.

    c. We need to consider two cases when adding a phone number: this is a new contact, or this contact already exists in our contacts and we want to add an additional number for them.

```
def add_number(self, name, phone_number):
    """
    Adds the given PhoneNumber to the given name's list
    of PhoneNumbers. If this is a new contact, creates a
    new contact with the given name and PhoneNumber.
    """
    if name in self.contacts:
        self.contacts[name].append(phone_number)
    else:
        self.contacts[name] = [phone_number]
```

2. This code will cause an error. This function iterates through its string parameter with a for-loop. As it is written, the iterating variable will take on values character by character instead of word by word. So, when the word "dime" is searched for as a key in the dictionary, it doesn't appear in the dictionary. One way to iterate through the first string word by word would be to change the code to:

```
for w in words.split():
```

3. The MSE difference between f and g is `((4-1)^2 + (5-3)^2 + (6-9)^2) / 3` `= 7.333`.

    The MSE difference between f and h is `((4-8)^2 + (5-6)^2 + (6-4)^2) / 3` `= 9`.

    The MSE difference between g and h is `((1-8)^2 + (3-6)^2 + (9-4)^2) / 3` `= 27.667`.

    The actual values of the MSE (in this case: 9, 7.333 and 27.66666666667) are not interesting; it's only comparisons between them that are. For example, these numbers show that *f* and *g* are the most similar (have the smallest MSE), and *g* and *h* are the most different (have the largest MSE).