Homework Assignment: Python Data Structures

Objective:

This assignment will assess your understanding of Python's data structures, including lists, tuples, dictionaries, and strings. You will practice operations such as slicing, indexing, list methods, and comprehensions. Ensure you attempt each question and write clean, well-commented code.

Part 1: Lists

List Slicing You are given the list:

```
numbers = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100]
```

Extract every second element starting from the second element (i.e., 20, 40, 60, …).
Extract the last four elements of the list.
Reverse the list using slicing.

List Methods Given the list:

```
fruits = ["apple", "banana", "cherry", "date", "fig", "grape"]
```

Perform the following tasks:

Add "kiwi" to the end of the list.
Insert "orange" at index 2.
Remove "banana" from the list.
Sort the list alphabetically.
Count how many times "cherry" appears in the list.

List Comprehension Using list comprehension, create a list of the squares of all even numbers between 1 and 20 (inclusive).

Part 2: Tuples

You are given the tuple:

```
student_data = ("John", 18, "Physics", "A")
```

Extract the name and grade from the tuple.
Convert the tuple into a list, modify the age to 19, and convert it back to a tuple.

Create a tuple of 5 different fruits. Write a function that takes a tuple and returns the fruits that start with the letter 'a'.

Part 3: Dictionaries

You are given a dictionary of student names and their scores:

```
students_scores = {
    "Alice": 85,
    "Bob": 78,
    "Clara": 92,
    "David": 88,
    "Eva": 74
}
```

Add a new student "Frank" with a score of 90.
Update "Eva's" score to 80.
Print the score of "Clara."
Remove "Bob" from the dictionary.
Calculate and print the average score of all students.

Processing Data Using a Dictionary Given the dictionary:

```
inventory = {
    "apple": 10,
    "banana": 20,
    "cherry": 15,
    "date": 5
}
```

Write a function that takes this dictionary and returns a list of all fruits with more than 10 in stock.

Part 4: Strings

You are given the string:

```
sentence = "Python programming is fun and powerful."
```

Convert the string to uppercase.
Count how many words are in the sentence.
Replace the word "fun" with "exciting."
Extract the word "powerful" from the string using slicing.

Write a function that checks if a given string is a palindrome (a word that reads the same forwards and backwards, e.g., "radar").

Part 5: Challenge Problem (Optional)

List and String Manipulation

You are given a sentence in the form of a list:

```
sentence_list = ["Python", "is", "a", "fun", "language", "to", "learn"]
```

Reverse the order of the words in the list.
Convert the list into a single string where the words are separated by spaces.
Print the length of the new string.

Feel free to ask questions if any part of the assignment is unclear. Good luck!