Report:

**Part 1:**

1. The major obstacle of this homework is the complexity of any possible input. For a random string, there will be too many things to be checked by using one single function, such as the beginning state name, the party results, the commas, and the order of all these elements. So I decided to break the function into several parts, each of which checking a specific part of the whole string so that the logic will be much clearer and the code will be more readable. Also, I started by assuming a simpler string in the form of a state forecast with no commas to make the first attempt easier.

The most useful idea I used is that “if a string fails at nth step, then it is unnecessary to go to the (n+1)th step.” So each step in the whole process helps me narrow down the range of possible situations until the code reaches the end.

2. Another obstacle is identifying arbitrary numbers or characters in a string. This is solved by creating an empty string, checking the property of each character by using isalpha or isdigit, and then filling in the empty string.

**Part 2:**

Design of function 1:

1. Receive an input string.
2. Check whether it starts or ends with a comma or not. Proceed if it doesn’t.
3. Start a loop to go through the string.
4. Extract a substring ending with a comma from the string, or the whole string if there is no comma.
5. Check whether the extracted string starts with a state name or not by checking and collecting the beginning characters. Proceed if it does.

*Pseudocode for step 5:*

*find the beginning letters of the text*

*if the beginning letters form a state name, return true.*

*otherwise return false.*

1. Check whether the state name is followed by a series of legal party results using similar method above. Proceed if it does.

*Pseudocode for step 6:*

*repeatedly:*

*check whether the text reaches the end;*

*find a number starting from the given position in the text;*

*if no number found, return false;*

*check whether the text reaches the end;*

*if it reaches the end, return false;*

*check whether the following character is a letter;*

*increment the number indicating the position;*

1. Go back to the original string and start from the first letter following the last comma checked in step 4. Repeat steps 4, 5 and 6 until the program reaches the end of the string.
2. If the function doesn’t return false until the end of the string, then the string is legal.

*Pseudocode for step 3 to 8:*

*repeatedly:*

*if the string starts or ends with a comma, return false;*

*collect a substring from the string until it reaches a comma.*

*if the string reaches the end, break;*

*check if the string starts with a state name, return false if not;*

*check if the state name is followed by a random number of party results, return false if not.*

*return true if the string reaches the end;*

Design of function 2:

1. Check whether the input string is legal. Proceed if it does.
2. Check whether the input party name is legal. Proceed if it does.
3. Start a loop to go through the string.
4. Find all the letters in the string matching with the input party and extract those that show up in the party results.
5. For each valid letter, collect the number it follows. Then add all these numbers together to get the total number of seats.

*Pseudocode for function 2:*

*check if the input string is legal, return 1 if not;*

*check if the input party is legal, return 2 if not;*

*repeatedly:*

*find the letter matching with the input party, proceed only if it is in a party result;*

*record its position;*

*repeatedly:*

*find a number character before the letter,*

*convert it to int;*

*adjust it to the correct digit place;*

*increment number of seats;*

*increment the digit place*

*return 0 when the string reaches the end;*

**Part 3:**

**For the first function:**

**True:**

1: “”

Check if an empty string is legal.

2.”CA”

Check if a single state name is legal.

3.”cA”, “Ca”, “ny”, “NY”

Check if state names with random lower or upper letters are legal.

4. “NY1d”

Check if a state name followed by a single party result with a single digit is legal.

5. “ak43e”

Check if a state name followed by a single party result with two digits is legal.

6. “CA3d5r”

Check if a state name followed by two party results of which each has one digit is legal.

7. “ny3d4e65e5t7688765r43v”

Check if a random state forecast with many party results, of which each has an arbitrary number of digits is legal.

8. “al3f, ny6y”

Check if a string with two state forecasts and a comma is legal.

9. “ny43t98e65r, nm, Ut43g114514h, AK80s”

Check if a string with random numbers of arbitrary state forecasts separated by commas is legal.

**False:**

10: “w944rq24r7E&&%\*$&$&”

Check if a string that doesn’t begin with a state name is legal.

11: “,”

Check if a single comma is legal.

12:”CA9”

Check if a state name followed by a digit is legal.

13: “Nyd”

Check if a state name followed by a letter is legal.

14. “Nm54e53yj”

Check if a state forecast missing digits before a letter is legal.

15:”Ak666e55r43”

Check if a state forecast missing letter after a number is legal.

16 “ca4k6j8f,”

Check if a state forecast followed by a comma is legal.

17 “ny6g7h, , ca54f”

Check if a string of two state forecasts separated by two commas is legal.

18. “tn98d,”

Check if a string ending with a comma is legal.

19. ”,tn98d”

Check if a string starting with a comma is legal.

20 “,tn98d,”

Check if a string starting and ending with a comma is legal.

**For the second function:**

**If the input string is legal:**

1: “”, party =’a’

Check what an empty string and a random party will produce.

2.”CA”, party =’a’

Check what a single state name and a random party will produce.

3. “NY1d”, party =‘d’;

Check if a state name followed by a single party result with a single digit and a corresponding letter will produce.

4. “NY1d”, party = ‘a’;

Check if a state name followed by a single party result with a single digit and an unrelated letter will produce.

5. “ak43e”, party =’e’

Check what a state name followed by a single party result with two digits and a corresponding letter will produce.

6. “CA3d5r”, party=’r’

Check what a state name followed by two party results of which each has one digit and one corresponding letter will produce.

7. “ny3d4e65e5t768r43v”, party = ‘t’

Check what a random state forecast with many party results, of which each has an arbitrary number of digits and a random corresponding letter will produce.

1. “al3f, ny6y”, party = ‘f’

Check what a string of two state forecasts and one corresponding letter will produce.

1. “al3f77y, ny6y”, party = ‘y’

Check what a string of two state forecasts containing one same letter and that corresponding letter will produce.

1. “ak114514f7676g93j, ny34f999n99j,ca,nm8y7j8r6f”, party = ‘f’;

Check what a string of multiple state forecasts all containing one same letter and that corresponding letter will produce.

**If the input string is illegal:**

1. **“**gg,” party =‘a’;

Check what an illegal string with a random letter will produce.

1. “ca13b,ny76d1b”, party =’#’;

Check what a legal string with a non-alphabetical party will produce.