Project (Week 1)

Write a Python program to simulate an ecosystem containing two types of creatures, **Bear** and **Fish**. The ecosystem consists of a river, which is modeled as a growing list. Each element of the list should be Bear object, a Fish object, or **None**. In each time step (in a while loop) based on a random process, each animal either attempts to move into an adjacent list location or stay where it is. If two animals of the same type are about to collide in the same cell, then they stay where they are, but they create a new instance of that type of animal, which is placed at the end of the list (i.e., append to the list, so the list size increases by 1). If a bear and a fish collide, however, then the fish dies (i.e., it disappears).

Example output:

>>> ================================ RESTART ================================

>>>

The initial river list:

['bear', 'fish', 'bear', 'fish', 'fish', 'fish']

The random moves are:

[-1, -1, -1, -1, -1, 0]

The current river list:

['bear', 'bear', 'fish', 'fish', ' ', 'fish']

Press any keys to continue, or (Q/q)uit?

The random moves are:

[-1, 1, -1, 0, 1, 1]

The current river list:

['bear', ' ', 'bear', 'fish', ' ', 'fish']

Press any keys to continue, or (Q/q)uit?

The random moves are:

[-1, -1, 1, 0, 1, -1]

The current river list:

['bear', ' ', ' ', 'bear', 'fish', ' ']

Press any keys to continue, or (Q/q)uit?

The random moves are:

[0, 1, -1, 0, -1, -1]

The current river list:

['bear', ' ', ' ', 'bear', ' ', ' ']

Press any keys to continue, or (Q/q)uit?q

The simulation has ended.

>>>

Hints:

1. You can use simple strings instead of class objects to represent Bear, Fish, and None.
2. Set the initial length of the list to 6 objects for easy testing.
3. Use random.seed(time.ctime()) to generate none duplicated random numbers.
4. Use random.randinit(0,2) to pick randomly from tuple (B, F, N).
5. Use random.randinit(-1,1) function to generate the random moves.
6. Test the following initial list conditions:
   1. [F, N, N, N, N, N]
   2. [B, N, N, N, N, N]
   3. [B, B, F, F, F, F]
   4. [6 random objects of B, F, N]
7. With the initial condition of **c** above, run your simulation in a good amount of times and observe your ecosystem develops. You should be able to see at least one case that fishes could actually survive and another case that bears would eventually dominate the river.

**Submit your code together and include your multiple output runs (at least 4 times with different initial conditions as shown above in Hints #6).**

Optional extra work and fun:

Write a simulator, as in the previous project, but add a Boolean gender field and a floating-point strength field to each animal, using an **Animal** class as a base class. If two animals of the same type try to collide, then they only create a new instance of that type of animal if they are of different genders. Otherwise, if two animals of the same type and gender try to collide, then only the one of larger strength survives.