Marine Biology Case Study
Worksheet for Part 1, pp 13-18

1. After you've read the first 3 paragraphs on page 13, think about a class design
   a) Name the private (state) variables you need.

   _____

   b) Aside from the class constructor, name a public member function that you will need and tell why (think about what a fish does).

   _____

   c) Are any other functions needed? What might they do?

   _____

   _____

   d) Can you think of any situation when the only item in the public section of the class is the constructor? Justify your answer

   _____

   e) Can you think of any situation when there is nothing in the private section of the class? Justify your answer.

   _____

2. In the next (last) paragraph on page 13, the author states "It will also have a `Swim` function that changes `myPosition` and *maybe* changes `myBumpCount`." Why did the author include the word "maybe" (ie, in what situations would `myBumpCount` not be changed)?

   _____

   _____

3. In this same paragraph, the author states "It will need a way to report the `myBumpCount` value..." Why? Can't we just print the value of `myBumpCount`? Explain your answer.

   _____

   _____

4. To what values should `myBumpCount` and `myPosition` be initialized?

_____

5. On page 14 at the end of the second paragraph, the author states “The (`if-ndef`) declaration is surrounded by code that protects against processing it more than necessary.”
   a) What code is the author talking about?

   _____

   b) Why is the author worried about processing it more than necessary?

   _____

   c) After the code for the `AquaFish` class, the author states that “The file `aquafish.cpp` is the implementation file.” How is this different from the file `aquafish.h` above?

   _____

   d) Why do you suppose that the author calls `BumpCount` an accessing function?

   _____

6. Study the code near the top of page 15.
   a) Why was `position` in the code on page 10 changed to `myPosition` here?

   _____

   b) If you want to print the position data member of a fish at the end of a run of a simulation, what would you have to change/add to the `AquaFish` class?

   _____

7. On page 15 there is a discussion and a diagram regarding the numeric representation of the tank.
   a) Why is it simpler to represent the tank the way it is shown in the diagram rather than representing it similar to the way `position` is represented in `onedwalk.cpp` (ie, with positive and negative numbers)?

   _____

b) Which value represents the right side of the tank? `size` or `size-1`? Why?

_____

c) Using the definition of the tanksize used in the narrative and noting that consecutive position numbers represent a length of 1 foot (i.e., from 1 to 2 is 1 foot), how long is a tank which has a tanksize value of 4? _____

8. In the code at the bottom of page 15, why isn't there a random number created for each of the first two `if` statements?

_____

9. On page 16 at the top, does the `if` statement go within the other `if` statements on the previous page or after them? Why?

_____

10. Look at the second paragraph and the code for the `AquaFish` constructor that follows.

a) The author states "...and the private copy of the tank size." Why is this necessary? Why is the fish concerned with the size of the tank?

_____

b) How does the author determine the middle of the tank for a fish?

_____

c) In the code what does the statement `myBumpCount(0)` do?

_____

d) What is the name of this kind of constructor?

_____

e) There is an alternate way to code the `AquaFish` constructor. Write it in the space below.

f) Consider a different implementation of the tank where the middle of the tank is at 0, the left side is represented by a negative integer and the right side if represented by a positive integer (similar to onedwalk). Write the AquaFish constructor for this situation in the space below.

11. In the bottom half of page 16, the author removed `randgen.h`. Since random numbers are needed for the simulation, where will this be included?

    _____

12. Study the code on the bottom of page 16 and the top of page 17.
    a) Where will random numbers be created in this simulation code?

    _____

    b) Instead of calling a function `fish.BumpCount()` near the end of the code, why doesn't the author just simply output `myBumpCount`?

    _____

    c) If you wanted to output the final position of the fish, how would you change the `AquaFish` class? What would you have to add and where?

    _____

    _____

    d) Once this addition is made, write the statement which would display the final position of the fish along with its bumpcount.

    _____

13. In the paragraph just after the code, the author states "There are several possibilities for error." State at least one possible error to which the author is referring.

    _____