**AP Java Marine Biology Simulation**

**Worksheet Ch 3**

1. Read pg 52. What is the first modification the marine biologists asked for? \_\_\_\_\_\_\_\_\_

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2. How did the marine biologists want to model the fish population breeding and dying? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What was the method suggested by the programmer which was rejected by the marine biologists? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. The marine biologists gathered some real world information in order to make their simulation more real.

a. What are the chances of breeding and dying that the marine biologists want to model initially? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. They want fish to “breed into all its empty, neighboring locations”. How many new fish are possible and where might they be located?

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5. In the last paragraph of page 52, the author states “I decided to break out these activities into separate breed and die methods.” Why do this instead of just including this code in the act method? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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6. Continuing in the last paragraph, the author stated the desire to check if a fish had been removed. Why bother doing this at the beginning of the act method? \_\_\_\_\_\_\_\_\_\_\_\_\_

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7. In the second paragraph on pg 53, the author says that breed method unlike the nextLocation method doesn’t require removing the location behind the fish. Look back on pg 37 at the code for nextLocation.

a. How many statements are there which deal specifically with removing the location behind the fish? \_\_\_\_\_

b. Which of those statements must you delete so that the location behind the fish remains?

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8. Near the end of this paragraph the author states “...fish add themselves to the environment as they are constructed...”. Look back on pg 28.

a. In what method does this occur? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Write the Java statement that does this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. In the code for breed at the bottom of pg 53, emptyNbrs is a list of those cells for a fish which are empty. The first statement within the for loop grabs one cell location from the list. Why would the following not be correct?

Location loc = (Location) emptyNbrs[index];

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10. In this first draft of breed, there is no logic (code) to determine if the 1 in 7 chance of breeding has been met.

a. Where do you suppose this code should appear? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Justify your answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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11. Read pg 54. The author in the second paragraph states that “probabilities are represented as real numbers from 0.0 to 1.0. Look in the JavaDocs for Java and find the section java.util.Random. Now look at the documentation for the method nextDouble.

a. Is 0.0 included as a possible random value? \_\_\_\_\_\_\_\_\_

b. Is 1.0 included as a possible random value? \_\_\_\_\_\_\_\_\_

12. Based on the discussion in this paragraph about probabilities, consider a standard cubical (6-sided) die.

a. What is the fraction you would use to determine if a 5 is “thrown”? \_\_\_\_\_\_\_\_\_\_\_\_

b. What is the chance of a 5 not appearing? \_\_\_\_\_\_\_\_

13. After reading the third paragraph, write the two statements that would be included in the Fish class initialize method to set the probability of breeding and the probability of dying instance variables correctly. Where would your two statement be placed in this method?

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14. In that same paragraph the author mentions the possibility of allowing each fish to have its own probability. Assume that a fish could have either a 1 in 5, 1 in 6 or a 1 in 7 chance of breeding. How would you program this to happen in the initialize method?

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15. Study the Java code on pg 55.

a. You could modify the two declarations of instance variables to assign the probabilities there (eg, private double probOfBreeding = 1.0/7.0; ). Write at least one disadvantage to doing this.

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b. You could also eliminate the second if statement which checks if there are neighbors to breed into (since the for loop will not execute if emptyNbrs.size() is zero). What additional code would you need to add so that the correct boolean value would be returned?

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c. In the generateChild method, how would you change the call to the Fish constructor so that the direction of the newborn fish would be the same as the mother fish? (Hint: look at the Fish class interface listing on pg 62).

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16. Read pg 56 then do the Analysis Set 1 on a separate sheet of paper.

17. Read pg 57. In the last if statement, you could replace the call to the die method with the single line which this method contains (see pg. 56). Why do you think the author didn’t write the program this way?

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18. When the author thought more about the breed method, the author decided to put the random number check inside of the breed method instead of having it in the act method. Write what you would change to do the same with the fish dying. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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19. Read through the list of test cases on pg 58 carefully.

a. In the 5th case, devise a starting situation which would demonstrate this test.

b. In the 7th case, note the last sentence. How does the simulation step method assure that this won’t happen? (The code is on pg 27)

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c. In the 10th case, what code in the breed method prevents a fish from moving into a cell in which a newborn fish has just been placed?

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20. Read pp 59 and 60. Why didn’t the author have to show the first 5 timesteps again when the simulation was run for 10 timesteps as indicated in the first paragraph on pg 60?

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21. Based on the testing described the author, what “rule” would you follow when testing your program which includes probabilities you need to verify?

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22. For the 20 timestamp test, if the breeding probability were changed to 1 in 10 and the dying probability were changed to 1 in 4, what values would you expect to see in the total columns for the number of breed attempts? \_\_\_\_\_\_\_\_\_\_ the number of deaths? \_\_\_\_\_\_\_\_\_\_\_\_

23. Modify a copy of the case study simulation code to use these probabilities and run it, following the techniques described by the author to verify the probabilities you provided in the previous question.

24. Do Analysis Set 2 on a separate sheet of paper

25. Do Exercise Set 1 on pp 61-62. There are 8 questions. Do as many as you can. The more you do the better you will understand how these revisions work. You should do at least the first four exercises plus at least one of the exercises which involve creating new material for this situation. In any case, please follow the directions of your teacher.