Math 1 Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4-4 Practice** Date\_\_\_\_\_\_\_\_

1. Recently, there has been a lot of publicity surrounding baseball players and steroid use. Steroids, while having a positive effect for the user in the short-term, have many long-term side effects. One reason for this is that steroids leave the human body very slowly. With one injection of the steroid *ciprionate*, about 90% of the drug and its by-products will remain in the body one day later. Then 90% of that amount will remain after the second day, and so on. Suppose an athlete injects himself/herself with a dose of 100 milligrams of ciprionate. Analyze the pattern of that drug in the athlete’s body by completing the following tasks.

a. Write an explicit equation that models this situation.

b. Complete the below table and graph showing the amount of the drug remaining at various times:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time Since Use (in days)** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Steroid Present (in mg)** | 100 | 90 | 81 | 72.9 |   |   |   |   |

![[image]]()

c. Use your equation to find out how much of the steroid is left after 11 days.

d. How long until there is less than 1mg of the steroid remaining in the bloodstream?

e. Theoretically (according to the equation), will the steroid every completely leave the bloodstream?

2. Radioactive materials have many important uses in the modern world, from fuel for power plants

to medical x-rays. Radioactive materials also can be very dangerous – for example it can cause cancer. Extreme care must be taken in transportation and disposal of these substances. They decays very slowly – for one certain substance, if any amount is stored at the beginning of a year, only 4% of that amount will decay by the end of the year.

a. Write an explicit equation that can be used to calculate the amount of the substance

remaining after any number of years.

b. If 240 grams (a bit more than half of a pound) of the substance are released due to an accident, how much of that substance will still be around after 1 year? After 5 years?

c. Write a recursive equation that can be used to calculate the amount of the substance

remaining after any number of years.

d. How long is the **half-life** of the substance. That is, how long until half of the original amount remains? Explain how you found your answer.

e. How long until less than 5 grams of the original substance? Explain how you found your answer.

3. Suppose you conduct the following experiment: You roll 100 dice. You remove all the dice that are showing either a 2 or a 4. You then gather all the remaining dice and roll them again. You again remove all the dice showing a 2 or a 4. You continue this process for several more rolls.

a. Using the probability skills that you learned in Unit 8, along with what you know about exponential decay, write an explicit equation that models how many dice you would *expect* to remain after each roll.

b. Fill in the below table for the expected number of dice remaining.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Roll #** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|  **Expected Dice Remaining** |   |   |   |   |   |   |   |

c. How many rolls do you think it would take until you have no dice remaining? Explain.