Morphine dosage activity.

In this activity you will explore how the rate of decay of a medicine as well as the time between administrations of the medicine effect the amount of the medicine in the bloodstream.

1. Open the fathom file “Morphine Dosage.ftm”. On the upper left you will see a chart that shows the amount of morphine in a patients blood for each of the first ten hours after the administration of a 12 mg. dose. To the right of this chart is a graph of this data. Below the graph is a slider that controls the rate of decay for the function. As you move the slider, you will see that the blue line moves accordingly to match the graph of a function of the form y = 12(1 – r)time, where r is the rate of decay of morphine. Adjust r until the graph of the function coincides with all of the points of your graph. What is the rate of decay? What would the half-life be for this function?

2. Move the slider again and notice the effect it has on the chart at the lower left and the graph of this chart on the lower right. The graph is just a scatter plot of the chart on the lower left. The chart on the left changes as the rate changes because it is simply a function that shows the amount of morphine in a patients blood after three administrations of 12 mg of morphine at 4 hour intervals. The function used to compute this is

y = 12(1 – r)time + 12(1 – r)time + 4 + 12(1-r)time + 8. In your own words, explain why this function could be used to compute the amount of morphine in a patients blood 2 hours after the third dose of morphine has been given.

3. The graph in the lower right shows a scatter plot of how much morphine is in a patients system for each hour after three doses of medicine have been administered. How much morphine would be in a patients blood shortly after the administration of the third dose?

4. Below the third graph are two sliders that control a function. The slider that controls “a” allows you to adjust the initial value of the function y = a(1 – r)time. The slider “r” allows you to control the rate of decay for this function. Move the sliders a and r until the function matches the scatter plot of the data. How does the rate of decay for this function compare with the rate of decay in the first graph? Explain why this relationship occurs.

5. Write the function based on a 12 mg dose that would show the amount of morphine in the blood after 4 doses given at 4 hour intervals (using the rate you computed in part 1).

6. Write a function that shows the amount of medicine in a patients body after the administration of five 10 mg doses of a medication with a decay rate of .23% if the doses are administered every three hours. Use this function to compute how much medicine would be in a patient 2 hours after the fifth administration of the medication.