Name:

Problem A: The Titanic

At 2:00 P.M. on April 11, 1912, the *Titanic* left Cobh, Ireland on her maiden voyage to New York City. At 11:40 P.M. on April 14, the *Titanic* struck an iceberg and sank, having covered only about 2100 miles of the approximately 3400 mile trip.

1. How many hours did the *Titanic* travel before hitting the iceberg? Show your work. Round to three decimal places of accuracy.

2. Find the average speed of the *Titanic* in miles per hour. Show your work. Round to three decimal places of accuracy..

3. If the *Titanic* had missed the iceberg and kept on going at the average speed, how many more hours would it have taken to reach New York? How many hours and minutes is that? Show your work.

Name:

Problem B: The Common Tern

Migrating birds have set some impressive transatlantic records. The current distance record holder appears to be a bird called the Common Tern. Banded as a chick on Finland on June 30, 1996, it was caught on January 24, 1997 on a beach in southeastern Australia. Scientists estimate that it flew about 26,000 kilometers during that time. (1 km = 0.621371 miles)

1. How many days did it take the Common Tern to complete its migration?

2. How many hours did it take the Common Tern to complete its migration? Show your work.

3. How many miles did it travel to complete its migration? Show your work. Round to three decimal places of accuracy.

4. Calculate the average speed in <u>miles per hour</u> of the Common Tern on its migration from Finland to Australia. Show your work. Round to three decimal places of accuracy.

Name:

Problem C: Ben Lecomte

In 1998, a swimmer named Ben Lecomte set a record for crossing the Atlantic ocean. On July 7, 1998, he left the shore of Hyannis, Massachusetts and started swimming toward Europe. He swam with the aid of a monofin attached to both feet. Ben was accompanied by a ship and swam inside a "protective ocean device" that used electric fields to repel sharks. A great white shark followed him closely for five days of his journey. On September 25, 1998, he reached the shore of Quiberon on the French coast, having swum 3376 nautical miles. (1 mile = 1.151 nautical miles)

1. How many days was Ben Lecomte at sea?

2. How many hours was he at sea? Show your work. Round to three decimal places of accuracy.

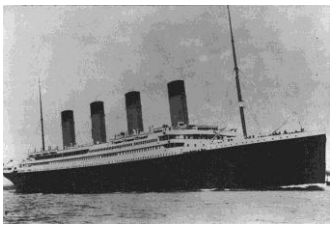
3. How many miles (regular miles, not nautical miles) did he swim? Show your work.

4. Find Ben Lecomte's approximate speed in miles per hour for his transatlantic swim. Show your work. Round to three decimal places of accuracy.

Name: Period: Date:

Math Journal: Rate of Change

The race to set transatlantic speed records has a long history. In July of 1845, the clipper ship *James Baines* set a record for sailing ships by sailing from Boston to Liverpool in 12 days and 6 hours. In 1998, a swimmer named Ben Lecomte set a much slower but equally amazing record. It took Lecomte 81 days to swim from Hyannis, Massachusetts to Quiberon on the French coast with the aid of a monofin attached to both feet. Ben was accompanied by a ship and swam inside a "protective ocean device" that used electric fields to repel sharks.



At 2:00 P.M. on April 11, 1912, the *Titanic* left Cobh, Ireland on her maiden voyage to New York City. At 11:40 P.M. on April 14, the *Titanic* struck an iceberg and sank, having covered only about 2100 miles of the approximately 3400 mile trip. Today, ocean liners still cross the Atlantic Ocean. The *Queen Elizabeth* 2, or *QE*2, is one of the fastest with a top speed of 32.5 knots (about 37 miles per hour). One knot is approximately 1.151 miles per hour.

Migrating birds have also set some impressive records. The current distance record holder appears to be a Common Tern. Banded as a chick on Finland on June 30, 1996, it was caught on January 24, 1997 on a beach in southeastern Australia. Scientists estimate that it flew about 26,000 kilometers in 209 days. (1km ≈ 0.621371 miles). The fastest short distance flying speed has been clocked at 40 miles per hour, which is considerably faster than the average speed of the *Queen Elizabeth 2*.

You may have noticed that the *QE*2's speed above was given in knots or nautical miles per hour. The nautical mile is about 1.151 land miles, which seems like a strange number. This "sea mile", which has been used by mariners since the seventeenth century, is based on the practice of measuring latitude and longitude in degrees. If you traveled all the way around the Earth at the equator, you would cover 360 degrees. Each degree is divided into 60 minutes. The nautical mile is denned so that one nautical mile equals one minute along any great circle. Aviators also navigate with degrees and minutes, so airplane speeds are also usually measured in knots.

1] If the *Titanic* had missed the iceberg and kept on going at the average speed, when would it have reached New York? Give the exact date and time. Show your work and/or explain your reasoning.

2] How many times faster was the Titanic's average speed than the average speed of the Common Tern? (Hint: make a ratio.) Show your work and/or explain your reasoning. Round to two decimal places. Then explain why the Titanic's average speed <u>in miles per hour</u> crossing the Atlantic is so much faster than the Common Tern's average speed even though the Common Tern has been clocked at more than 40 mph.

3] The distance from Boston to Liverpool is about 3150 miles. How many times faster was the *Titanic's* average speed in miles per hour than the average speed of the *James Baines* on its record-setting trip? (Hint: make a ratio). Show your work and/or explain your reasoning. Round to two decimal places. Then explain why the Titanic was faster than the Baines.

4] How many times faster was the Common Tern's average speed in miles per hour than the average speed of Ben Lecomte on their transatlantic crossings? (Hint: make a ratio). Show your work and/or explain your reasoning. Round to two decimal places. Then explain why the Common Tern was faster than Lecomte.

5] When not swimming, Ben rested on his ship, which was allowed to drift with currents and winds, so that his progress would be due solely to his swimming. What do you think a graph of his distance from Hyannis plotted against time would look like? Would it be linear? Would its slope always be positive? Sketch your idea of the graph below and explain your reasoning.