

Homework 9 Follow-Up

Consider the generalization of Problem 4 in Homework 9 presented last week. Let x be the distance the dog runs up the beach, d be the distance from the woman to the point on the beach closest to the ball, w be the distance from the beach straight out to the ball, r be the speed the dog can run, and s be the speed the dog can swim.

1. Express the time required for the dog to reach the ball in terms of all the other parameters.
2. Verify Reese's determination that to minimize the time required,

$$\frac{s}{r} = \frac{d - x}{\sqrt{(d - x)^2 + w^2}}.$$

3. Examine the expression in Part 2 and formulate an efficient strategy to solve for x . Clearly describe this strategy.
4. Solve for x .
5. Consider limiting cases. What happens to x as $\frac{r}{s} \rightarrow \infty$? What happens as $\frac{r}{s} \rightarrow 1$? What do your answers mean in terms of the context of the problem?
6. You likely encountered a nonsensical result when considering the limiting cases. Find the error and find a way to correct it.
7. What other questions do this error and your resolution of it suggest exploring?
8. Explore them.