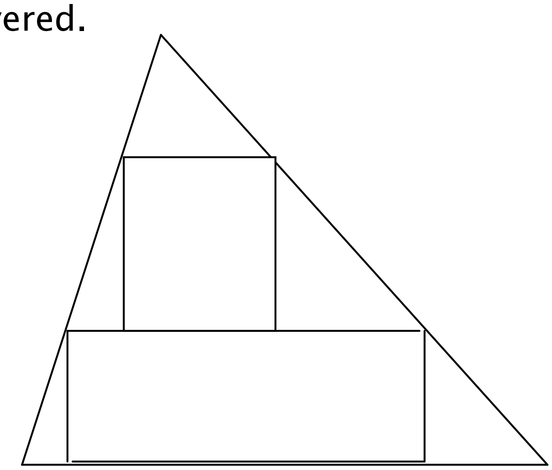
EXTRA CREDIT PROBLEMS

1. Longest Ladder: Given corner of hallways of widths A and B as shown in the diagram, what is the longest ladder which can be moved horizontally around the corner?

```
|    A    |
|<----->|
|         |
|\        |
| \       |
|  \      |
|   \     |
|    \    |
|     \   |
|      \  `-----------
|       \          ^
|        \         |B
|    theta\        v
`-------------------
```

2. Start with any triangle T. We want to place two non-overlapping rectangles inside T so as to maximize the proportion of the area of T which is covered by the rectangles. What is the maximum proportion that can be covered.



3. Let A be a positive definite, n x n matrix, and B be a 1 x n matrix, $B \neq 0$. Find the point in the elliptical region $\{ X \in R^n ; X^tAX \leq 1 \}$ which minimizes BX. Express your answer in terms of A and B only.

4. The hands of a clock are 5 inches and 3 inches respectively. Find the distance between the endpoints of the hands when the distance between them is decreasing at the maximum rate.

5. A mathematician is lost in a woods bounded by a linear beach. The fog is very dense, so that visibility is epsilon. She knows she is one mile from the beach, but does not know in which direction the beach lies. She can measure distance and walk in any path she wants to. Show that she can be certain to reach the water in less than 6.4 miles.

Alternative statement: Show that there is a curve of length 6.39724... starting at the center of the unit circle and touching or crossing all tangents to the unit circle.