Tile Guide

The main thing a mentor needs to do for this activity and many mathematical activities is to convince students to try it. Once students start work encourage them, give them "high-fives." First let students try to tile a rectangle with an odd number of squares. Once they figure out that it is impossible, ask them why? Then cover some square with a counter, and ask them to tile the rectangle except for the square. Let them think about the squares where this works. With luck, they will hit upon the idea of coloring the region like a checker board.

It may be tempting to give students hints. You should avoid giving problem specific hints wherever possible. Instead of problem specific ideas make hints general problem solving stratagems. For example:

Try some examples.

Change the problem.

Work backwards.

What do you wish was true?

Can you make a diagram, or an organized list?

Always ask, "why?" One of the characterizing features of mathematics is that it is possible to justify the things that are known with deductive reasoning. This process is really more important than just finding the answer.

The 3×1 tile problem may be solved by tricoloring the rectangle in two different ways. **The tiling activity is very closely related to the Laughter and Insight activity.** You should encourage anyone who spends time on the tiling activity to try the laughter and insight activity, and vice versa. In fact the Laughter and Insight activity gives a way to decide if any region may be tiled with a certain set of tiles. The specific case of domino tiles leads to the notion of tiling functions discussed in some of the problems on the tiling activity.

A different theme found in this activity is mathematical induction. Some of these tiling problems lead to very nice induction proofs that are not the typical replace n by $n+1$ in an algebraic formula. You should describe induction to the students in at least one case, and see if they can get it in a different case. Of course you should let the students thing about everything first.