

## Generalities

Work with 1–3 other students, and choose one of your group as the recorder (who will keep a written record of your progress). Make a start on the problem for about 5–10 minutes, then stop and review any choices you’ve made about how to proceed. I have suggested a couple of approaches to consider on the back of this sheet, but you should only look at these after you have made a good start on the problem. Organize your discussion following the “UPEEG” method:

**Understand** the problem—in particular, are there various ways to represent it?

**Plan** one approach—or two! What is the outcome you expect from your plan?

**Execute** your plan.

**Evaluate** your progress—figure out when and how you became stuck (if you did), and what insights (if any) represented a breakthrough.

**Generalize** your results—think of various ways in which the problem could be generalized, and whether or not your approach(es) would still work.

## The problem

Take a strip of paper and stretch it so that you have one end between your left thumb and index finger and the other between your right thumb and forefinger. Fold the strip so that the left end is on top of the right end. Repeat this several times, each time folding so that the left end is on top of the right end of the strip.

When you’re done, keep holding the right end and unfold the entire strip. Some of the creases point vertex up, some down. Can you predict the sequence of ups and downs for any number of times you carry out the folding operation? Can you form a convincing argument that your prediction method is correct?

Can you extend the problem to two dimensions (folding first left over right, then top over bottom, then left over right, ...)?

**Hint 1—think recursively:** Suppose you knew the pattern produced by 4 folds. How could you use this in finding the pattern produced by 5 folds? Is one pattern somehow “contained” in the other?

**Hint 2—think symmetrically:** Where does your first fold occur in the overall pattern of folds? Does this suggest a way to organize fold patterns?