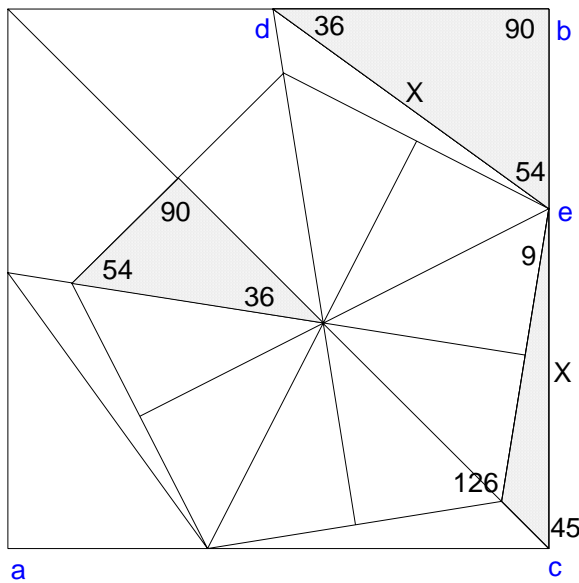


# Folding a Regular Pentagon from a Square

This is a modification of a method by Alice Gray.



## Overview

The folding method is based on the pattern shown here. There are 12 triangles with angles of 36, 54, and 90 degrees (10 in the pentagon and 2 larger ones), and 4 triangles with angles of 9, 45, and 126 degrees.

Corner **a** is folded to corner **b**, then point **c** is folded to point **d** to establish initial angles. The initial angles are then halved to get the other angles around the center of the pentagon.

Point **d** is estimated as the midpoint of the upper edge of the square, but actually it is slightly left of center. If lines **de** and **ce** have length **X**, then the ratio of length **db** to **bc** is:

$$\frac{X \cdot \cos(36 \text{ deg})}{X + X \cdot \sin(36 \text{ deg})} = 0.50953$$

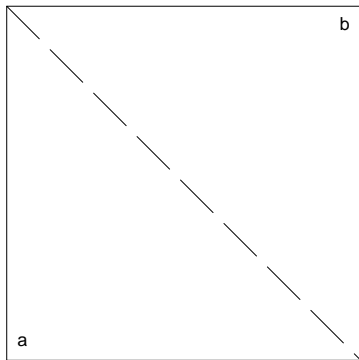
## Adjustment Guide

For a 10 1/2 inch square, point **d** needs to be one tenth of an inch left of center.

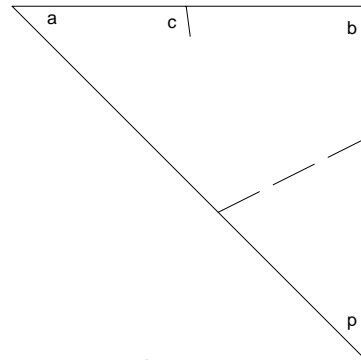
For a 6 1/2 inch square, point **d** needs to be one sixteenth of an inch left of center.

In general, the adjustment is about 1/105 of one side of the square.

## Instructions

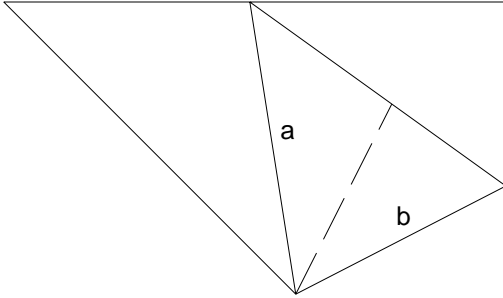


1. Valley-fold corner a to corner b.

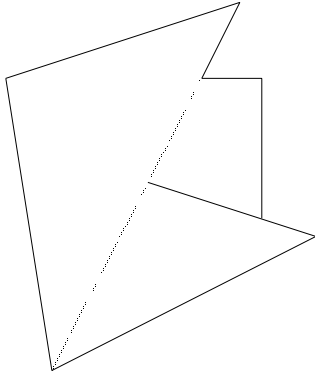


2. Valley-fold corner a to corner b to make crease c, and unfold. Then valley-fold point p to slightly left of crease c, using the above *adjustment guide*.

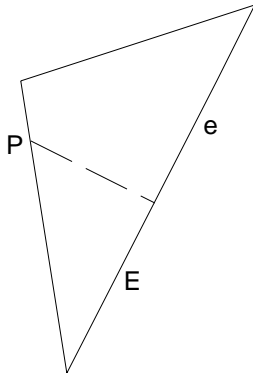
Don't worry too much about the estimation. If you are estimating 1/16 inch, your error will probably be less than that, so an honest try is a big improvement over just aiming for the center crease.



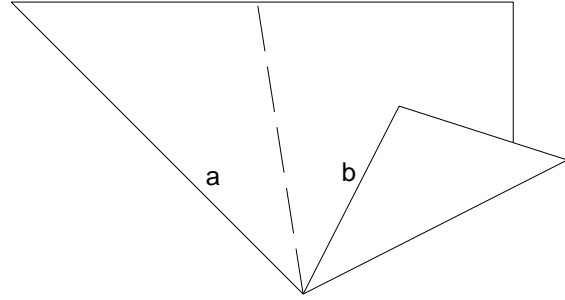
3. Valley-fold edge a to edge b.



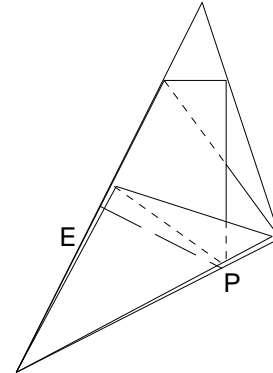
5 Mountain-fold where the edges meet in the middle, folding the left side behind.



6b. Or, *to use scissors*, turn the paper over and fold only the top two layers, edge e to edge E, and turning on point P. Unfold, and cut along the new crease through all layers.

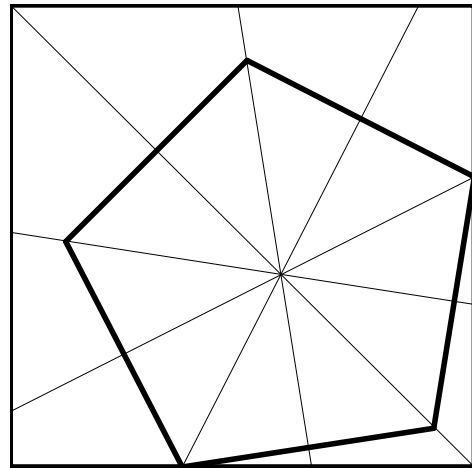


4. Valley-fold edge a to edge b.



6. Dotted lines show hidden edges. Find the hidden corner P.

6a. *Using a paper-cutter*, cut all layers through corner P, at right angles to edge E. (Put edge E against the paper guide.)



7. Unfold. The pentagon (and scrap paper) have only these creases.