Fold & Cut Theorem - Cut any shape from only one cut

History of Fold & Cut

Kan Chu Sen’s Wakoku Chiyekurabe

The first published reference to folding and cutting of which we are aware is a Japanese book, *Wakoku Chiyekurabe* (Mathematical Contests), by Kan Chu Sen, published in 1721. This book contains a variety of problems for testing mathematical intelligence. One of the problems asks to fold a rectangular piece of paper flat and make one complete straight cut, so as to make a typical Japanese crest called sangaibisi, which translates to "three folded rhombics." The author gives a solution that consists of a sequence of simple folds, each of which folds along a line. Here are scanned images of the relevant pages in the book:

![Scan of relevant pages from Kan Chu Sen’s *Wakoku Chiyekurabe*](image)

The fold-and-cut theorem states that any shape with straight sides can be cut from a single sheet of paper by folding it flat and making a single straight complete cut. \(^{[1]}\)

To accomplish this we have four steps.
1. Take a piece of paper.
2. Fold it flat.
3. Make one complete straight cut.
4. Unfold the pieces.

Let's cut out a square from a sheet of paper.
Try a rectangle.

**Paper Holding**

There are two types of holds.

![Mountain Fold](image1)

![Valley Fold](image2)

[http://www.fishgoth.com/origami/basics2.html](http://www.fishgoth.com/origami/basics2.html)

What is a big idea behind the Fold & Cut Theorem?

**References**

Erik Demaine’s Folding and Unfolding: The Fold-and-Cut Problem  
[http://erikdemaine.org/foldcut/](http://erikdemaine.org/foldcut/)

Fold and Cut Theorem - Dr Katie Steckles  
[https://www.youtube.com/watch?v=G8SoJ53OJA8](https://www.youtube.com/watch?v=G8SoJ53OJA8)

Dr Katie Steckles: Fold and Cut introductory demonstration  
[https://www.youtube.com/watch?v=GKzI0_6NKJ8](https://www.youtube.com/watch?v=GKzI0_6NKJ8)  
[https://www.youtube.com/watch?v=ZREp1mAPKTM](https://www.youtube.com/watch?v=ZREp1mAPKTM)