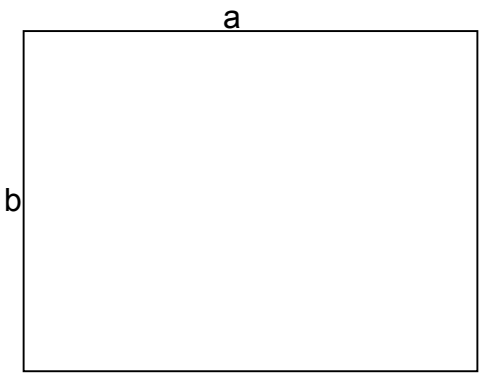
Folding a rectangle into a box with maximum volume 2

How to construct a box from a given rectangle with arbitrary predefined side lengths by folding up the same amount from each edge in order to achieve the maximize volume in the resulting container.

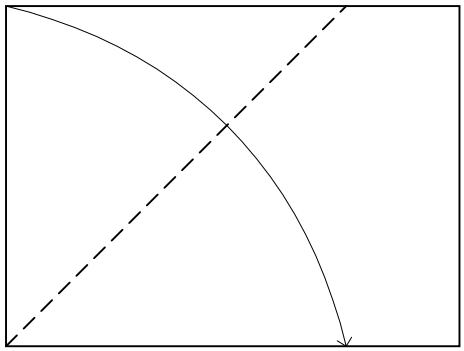
or

How to fold up the sides of a piece of paper to get the most space possible.

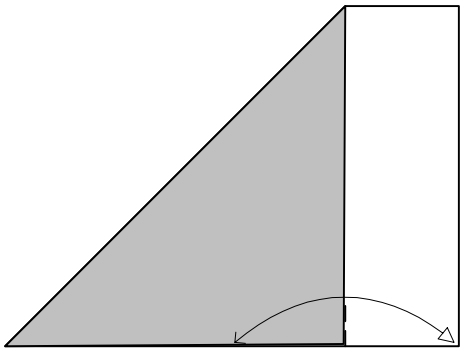
Lucas Garron



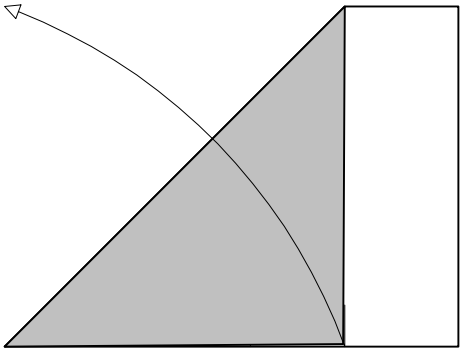
1. Start with a rectangle of any proportion, long side on the bottom and white side up.



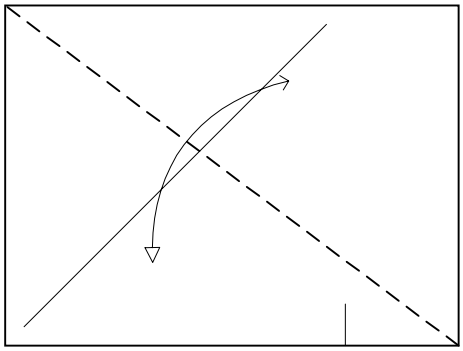
2. Fold over the top left corner so that the right edge now lies over the bottom edge.



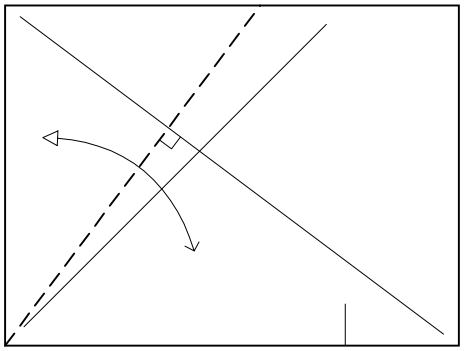
3. Pinch where the former left edge of the paper terminates.



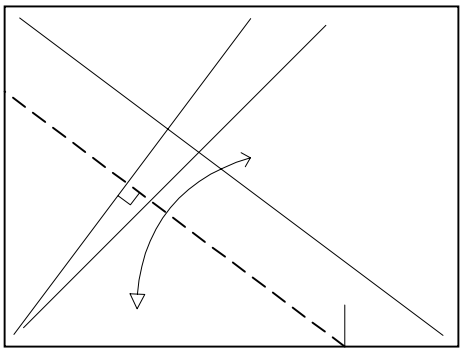
4. Unfold.



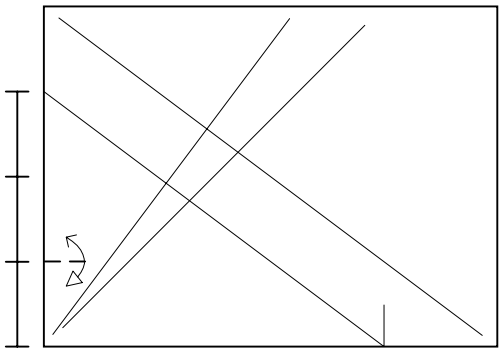
5. Crease the upper-left to lower-right diagonal.



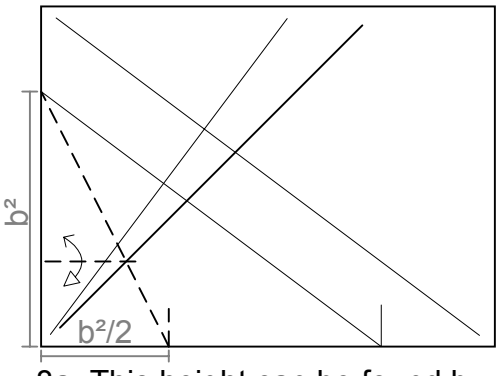
6. Fold the perpendicular to it, through the lower left corner.



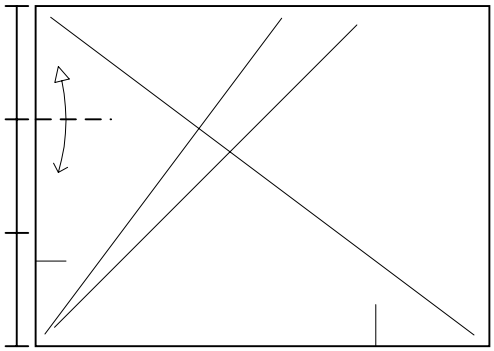
7. Fold a parallel to to the diagonal throught the mark from step 3, by making it perpendicular to last crease.



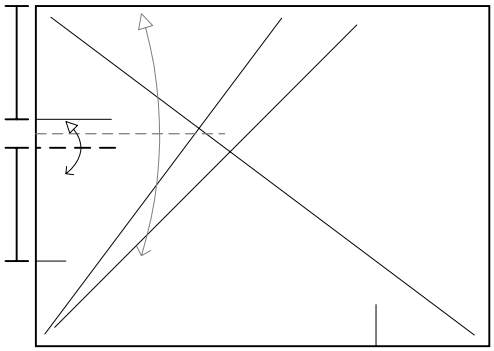
8. Mark of the third of the distance marked vertically by last step.



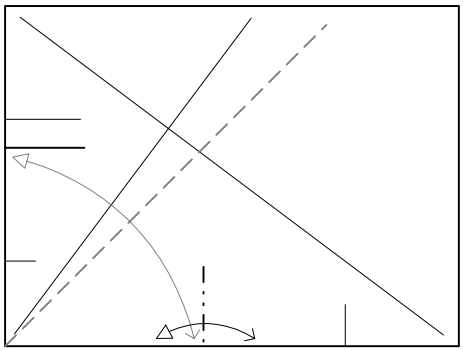
8a. This height can be found by transferring half the length to lower edge, connecting the marks, and horizontally extending its intersection with the 45° crease.



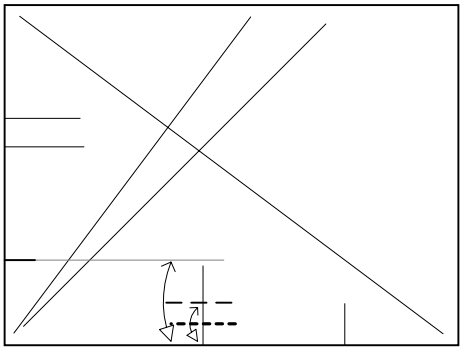
9. Mark off a third of b, at the top of the left edge, similar to last step (halve b on the bottom, connect to the upper left, and fold the top to its intersection with the 45° crease.



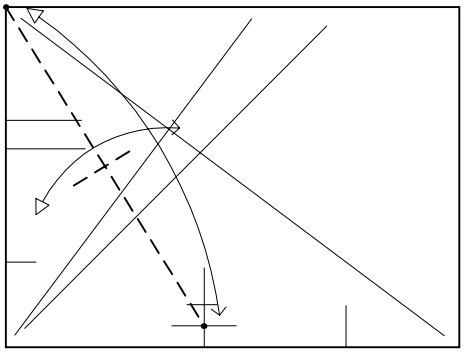
10. Join this length to the one from step 8. This is easily done by folding the top down to the mark from step 8, and copying step 9's mark to the other layer.



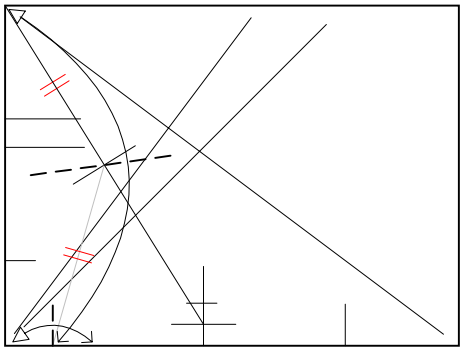
11. Transfer the combined length to the bottom, by temporarily refolding the 45° crease and pinching.



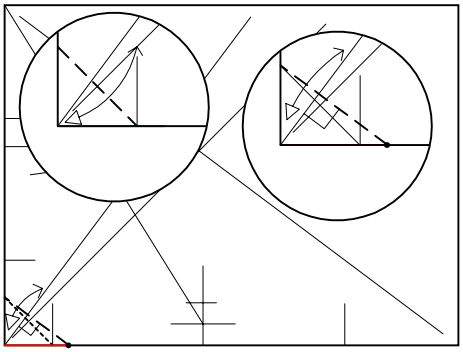
12. Somehow demarcate a fourth of the height from step 8 onto last mark.



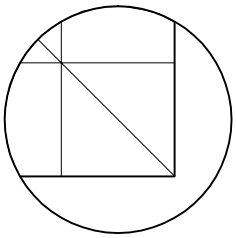
13. Find the midpoint of the segment joining this intersection and the upper left corner, by folding a crease through them, and folding one onto the other.



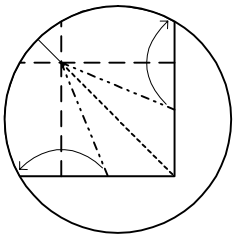
14. Fold the upper left corner, creasing through the midpoint, onto the bottom edge (left of the midpoint), and pinch at the the bottom. Be <u>accurate</u>! (mistakes become amplified, and this is where any inaccuracy reveals itself)



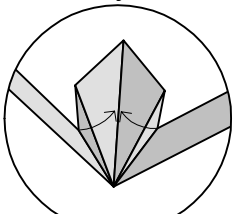
15. Scale the mark, using a parallel to the diagonal (first, transfer it to the left edge).



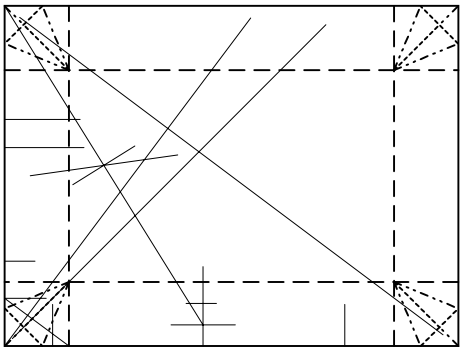
16a. This shows how to lock a corner.



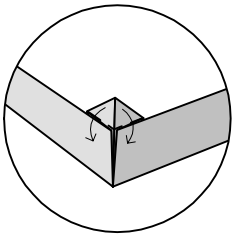
16b. Fold the 45° angle bisectors out.



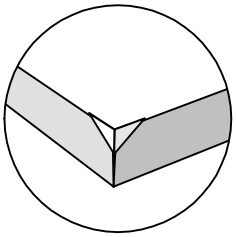
16c. Now in 3D, continue collapsing.



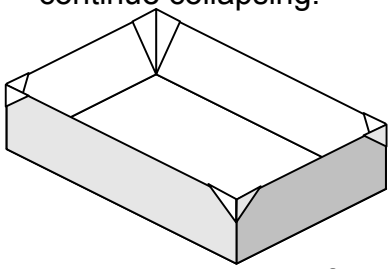
16. Fold a parallel crease at this distance, from each edge, and collapse.



16d. Fold the top part down as far as possible.



16e. Finished lock.



17. Finished box of maximum volume.

Lucas Garron, 2006. Note that this is a more efficient folding sequence improving on an earlier paper.