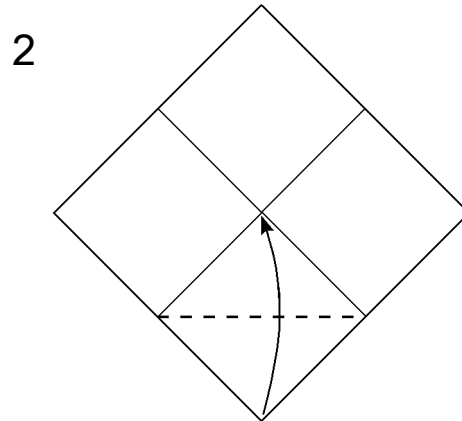
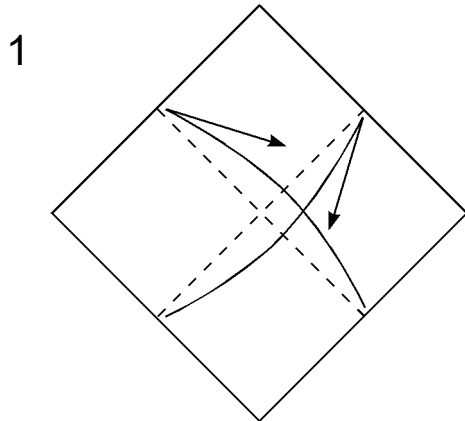


# Point of Balance

Point of Balance is a simple mathematical / engineering problem that is set, and can be solved, just by folding a square of paper. Ideally that paper should be white on one side and coloured on the other.

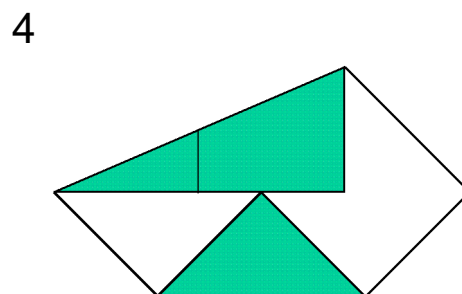
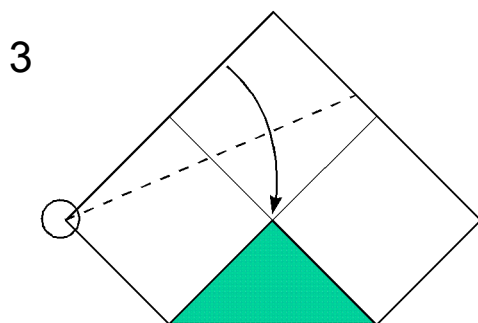
## Setting the problem

Begin with your square arranged white side up.



1. Fold your square in half edge to edge in both directions, unfolding both times, to locate the centre of the square.

2. Fold the bottom point into the centre.



3. Fold the top edge onto the top point of the front layer whilst making sure that the new crease starts from the left hand corner of the square, which must remain sharp.

4. The two coloured triangles are the ends of two prisms of uniform density. The problem is to work out whether the top prism is balanced, or if it is not, which way it will fall. Take a guess before you try to work it out. Balanced? Right? Or left?

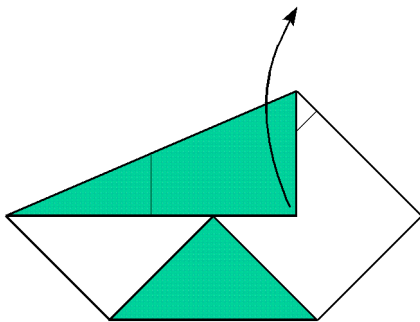
## Solving the problem

In order to solve the problem we need to find the centre of mass of the top prism. If the centre of mass is directly above the top point of the bottom prism it will be balanced, if not it will fall either right or left.

The centre of mass is the point at which the medians of the triangle intersect. Any two medians will do.

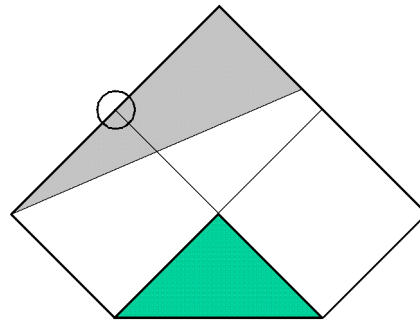
Medians are lines, or creases, drawn from one corner of a triangle to the centre point of the opposite edge.

5



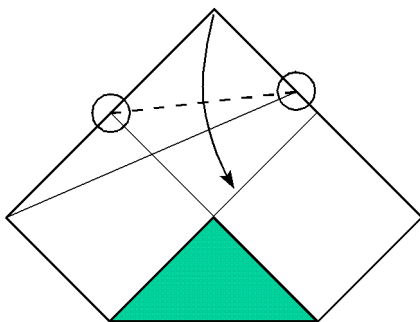
5. The solution is easier to obtain if we first unfold the top front flap.

6



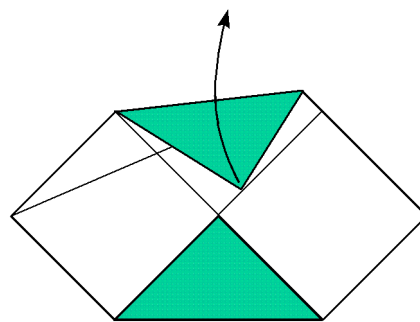
6. The centre point of the left sloping top edge has already been found as this edge is bisected by one of the creases made in step 1.

7



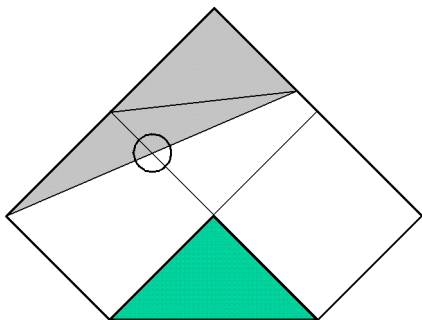
7. Fold the top point downwards so that a crease forms between the centre of the left sloping edge and the right corner of the triangle marked in grey in picture 6.

8



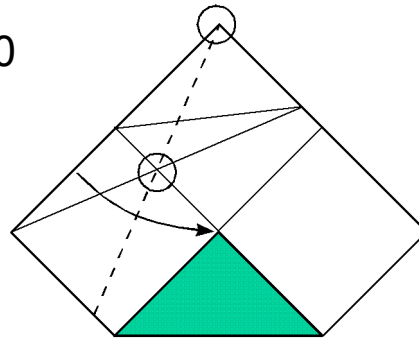
8. This crease is the first median. Unfold.

9



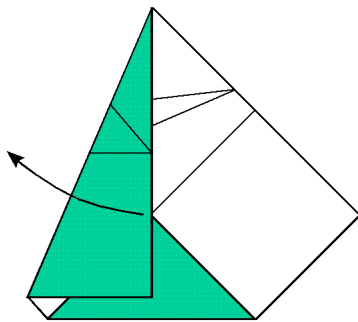
9. The centre point of the bottom sloping edge of the triangle marked in grey has already been found as this edge is bisected by one of the creases made in step 1.

10



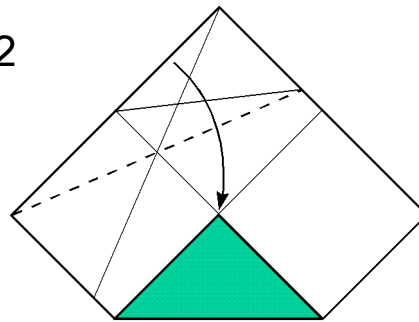
10. This fold is similar to step 3. It is made by folding the left sloping edge onto the top point of the lower prism making sure that the crease starts from the top corner of the square which must remain sharp.

11



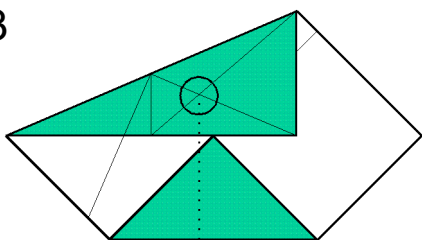
11. This crease is the second median. Unfold.

12



12. Remake fold 3.

13



13. The point where the creases made to mark the medians in steps 7 and 10 intersect is the centre of mass of the top prism. Dropping a line from this point shows that the centre of mass is to the left of the top point of the bottom prism and the top prism will therefore fall to the left.

Note that this problem could be made slightly more difficult to solve by finding the centre of the square in step 1 by folding in half diagonally in both directions, in which case extra folds to locate the centres of the two edges of the top prism would be necessary.