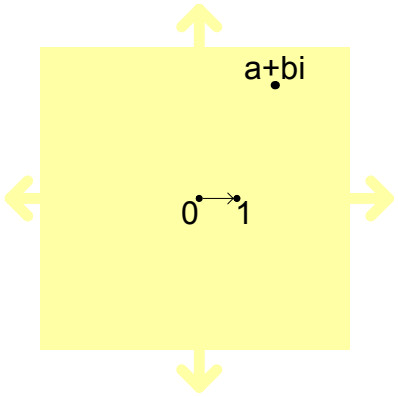
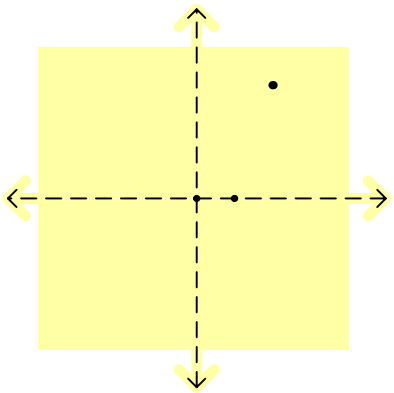
Folding the cube root of a complex number

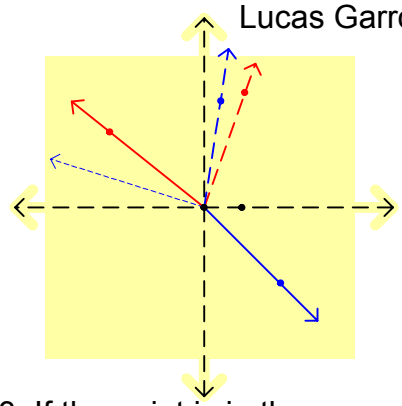
Lucas Garron



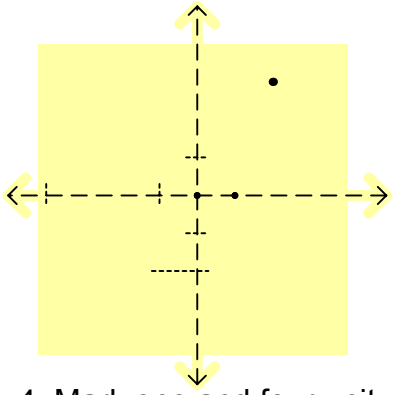
1. Start in the middle of a piece of paper, with the unit vector and the point whose cube root will be taken.



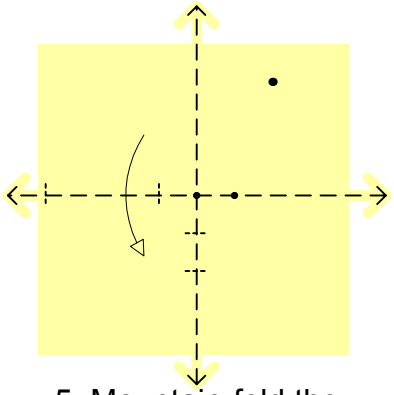
2. Crease the real and imaginry axes.



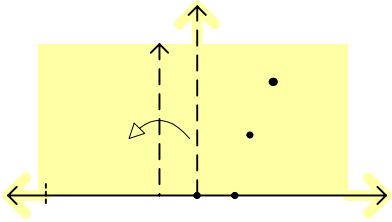
3. If the point is in the second quadrant, halve its argument. If it is below the x-axis, halve its argument twice. This will be undone later



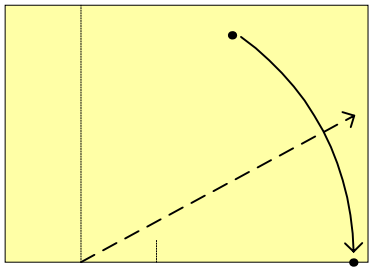
4. Mark one and four unit lengths to the left of the origin, one above, one and two below.



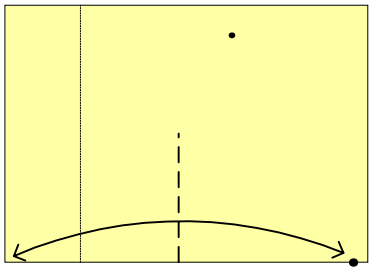
5. Mountain-fold the the negative imaginary axis behind



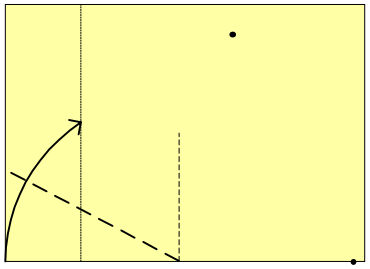
6. Mountain-fold behind vertically at the negative unit mark



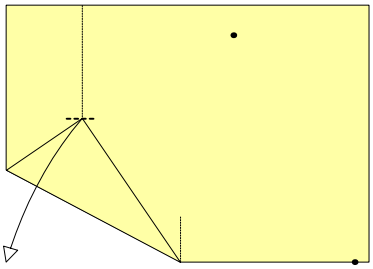
7. Fold the absolute value of the point onto the real axis



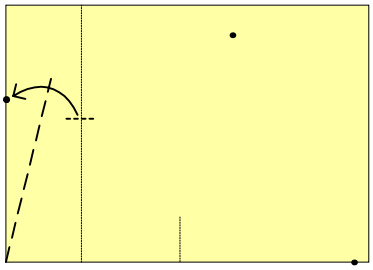
8. Bisect the length to -1



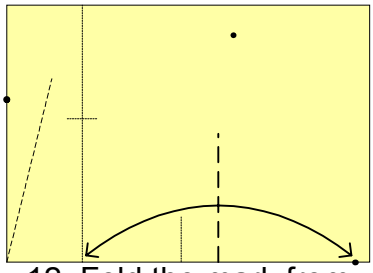
9. Fold the left bottom corner onto the imaginary axis through the last mark.



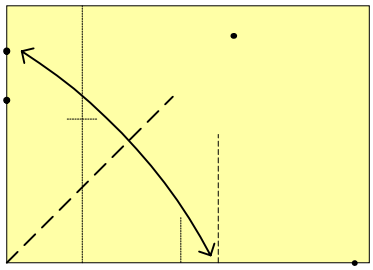
10. Crease a mark along the imaginary axis and unfold.



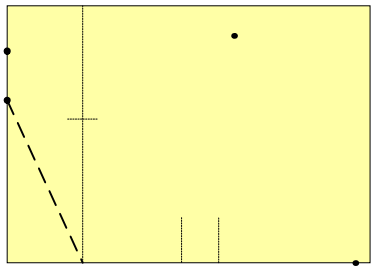
11. Fold the mark to the left of the paper.



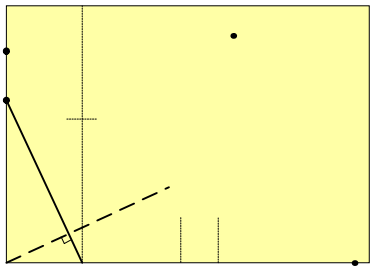
12. Fold the mark from step 8 to the origin, crease, and unfold



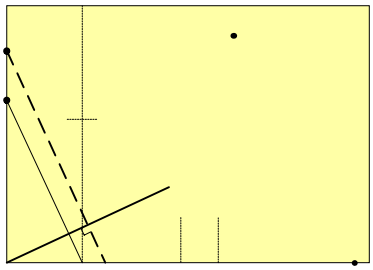
13. Transfer the mark to the left of the paper



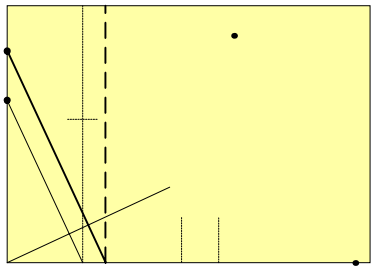
14. Crease from step 11's mark through the origin.



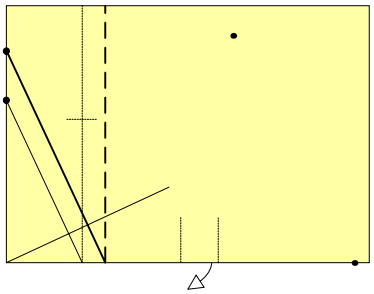
15. Fold a perpendicular through the new segment to the bottom left corner.



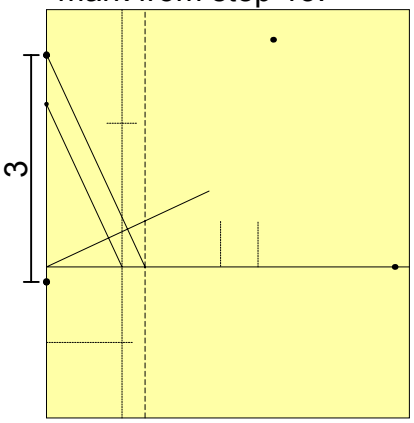
16. Fold a perpendicular to that, going through the mark from step 13.



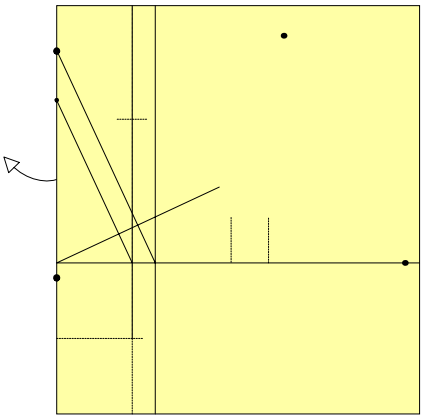
17. Make a vertical crease where it meets the bottom edge.



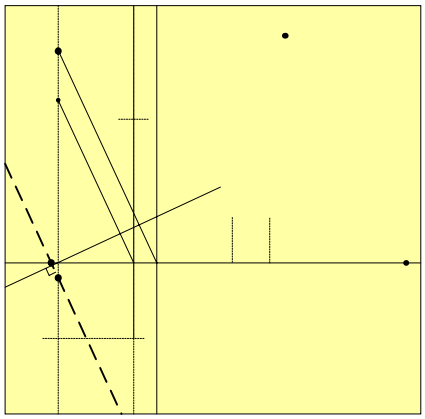
18. Pull out two unit strips of paper from below.



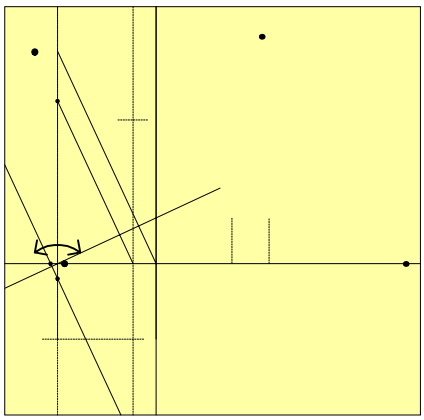
19. Lower the step 13 mark by 3 units. (This will not always be near the real axis)



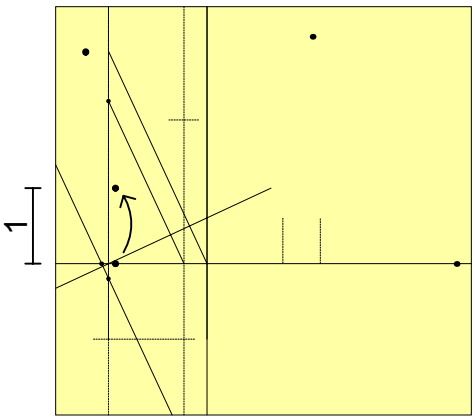
20. Pull out more paper, if necessary for the next step



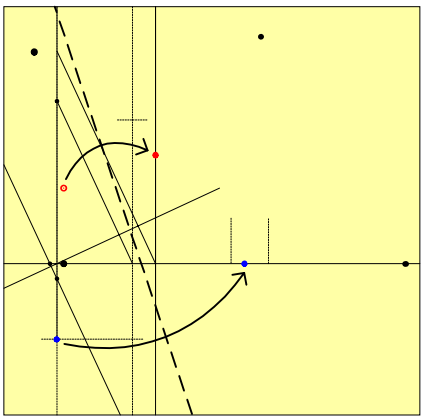
21. Fold another perpendicular.



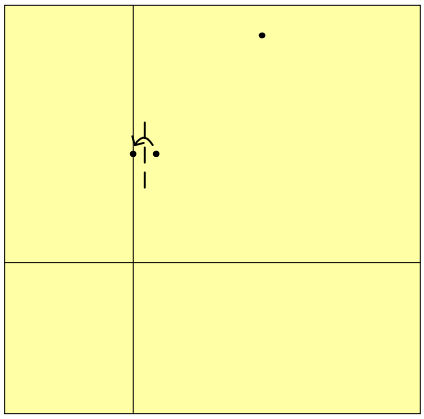
22. Fold the Re(x)=-1 line to transfer the mark.



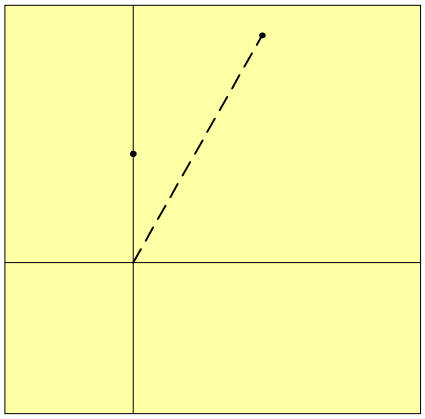
23. Raise the mark by 1.



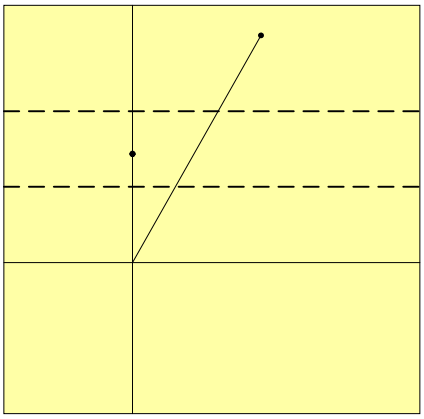
24. Fold the point to the line from step 17, and -1-i to the real axis.



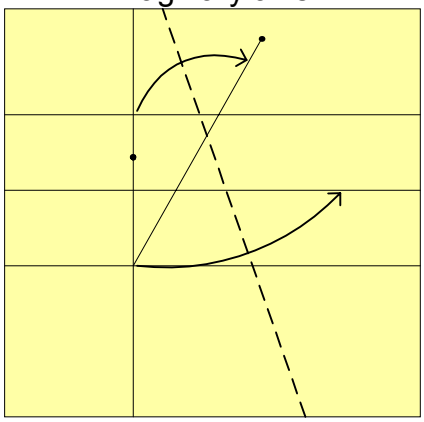
25. Fold the point to the imaginary axis.



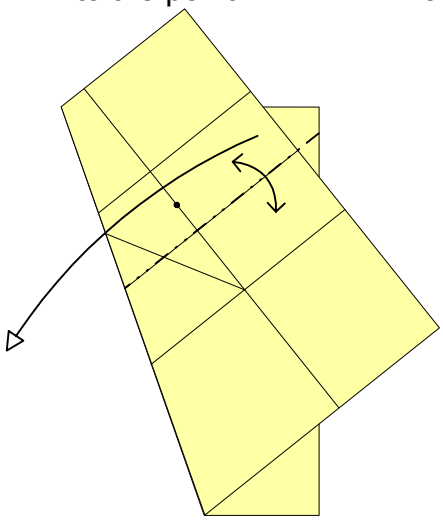
26. Crease from the origin to the point



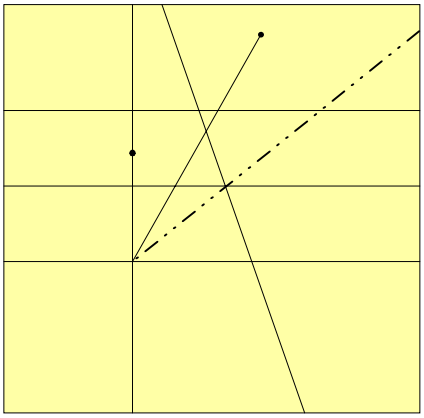
27. Fold two horizontal lines above the real axis, on twice as far above as the other.



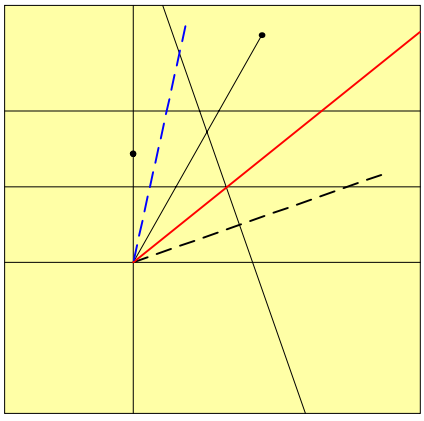
28. Fold the intersection of the higher line and the imaginary axis to the segment from the origin, and fold -i to the real axis.



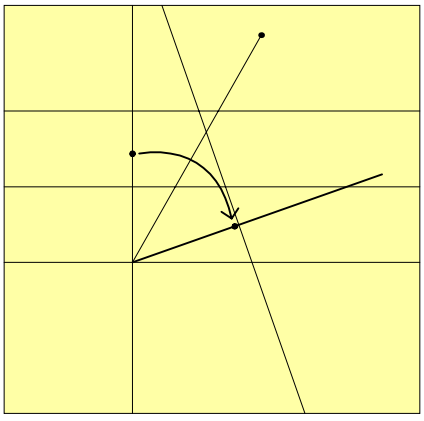
29. Crease through all layers and unfold.



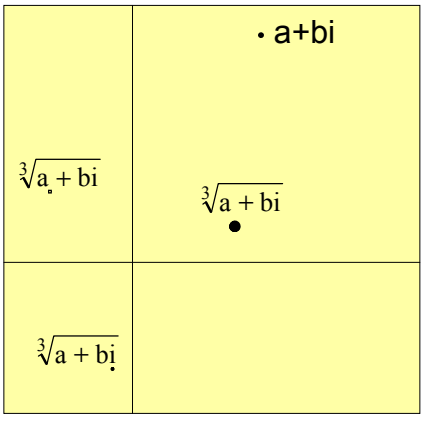
30. Extend the crease to the origin



31. Recall step 3. If the angle was halved twice, double this angle; if once, leave it; if kept, halve it.



32. Transfer the length from the origin to the point in step 25 to the line.



33. We have a cube root of the original number. The other two are 120° and 240° around the origin.