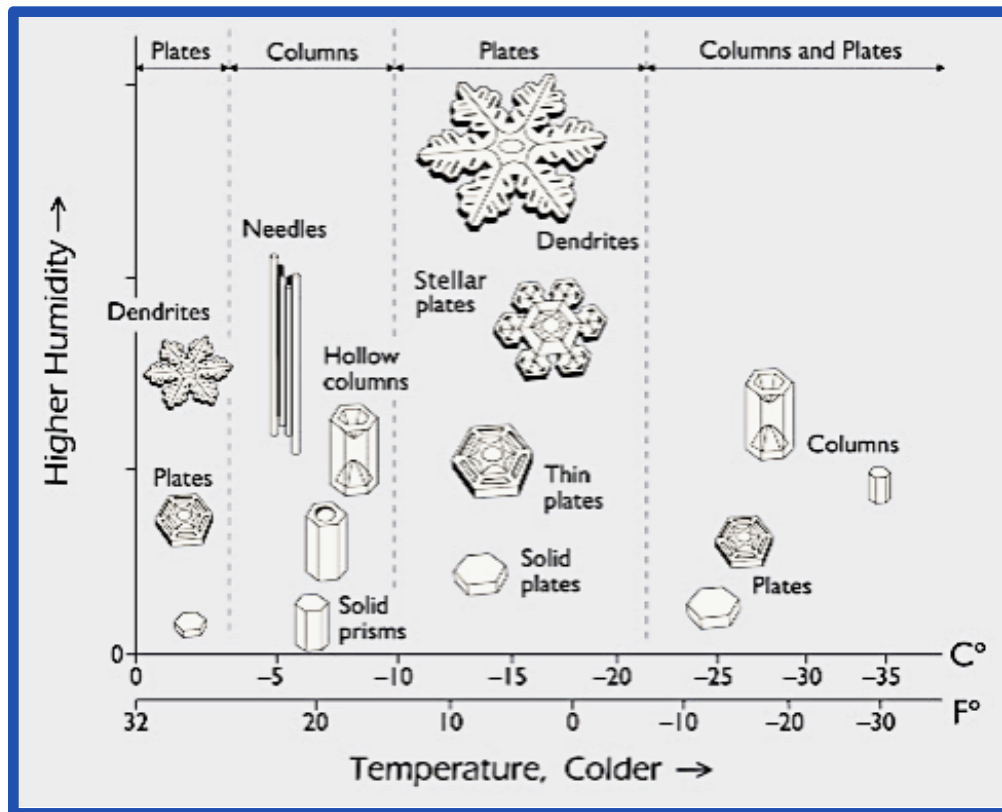


## What can you deduce from a Snow Crystals?

“A snowflake begins to form when an extremely cold water droplet freezes onto a pollen or dust particle in the sky. This creates an ice crystal. As the ice crystal falls to the ground, water vapor freezes onto the primary crystal, building new crystals – the six arms of the snowflake.” ... National Oceanic and Atmospheric Administration (NOAA)



<http://www.snowcrystals.com/morphology/morphology.html>

1. What can you deduce from this chart?
2. What would the atmospheric conditions be like to have a totally dendrite snowflake form on its way down to Earth?
3. What situations of temperature and humidity might result in the snowflake on the right have experienced on its trip to the ground?



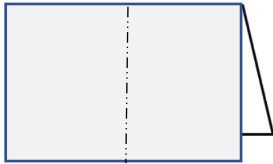
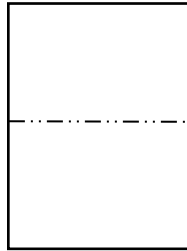
Photo from: Kenneth G. Libbrecht,  
Professor of Physics, at California  
Institute of Technology (Caltech)

## Cutting realistically possible snowflakes

You've probably cut snowflakes out of paper before. This time we are going to try to make a more accurate snowflake.

First you will need to fold a paper so that it has a center point dividing it into six 60-degree folds. We'll show you how to start that process but you will have to help us understand the geometry of this.

Fold your paper in half lengthwise.  
Crease your fold.

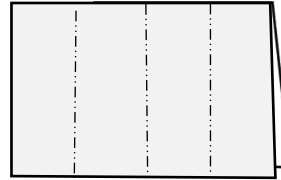


Fold your folded paper in half again as shown.  
Crease your fold.

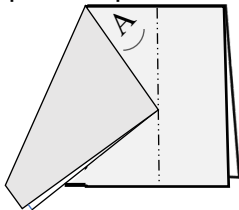


4. Before you continue folding, mark on this drawing above, the center of your whole piece of paper.
5. Now calculate the measurement of that central angle of your piece of paper and write that measurement here.

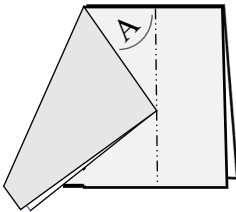
Now unfold that last fold and fold it twice more as shown, lining up the corner edges with that center fold to create 4 equal sections of folded paper. Crease well.



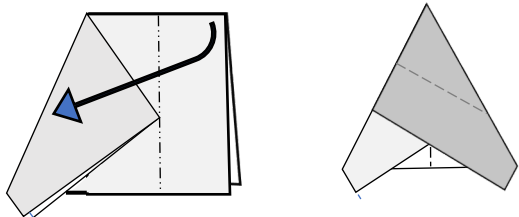
Now fold the top left corner of your folded and creased paper. While holding the center point of the page with a finger, and line up that top corner with the 3<sup>rd</sup> fold mark as shown below.



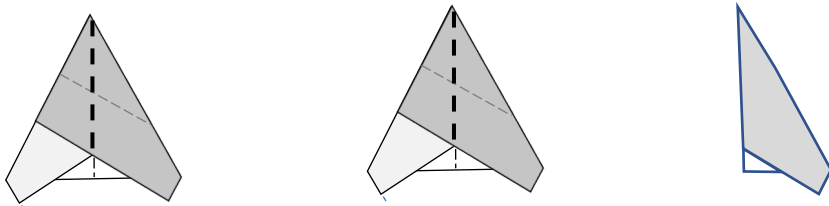
6. I've marked that top angle as angle A. Can you figure out the measure of angle A? Please explain.



Now its time to keep folding. Again, keeping one finger at that center point of your paper, fold the right hand  $\frac{1}{2}$  of the paper inward to line up with the left hand fold.



To make each of the six rays of our snowflake symmetrical, you should now fold the paper in half vertically and crease well.



7. Indicate on the pictures above, where each of the spokes to our future snowflake will be located?

8. Now you are ready to start cutting out your snowflake. While keeping in mind where the snowflake spines are, create a snowflake that shows some plates, dendrites, and columns. Press your snowflake with a cool iron or by pressing it between the pages of a large book. Be ready to bring your flake to class and explain what your snow crystal might have experienced on its way from a cloud to the Earth.



Sources: <https://medium.com/however-mathematics/the-mathematical-beauty-of-snowflakes-c93d004ce1e>  
<http://www.snowcrystals.com/science/science.html>  
<http://www.snowcrystals.com/paper/paper.html>  
<https://www.noaa.gov/stories/how-do-snowflakes-form-science-behind-snow>