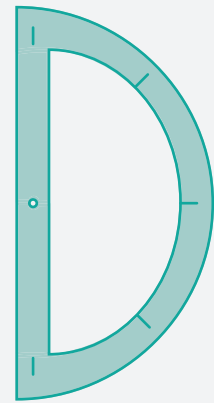
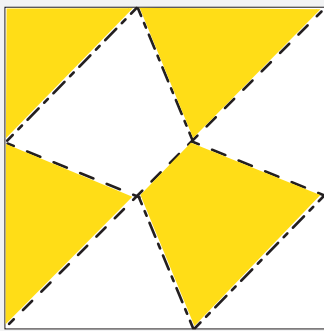


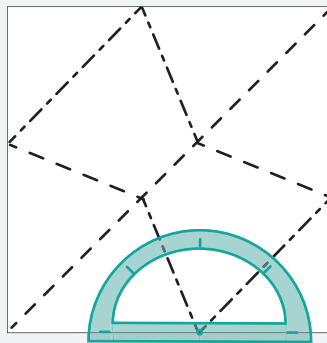
# Origami Angles



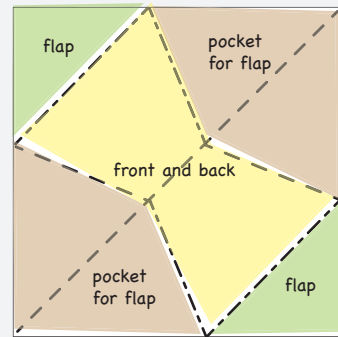
Free Sample



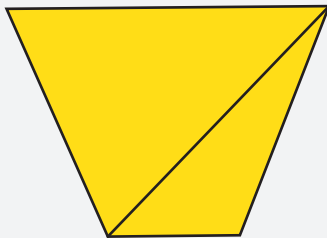
Cup



Cup



Cup



Isabelle Hoag M. Ed.  
Director of Education  
UnCommon-Core.com

Hello Teachers,

Thank you for downloading this handout. After decades of teaching, now I'm sharing activities I designed for my classes and some new ones as well.

Please visit [UnCommon-Core.com](http://UnCommon-Core.com). While you are there, sign up for your free copy of **Colorful Collections: A Mindful Exploration of Proper Fractions**.

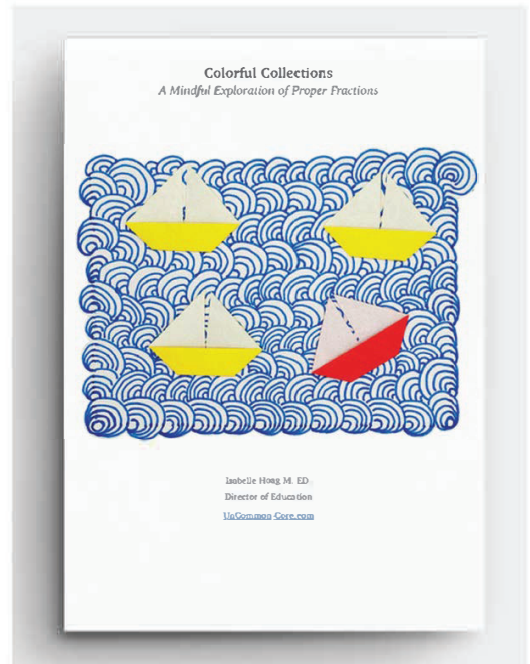
In addition to **Colorful Collections**, you will receive a Wednesday morning email with teacher tips, educational ideas, or a free version of whatever I'm working on at the moment. You get to use it for free, and I benefit from your questions and comments.

Also, visit my Teachers Pay Teachers store [Uncommon-Core dot com](http://Uncommon-Core dot com).

Thank you again. All the best,

Isabelle

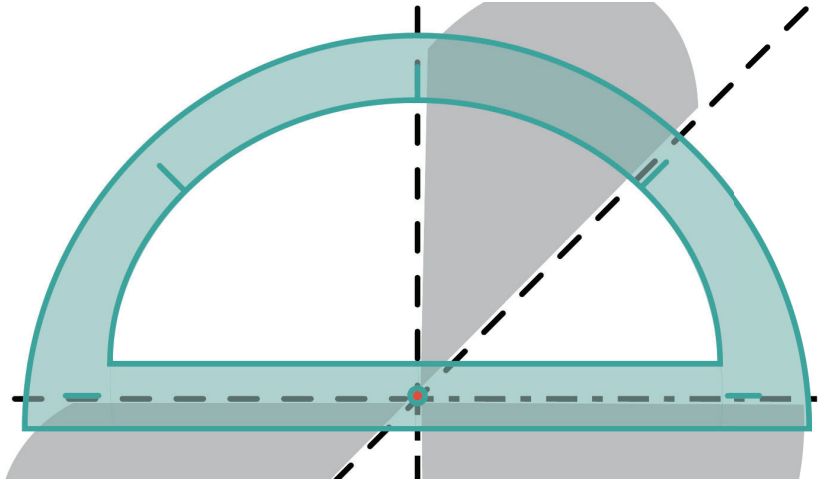
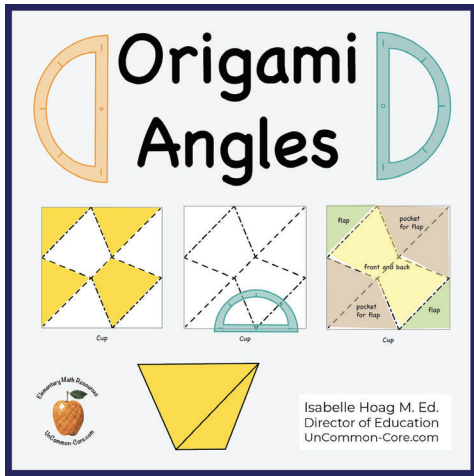
Isabelle Hoag M.Ed.  
Director of Education  
[UnCommon-Core.com](http://UnCommon-Core.com)



# Origami Angles Free Sample

## Introduction

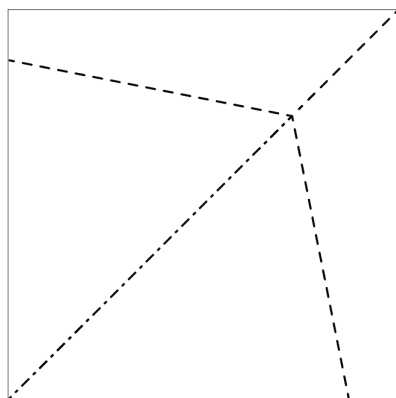
Thank you for your interest in Origami Angles. Folding paper models is a great way for students to learn about geometry. The activities collected here provide an engaging way for your students to practice measuring angles and finding the sum of angles. This free sample is a taste of a larger ebook that will be for sale on my TPT store: Uncommon Core dot Com (as soon as I complete it).



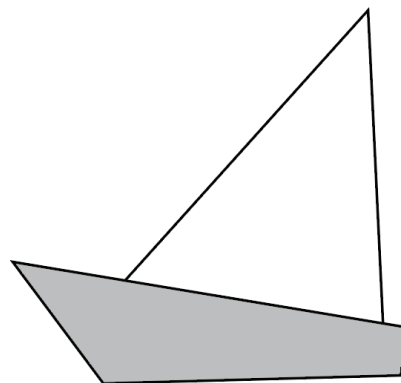
## Academic Value

In addition to providing hands on experience with folding angles, investigating crease patterns of origami models gives your students an authentic reason to measure angles and find their sums.

Studying crease patterns in relation to the final model lets students visualize how the flat, two dimensional paper folds into a more complex shape. They can create a mental image of what is happening with each new fold.



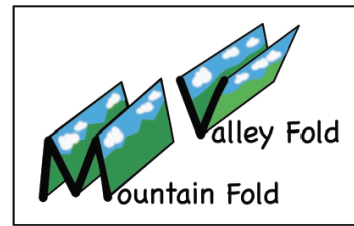
Sailboat



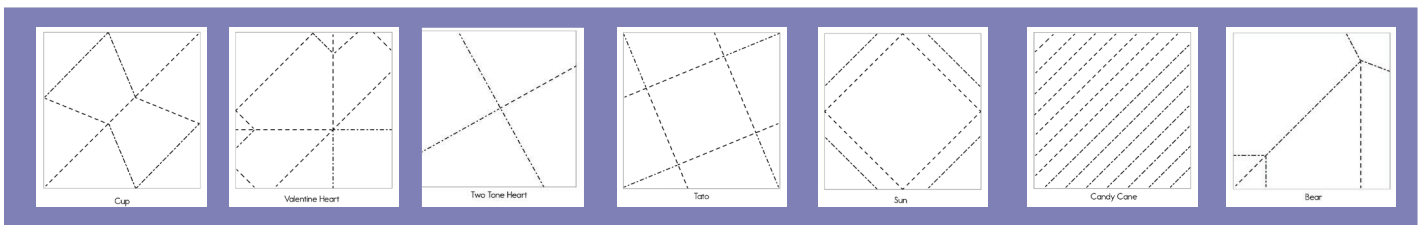
## Mathematical Properties of Origami Models

Folding paper and other thin, flat materials into various shapes and objects is not just child's play. Many scientists, engineers, and mathematicians are using principals of origami in their cutting edge, futuristic projects. What makes origami so special?

Basically, there are only two things that can happen to a flat sheet of paper – you can fold part of it up or you can fold part of it down. The first action makes a valley fold, and the second a mountain fold.

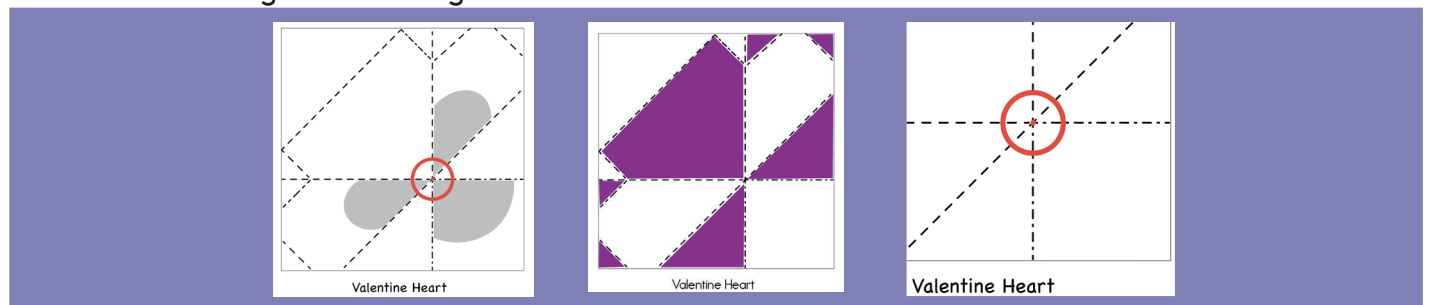


Crease patterns are created by folding a model and then unfolding it. The resulting network of fold lines is called the crease pattern. Each origami model has a unique crease pattern.

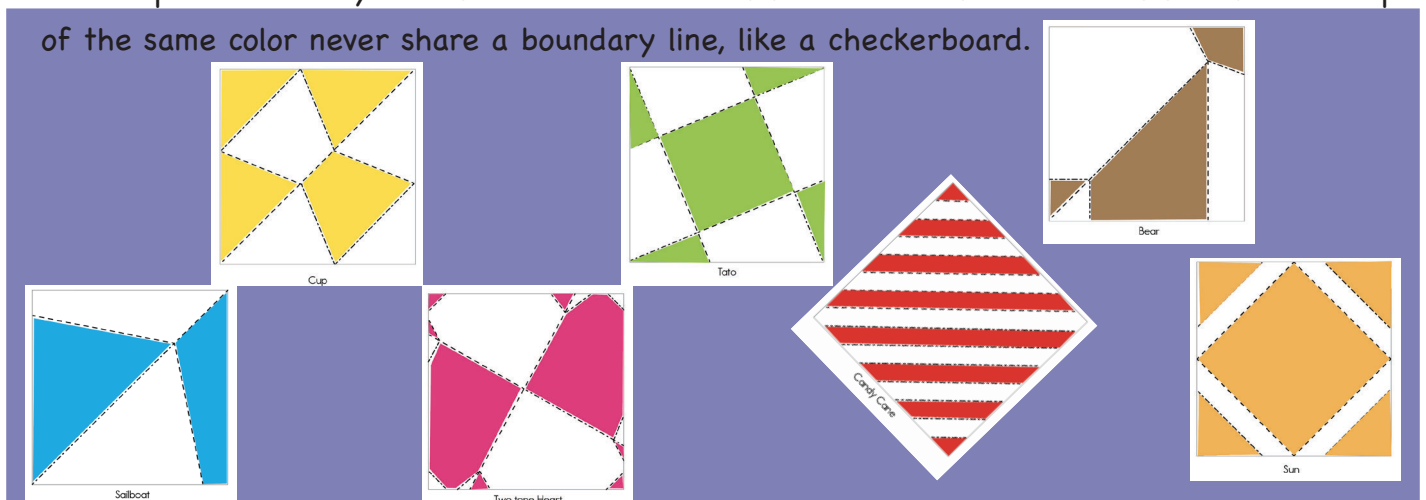


When mountain and valley folds meet or cross they always have the same characteristics:

- There is a difference of two between the number of mountain folds and valley folds.
- The sum of angles encircling each interior vertex is  $360^\circ$ .



- If you number the angles surrounding an interior vertex sequentially, the sum of angles that have been assigned even numbers is  $180^\circ$ .
- The shapes created by the folded lines can be colored with two different colors so that shapes of the same color never share a boundary line, like a checkerboard.



# Activities

## Exploring Crease Patterns

The following pages help your students make sense of crease patterns of origami models. There are several types of activities that can be done, here's a sample:

### Mountain Folds Valley Folds

Give your students pages of blank crease patterns or have them fold and unfold origami models of their own. Trace over the mountain folds with sky blue crayons, or highlighters. Trace over the valley folds with grass green crayons or highlighters.

Discuss how the models will look when folded. Encourage students consider why both mountain and valley folds meet at each vertex.

Invite students to write descriptions of the crease patterns that include important vocabulary words from the glossary. You might want to share descriptions and the crease patterns on a bulletin board. Challenge students to match the descriptions with the crease patterns.

### Two Color Designs

Four different colors are sufficient to ensure that countries on a map can be filled in so that no countries of the same color share a boundary line. Well, the shapes created by the lines in origami crease patterns can achieve the same effect with two colors.

Share crease patterns with students or have them make their own. Challenge them to shade every other shape within the crease pattern the same color. They should leave the rest white.

Collect student observations, ideas, and questions about this property of origami crease patterns. Ask how they could find out for certain if this property is true for every single origami crease pattern.

### Crease Pattern Match

Share crease patterns and folded models (or images of folded models) with your students. Have them decide which model was folded from a specific crease pattern. Once they have written the name of the model under each crease pattern, have a class discussion about how they made their decisions. What kinds of clues did they look for? Why were some models easier to match?

Tato

A tato is an envelope.

Cup

# Exploring Origami Angles

## Instructions

Carefully fold an origami model. Unfold it to reveal the crease pattern. Identify an interior vertex. A vertex is the point at which line segments meet. Find a vertex that is in the center of the paper and has angles all around it.

Lightly color in every other angle that meets at the vertex. You do not need to color in the entire shape, just color the tip of the angle.

Give each angle a number, make the odd numbered angles white. Start numbering with an angle that was not colored in and then work your way around the vertex.

Use a protractor to measure the degrees in each angle. If your protractor is too big or your model too small, find a way to extend the line out farther.

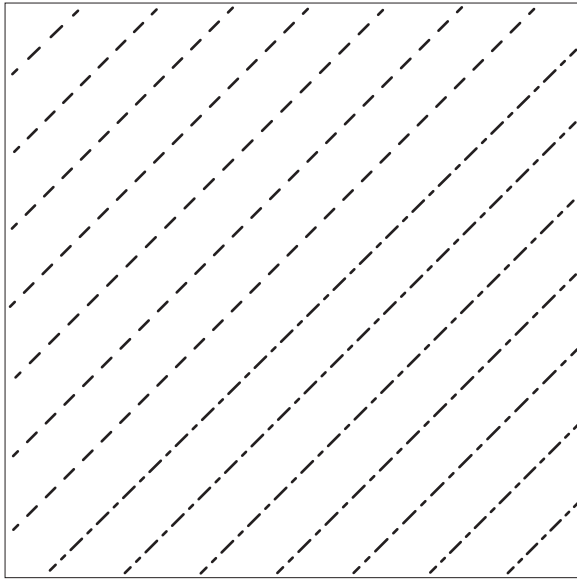
Record the degrees in each angle on the chart. Give the Origami Angles Record Chart a title and make note of the model you are using to complete the chart.

Add the columns and the rows. Then find the total of each to make sure you added correctly. Can you explain why each total should have the same number?

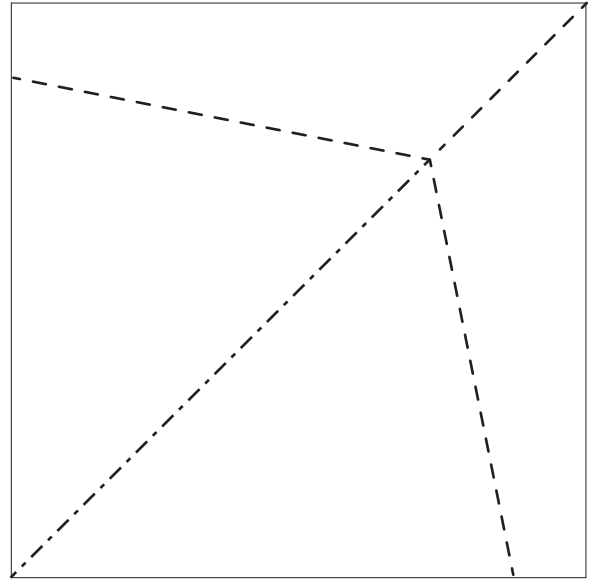
What do you notice about the sum of the two columns. Why do you think this happens? What other geometric objects have the same number of degrees?

What is the total number of degrees of all the angles around the vertex? What does this number remind you of? Do you think the total will be the same for any interior vertex on any origami model? How could you find out for sure?

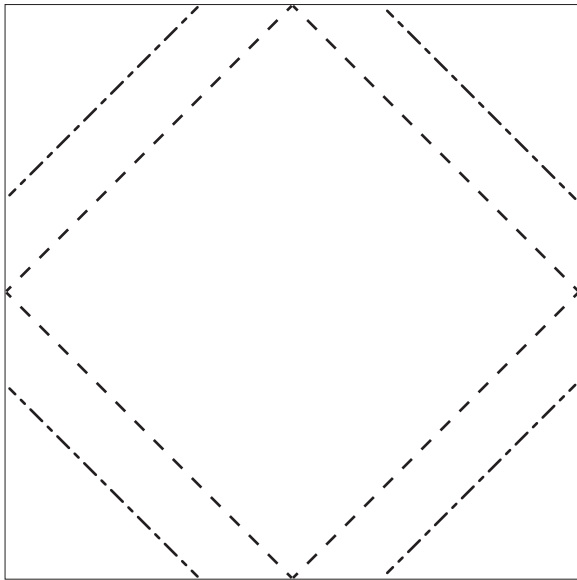
# Crease Patterns



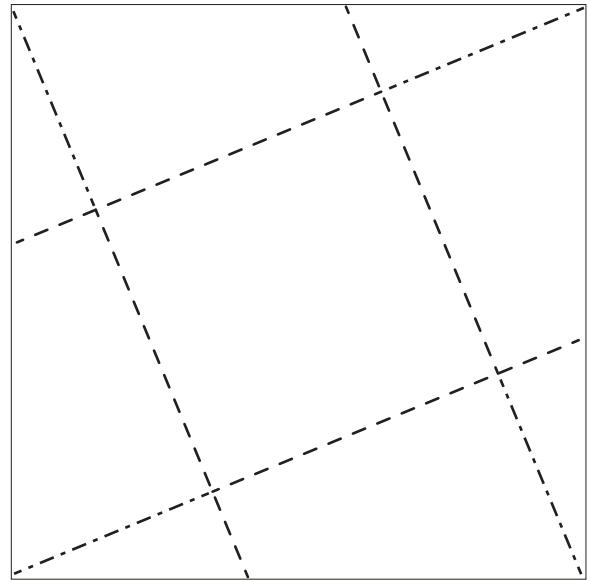
Candy Cane



Sailboat

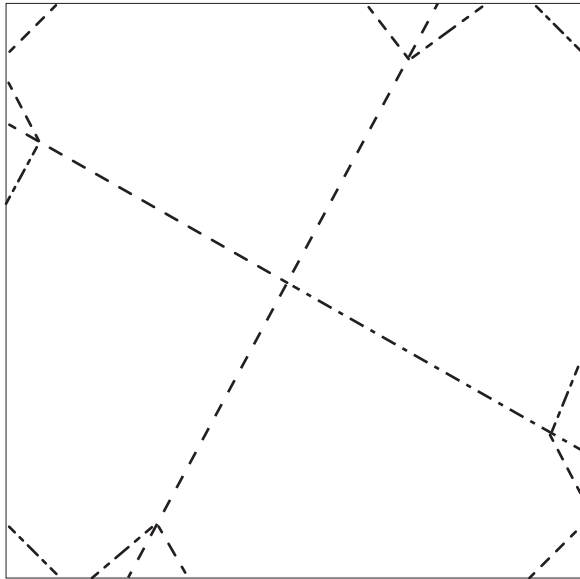


Sun

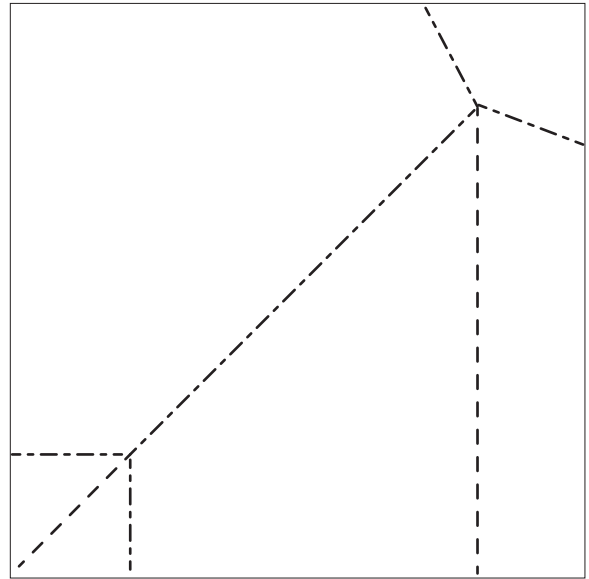


Tato

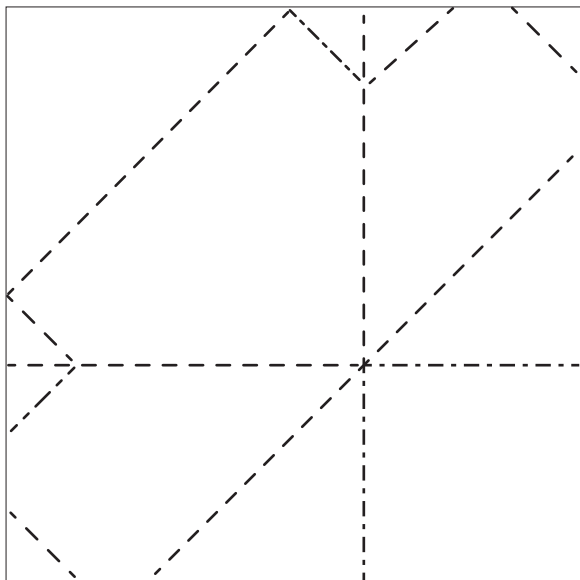
# Crease Patterns



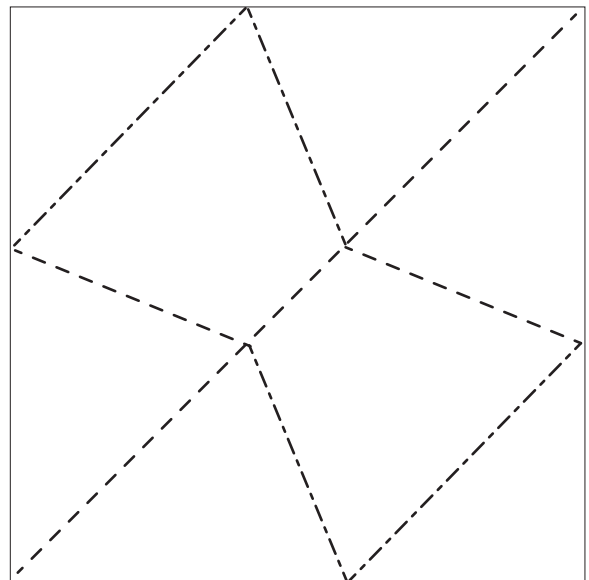
Two tone Heart



Bear



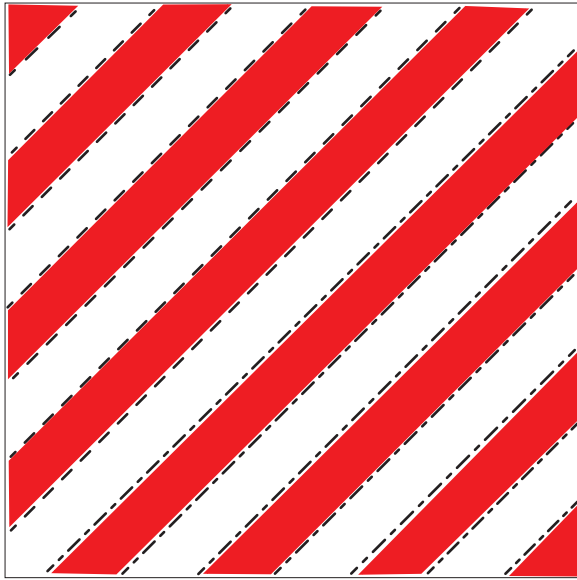
Valentine Heart



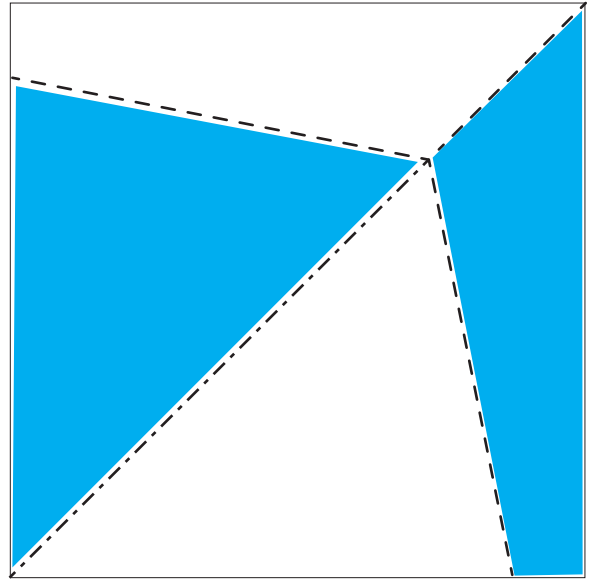
Cup



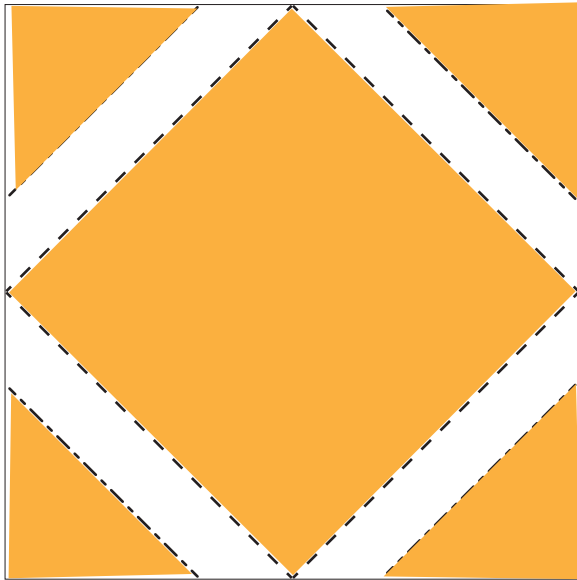
# Crease Patterns



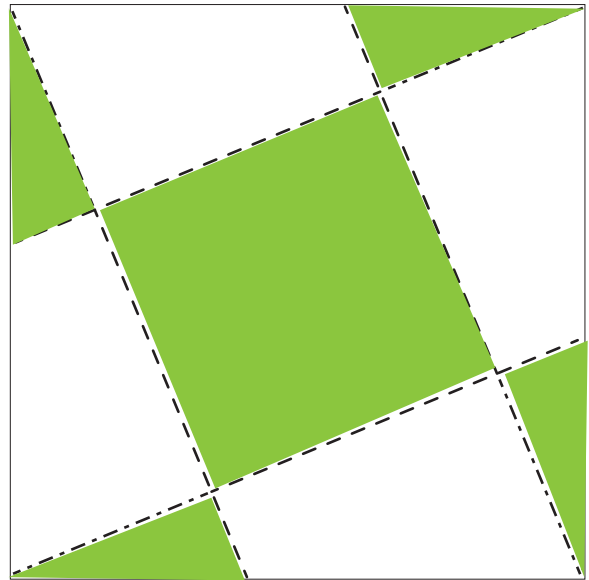
Candy Cane



Sailboat

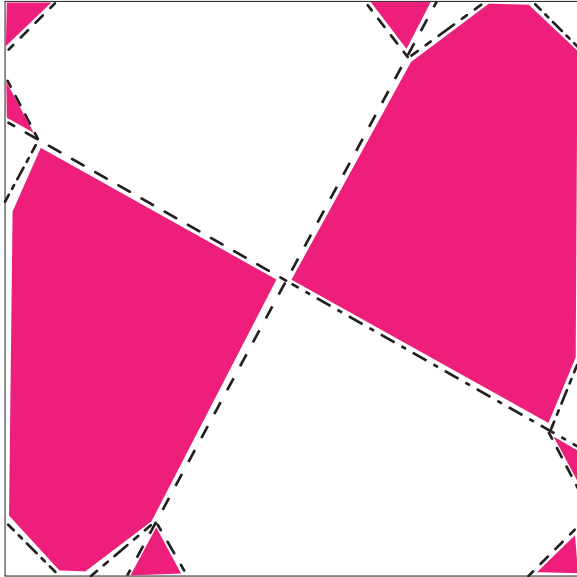


Sun

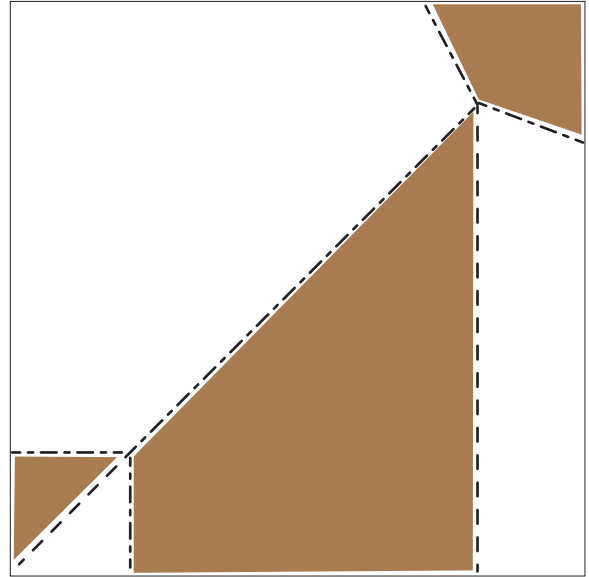


Tato

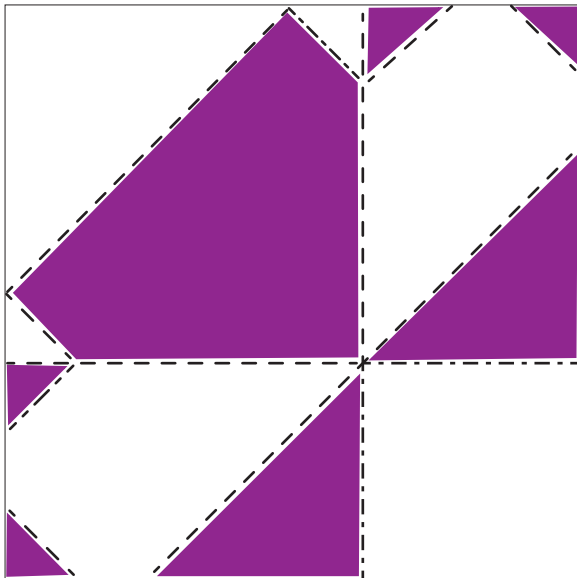
# Crease Patterns



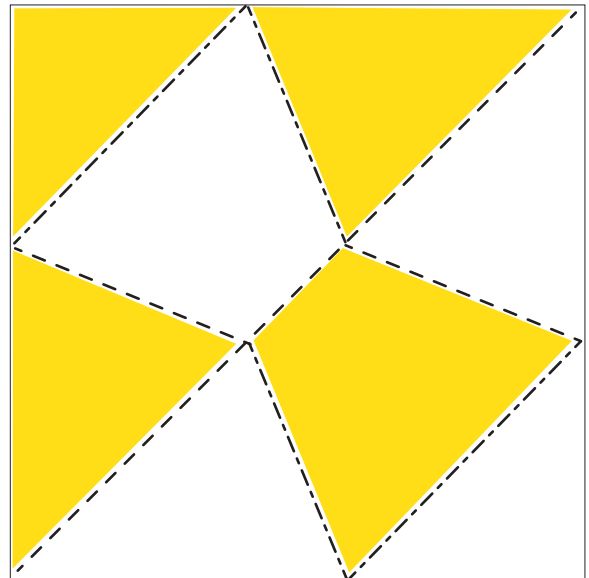
Two tone Heart



Bear

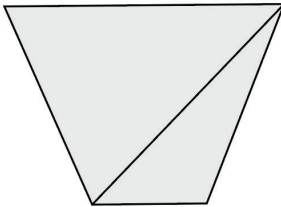
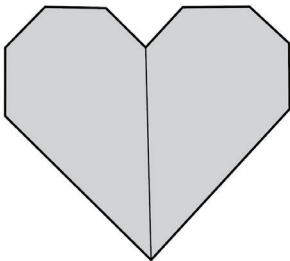
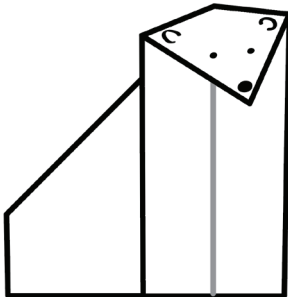
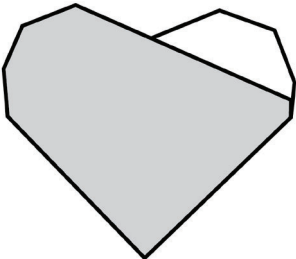
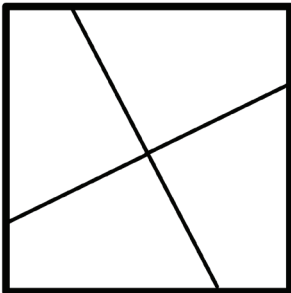
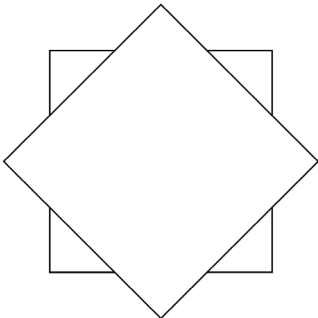
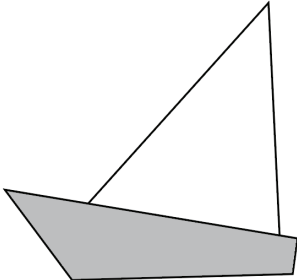
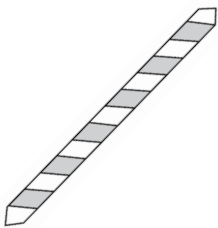


Valentine Heart



Cup

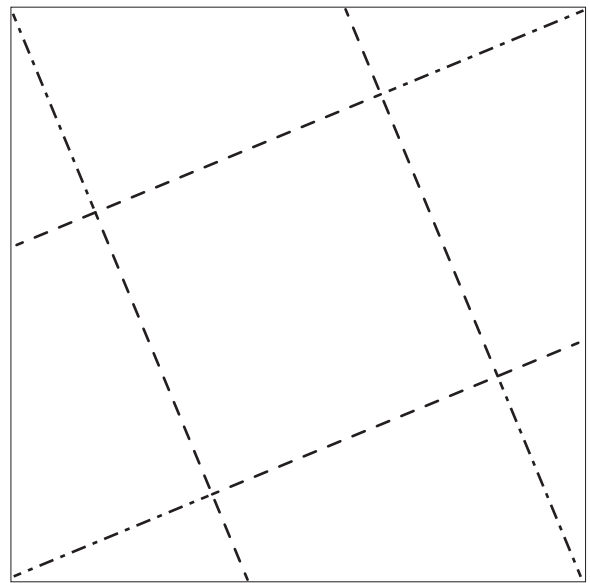
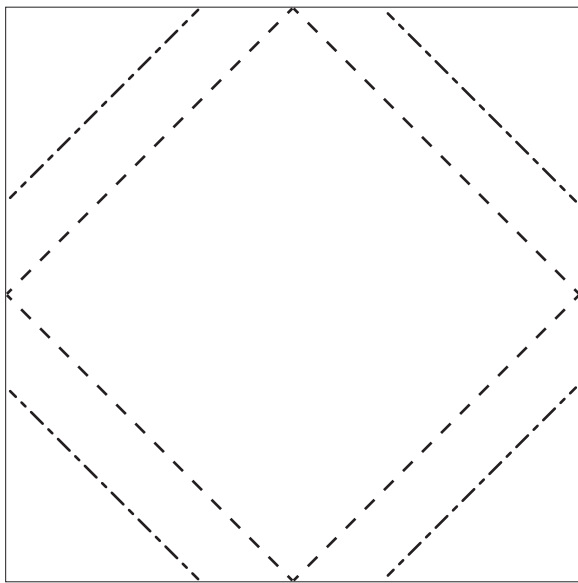
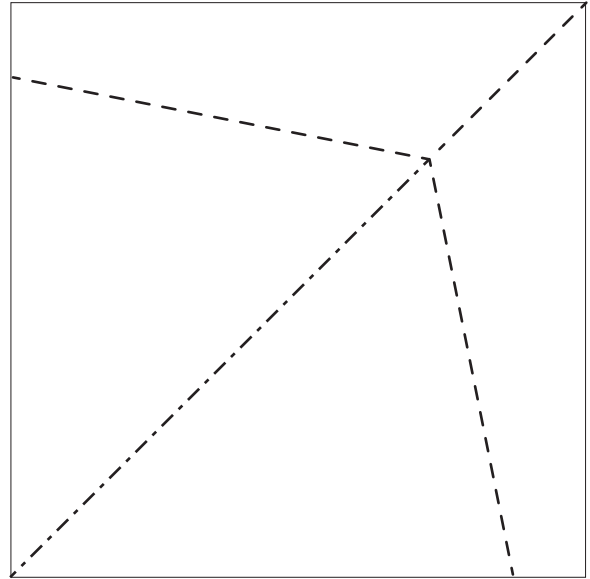
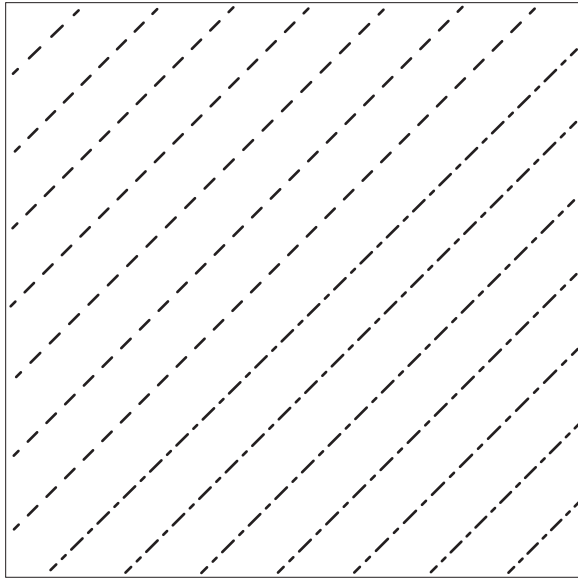
# Images of Origami Models



# Crease Pattern Match

name:

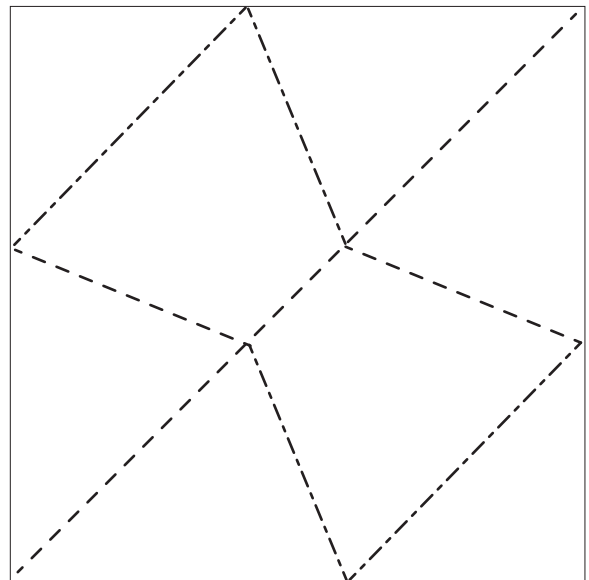
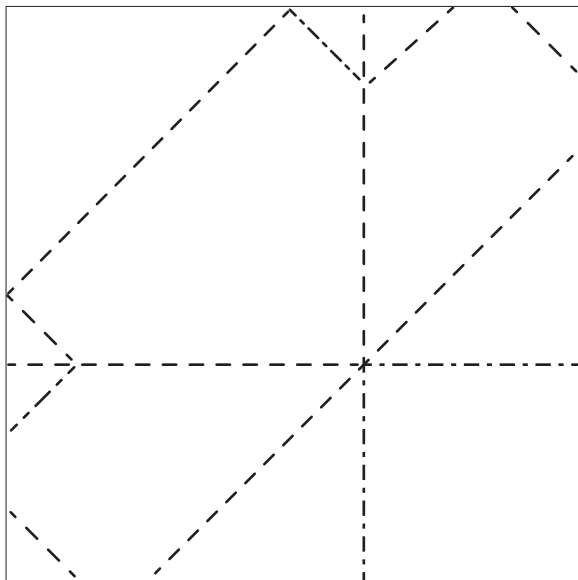
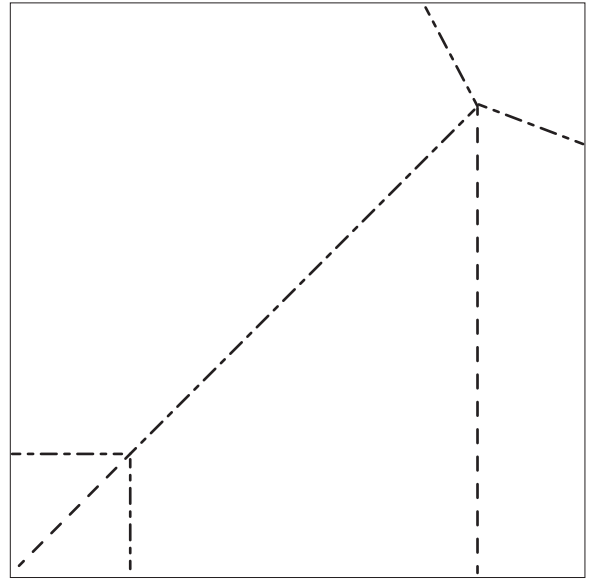
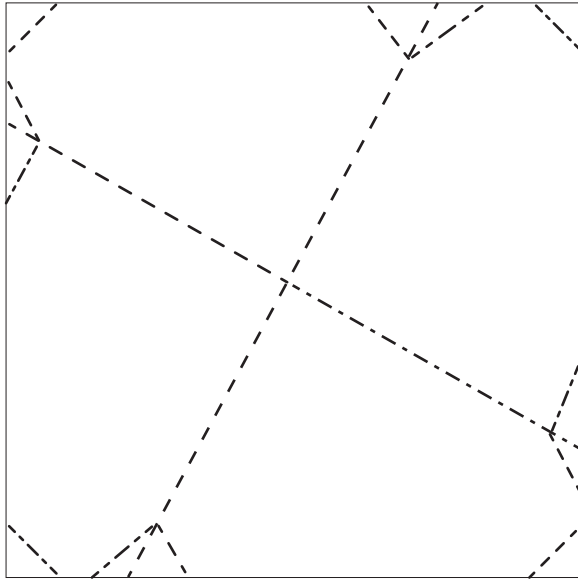
Write the name of the model under the crease pattern it was made from.



# Crease Pattern Match

name:

Write the name of the model under the crease pattern it was made from.



# Origami Angles Record Sheet

name:

title

White even # angles	Colorful odd # angles	sum of each row
sum of column	sum of column	both totals

Explain what you did and what you found:

# Glossary A - M

Write the meaning of each word. If possible draw an example, too..

angle

center

circle

congruent

degrees

diagonal

edge

exterior

geometry

horizontal

interior

line

line segment

math

measure

mountain fold

# Glossary N - Z

Write the meaning of each word. If possible draw an example, too..

origami

parallel

perpendicular

plane

point

quadrilateral

rhombus

right angle

similar

straight line

square

symmetry

triangle

valley fold

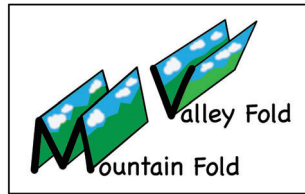
vertical

vertex



# Origami Symbols and Vocabulary

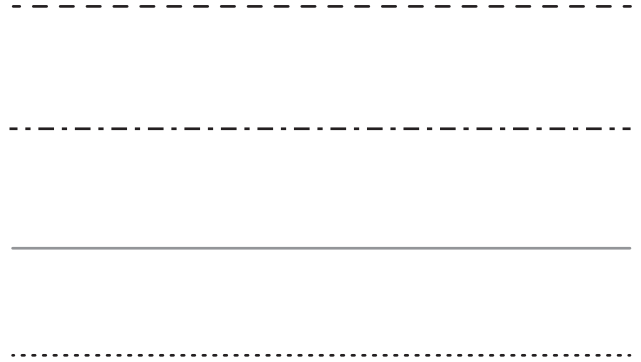
A valley fold on top is a mountain fold underneath.



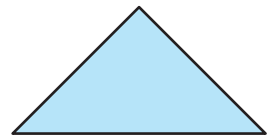
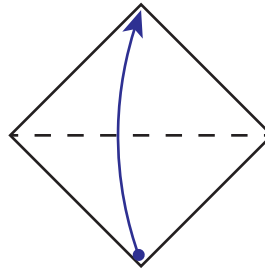
A mountain fold is an upside down valley fold.

Grey lines show previous folds that still appear on paper.

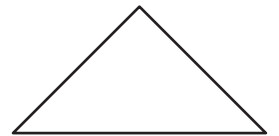
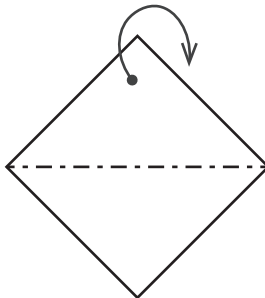
Dotted lines show edges that are hidden behind the surface of the model.



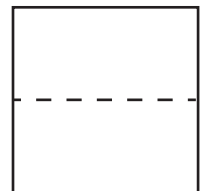
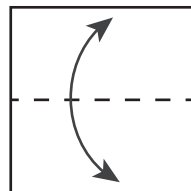
A single pointed arrow shows the starting and ending point of a fold.



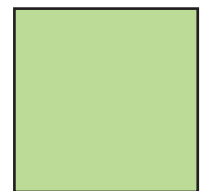
When a single pointed arrow is shown with a mountain fold, send the top of the paper to the back of the model.



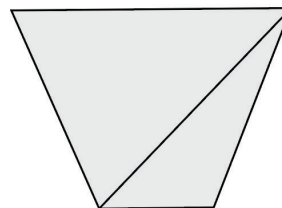
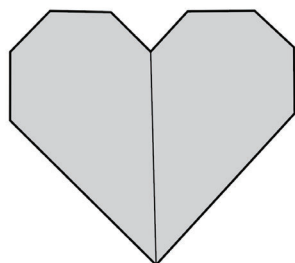
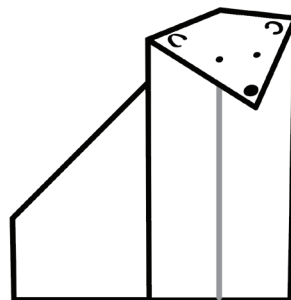
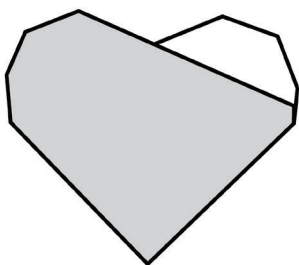
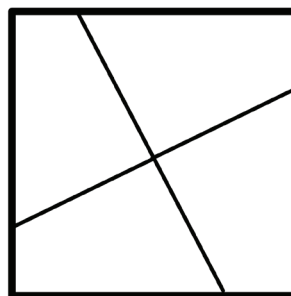
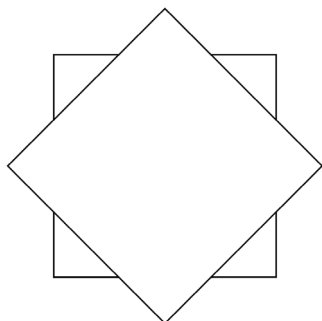
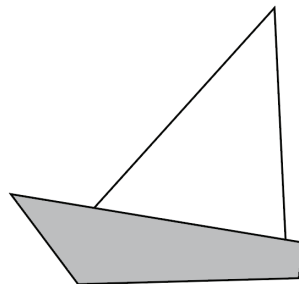
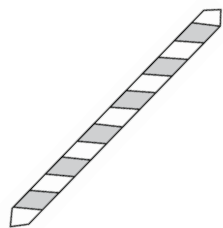
An arrow with two points tells you there are two steps! First make the fold as shown. Next, unfold the paper.



The loop-the-loop arrow tells you to flip over the model.



# Links to Instructions



# Terms of Use

By downloading this product, you agree that the contents are the property of Isabelle Hoag M. Ed., Director of Education at [UnCommon-Core.com](http://UnCommon-Core.com) and licensed to you only for classroom/personal use as a single user. I retain the copyright, and reserve all rights to this product.

---

## YOU MAY:

- Use this product with your own students, in your classroom, or for your own personal use.
  - Reference this product in blog posts, professional development workshops, at seminars, or other similar venues, ONLY if both credit is given to me as the author and a link to [UnCommon-Core.com](http://UnCommon-Core.com) is included.
  - Please direct others to my TPT store [UnCommon-Core dot com](http://UnCommon-Core dot com) where they can download their own copy.
- 

## YOU MAY NOT:

- Claim this work as your own, alter the files in any way or remove copyright/watermarks.
  - Sell the files or combine them into another unit for sale or for free.
  - Post this document for sale or free elsewhere on the internet including Google Doc links on blogs.
  - Make copies of this product to share with others.
- 

Thank you for following universally accepted codes of professional ethics while using this product. If you have any issues with the file, or notice an error please contact me and I will be happy to help sort it out.

Thank you!

[Isabelle@UnCommon-Core.com](mailto:Isabelle@UnCommon-Core.com)