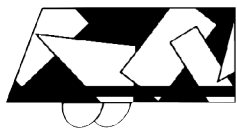




Unfolding the Secret



**ARTMOBILE**

Traveling throughout Bucks County  
September 2006–June 2007

**ARTMOBILE**, the outreach museum of the Department of the Arts at Bucks County Community College, is celebrating its 30th year of bringing the arts to the school children and adults of Bucks County through its visits to schools and public sites.

This manual was developed to help teachers incorporate the Artmobile experience into their curricula by providing background information and classroom activities related to the exhibition. It is intended to serve as a resource both in conjunction with and apart from the exhibition.

*ORIGAMI: Unfolding the Secret* is supported in part by **Gene W. Fickes**, **Target**, and the **Pennsylvania Council on the Arts**, a state agency funded by the Commonwealth of Pennsylvania.

For more information on Artmobile and its programs, please call 215-504-8531.





## Unfolding the Secret

### Contents

<b>Acknowledgments</b>	<b>2</b>
<b>What is Origami?</b> <i>by Larissa Mellor</i>	<b>3</b>
<b>About the Collection</b> <i>by Barbara Pearl</i>	<b>4</b>
<b>Educational Benefits</b> <i>by Barbara Pearl</i>	<b>8</b>
<b>Classroom Activities</b> <i>by Larissa Mellor</i>	
Pre-Visit Activities	<b>9</b>
Post-Visit Activities	<b>12</b>
<b>Bibliographies</b>	<b>15</b>
<b>Resources</b>	<b>16</b>
<b>Appendices</b>	
A. How to Fold a Cup	<b>17</b>
B. Folding a Paper Crane	<b>18</b>
C. Haiku	<b>19</b>
D. Folding Paper Hats	<b>20</b>
E. Picture Frame	<b>21</b>
F. Asian Origami Scroll Lesson Plan <i>by Rhonda Rea</i>	<b>22</b>
G. Post-Visit Hand-out	<b>23</b>
H. Japanese Fan	<b>25</b>

# Acknowledgements

*This fall marks a significant milestone for Artmobile—its 30th anniversary of bringing art to the school children and adults of Bucks County.*

*Artmobile was born out of a response to the energy crisis of the 1970s, when many schools could not undertake the expense of bussing their students for class trips to museums. In 2006, we have experienced record breaking gas costs again and the need for an affordable, high quality museum experience brought directly to our schools and neighborhoods is no less now than it was 30 years ago.*

THE PLANNING, DEVELOPMENT AND PRESENTATION of an exhibition is the ultimate collaborative effort. I was fortunate to have an extraordinary team of knowledgeable and dedicated staff and volunteers with which to work on *ORIGAMI: Unfolding the Secret*. I offer my deepest thanks to:

**Barbara Pearl**, without whom this exhibition would not have been possible. Her passion for origami and education is unparalleled. Barbara's collection of exquisite origami from around the world serves as the foundation for this exhibition. Her expertise was invaluable for developing curricular connections for the exhibition and her book, *Math in Motion: Origami in the Classroom K-8*, was a vital resource for this manual. It is with utmost appreciation that I offer my sincere thanks to Barbara for her generous contributions to this exhibition and teachers' manual. I am delighted that Artmobile is able to provide every school on our tour with a copy of her book.

**Rhonda Rea**, who enthusiastically loaned several objects to the exhibition, contributed ideas and lesson plans to the teachers manual, and graciously made two large models especially for Artmobile;

**Betty Tsai**, who embraced the concept of the exhibition, donated paper, and offered her ideas;

**Larissa Mellor**, Exhibitions Assistant extraordinaire, for her unusual combination of creativity and organizational skills, her considerable knowledge of museum education, and her dedication to the project;

**Jamie Blank** and **Natalie Poserina**, the two finest work-study students one could hope for, for their hard work, dedication and attention to detail during the installation of the exhibition;

**The Bucks County Community College Foundation**, for their support of Artmobile and its programs over the years;

The many other dedicated members of the Bucks County Community College family, especially in the areas of security, maintenance, accounting, budget, purchasing, payroll, public relations and computer operations, upon whose daily assistance Artmobile relies;

And finally to our Artmobile Educators for this exhibition—**Ron Benek**, **Carole Cunliffe** and **Lisa Kidos**—whose professionalism, knowledge, and enthusiasm will bring *ORIGAMI: Unfolding the Secret* alive for more than 20,000 visitors at 39 schools and 5 public sites over the course of its nine-month tour of Bucks County.

FRAN ORLANDO  
*Director of Exhibitions and Artmobile  
Bucks County Community College*

# What is Origami?

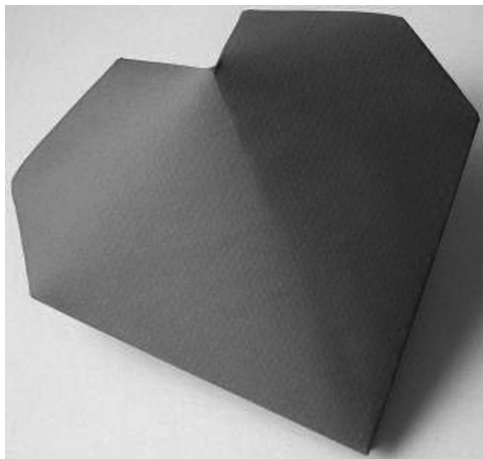


**O**RIGAMI IS THE ART OF PAPER FOLDING. The Japanese word origami is a compound of the verb *ori*, “to fold,” and the noun *kami*, “paper.”

Origami probably originated in China shortly after the creation of paper. However, it flourished in Japan, where it has been practiced for over 1000 years. About fifty years ago in Japan Akira Yoshizawa began creating new origami designs sparking a worldwide resurgence of paper folding. Today, origami is practiced all over the world, by people of all ages and skills. Artists, such as Joseph Wu and Robert Lang, continue to design innovative models.

Origami uses a small number of folds that can be combined in many ways to create different designs. Paper remains the most common material for origami. There are many possibilities for paper: textured, duo (a different color on each side), metallic, foil, shiny, translucent, opaque, patterned, recycled (newspapers, magazines, bubble gum or tea bag wrappers), and washi (a soft, fibered, handmade paper). However, other materials, such as cloth and sheet metal are also used.

Traditionally origami is folded from one square sheet of paper. However, some models are created from rectangular, triangular, or other shaped papers. Also, multiple sheets can be combined to create one model. This is called unit or modular origami.



**This teapot, an example of unit origami, is made from over 300 individual units.**

Models range from simple—just a few folds, to very complex—many intricate folds.

**This heart is made from eight steps.**

**To create this Praying Mantis an artist must complete fifty-eight steps.**



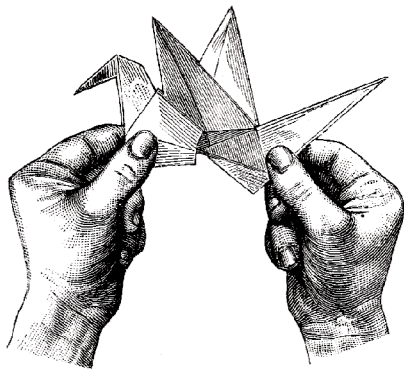
**Fun Fact!** The Japanese astrophysicist, Koryo Miura, invented a map fold, which has been used to deploy large solar panel arrays for space satellites. This creative use of origami clearly demonstrates the practical employment of paper folding in today’s world. Miura’s map fold is a rigid fold, which requires that a model can be unfolded and lain flat and folded so that the areas of paper between creases do not bend or twist in the process.

**Fun Fact!** Dr. Robert J. Lang, one of the foremost origami artists in the world, is known for his complex and elegant designs. He has often used computers to study the theories behind origami and has made great advances in the application of origami techniques to real-world engineering problems. A team at the Lawrence Livermore National Laboratory in California is developing a powerful space telescope, with a 100-meter lens in the form of a thin membrane. Lang was hired by the team to develop a way to fit the tremendous lens, known as the Eyeglass, into a small rocket in such a way that the lens can be unfolded in space and will not suffer from any permanent marks or creases. See *Origami Astronomy: The Art and Science of a Giant Folding Telescope*.

[http://www.space.com/business/technology/origami\\_design\\_020220-1.html](http://www.space.com/business/technology/origami_design_020220-1.html)

# About the Collection

by Barbara Pearl, M.A.



*A single thought can revolutionize your life.*

—MAYUMI MORI

## ENTER THE FOLD

I learned very early as a parent and a teacher that the more fun I can make learning, the more children are willing to learn. As parents and educators we are always looking for ways to teach and improve basic reading and mathematics skills, encourage critical thinking and problem solving, nurture creativity, introduce students to other cultures and foster cooperation and socialization. An ideal lesson strives to achieve all these goals and take a form so appealing that students of all ages are eager to learn. Origami, the Japanese art of paper folding is a motivational teaching tool that will captivate your students' hearts as well as their minds. In creating an origami model, the origamist begins with a square sheet of paper and transforms it into any shape limited only by their imagination, skill and determination.

Nineteen years ago, origami captured my heart when I first took my son Jason (then age 7) to a library workshop in New York City. My previous folding experience was limited to laundry. From the moment my hands touched the paper, I was enchanted by the beauty, symmetry, and mystery of paper folding. When we were finished we had created a panda bear with anatomically accurate ears, eyes, and a nose. I shared this experience with my math students and their enthusiasm inspired me to learn more about origami. My oldest student, Louise Platt (a neighbor) was 83 when I introduced her to origami. Louise is still folding at the age of 90. When Louise developed arthritis in her hands, she found relief in paper folding exercises and still enjoys learning new projects.

In 2000, I was invited to Japan to present my Math in Motion program to the Japanese Ministry of Education, which has also been striving to incorporate sogo gakushu, an interdisciplinary approach to teaching. <http://www.mathinmotion.com/newsarticles>. In Japan, Kindergarten supply rooms are stocked with origami paper. Japanese children begin learning to fold at the age of three. Ruriko Hirai, a parent and English teacher with the Saitama English Teacher Study Group (SETS) I met in Omiya, Japan states, "After your workshop, I understood how we can teach reading, writing and mathematics without so many special and expensive textbooks and materials. We can use almost everything around us as a resource and help our children make connections to what they already know. You opened my eyes and my mind. My children can't wait to learn more!"

## ORIGAMI IS IN[CREASING]

My background is in education and mathematics. In the classroom, I developed a methodology for teaching with origami to support national and state mathematics standards. I was invited to speak at educational conferences.

The response was overwhelming. I wrote *Math in Motion: Origami in the Classroom K-8*, a book about integrating mathematics and origami across

the curriculum. Today, my work takes me around the world presenting teacher inservice, student workshops and family programs that demonstrate how to use this simple yet powerful resource to **strengthen and enhance student learning**. <http://www.mathinmotion.com/workshops>

One of the most compelling reasons to use origami in the classroom is that paper folding gives children a sense of achievement. When students feel successful, they are more motivated to learn. Origami allows students to create their own manipulatives for learning, discovery and exploration. According to the National Research Council, *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, “In reality no one can teach mathematics. Effective teachers are those who can stimulate students to learn mathematics. Educational research offers compelling evidence that students learn mathematics well only when they construct their own mathematical understanding.”

As a teacher, one of the best parts of using origami in the classroom is that no one is left out. Dolores Monza, a 3rd grade teacher at the Southeast Delco School District in Sharon Hill, Pennsylvania states, “I use origami as a reward for students who are trying hard and improving in math. They feel so excited and proud after they have completed their origami project. Every child is actively engaged in the learning process. It is a great way to motivate my students and teach fractions and geometry skills. I have also done model lessons for other teachers with whole class instruction. They have been very positive and fun lessons to teach.”

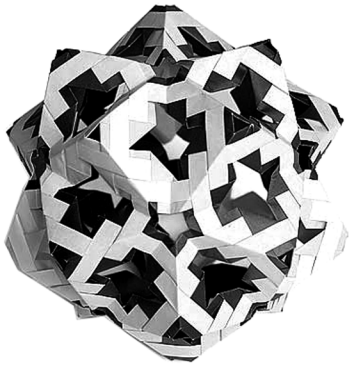
## FOLDING TO LEARN

Peter Engel, an architect, and a master of the art and science of origami and author, calls origami the “mathematicians art” and reveals in his book, *Folding the Universe*, his years of work and unique discoveries and creations. He emphasizes the strong connection between origami, mathematics and nature by drawing analogies to minimization problems, fractals and the chaos theory. Engel says, “studying the progression of an origami creation is very enlightening. One begins with a square (a 2-dimensional object), and then manipulates the square to form a figure (a 3-dimensional object).” A study of the creases impressed on the square sheet of paper, after an origami object has been created, highlights a wealth of geometric objects and properties.

## WE CREASE TO EXIST

My collection has been displayed at The Franklin Institute Science Museum, The Philadelphia International Airport, libraries, universities, corporations and hospitals. I collected models from throughout the United States and thirteen countries around the world, including China, Japan and Russia.



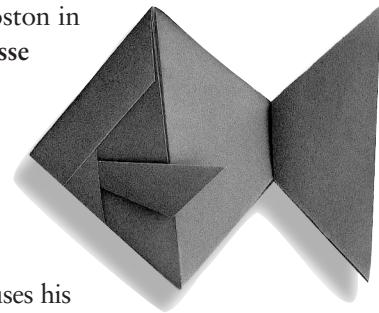


The youngest contributor is 4 years old and the oldest is 96. The models were created from a variety of papers from recycled magazines to traditional Japanese washi paper. Some of the models concentrate on symmetry, featuring 3-dimensional shapes such as cubes, stars and a colorful array of geometric designs. Others feature a variety of paper sculptures as varied as the imagination, a dragon, a high-heeled shoe and a Volkswagen bug. Many are gifts from my travels when I teach Math in Motion. I arrange to meet with artists and masters who contribute models to the collection.

In Japan, I had the opportunity to meet with **Akira Yoshizawa**, one of Japan's legends. Yoshizawa acted as an international cultural ambassador for Japan throughout his career. He is credited with raising origami from a craft to a living art. In all, he created more than 50,000 models, of which only a few hundred designs were diagrammed in his 18 books. He pioneered many techniques, including *wet-folding*. In this technique the paper is dampened before folding, letting the folder create a much more rounded and sculpted look. In 1983, *Japanese Emperor Hirohito* named him to the *Order of the Rising Sun*. Yoshizawa did not speak English but once we started folding, origami transcended the language difference. The translator explained to Yoshizawa that I work with young children and he promptly demonstrated the "Puppy Dog". He presented me with many samples, posters and flyers of his work which are now part of the collection. Yoshizawa passed away in 2005.

When some of the contributors visited the United States, they stayed in my home. While visiting, we would often fold late into the night sharing stories about our favorite models. **Robert Chen** from Singapore, folded the popular "Kawasaki Rose" designed by Kunihiko Kasahara each morning. At the end of his visit, Robert presented me with an origami box full of miniature Kawasaki roses. The Kawasaki rose requires a lot of skill as it is very challenging to fold circles out of a square piece of paper. **Wensdy Whitehead**, a local master folder from Massachusetts folded the intricate yolk inside the egg.

When I spoke at the Annual National Mathematics Conference (NCTM) in Boston in 1995, I met master folder **Michael LaFosse** who presented me with several "Happy Good Luck Bats." They were part of an original commercial design he created in a Sax Fifth Avenue window for Halloween in the 1990's. Hundreds of bats were hung in the rafters of the window. LaFosse, also a paper maker, often uses his own paper just to suit the models. His work has been displayed at the Louvre in Paris, France.





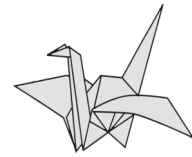
Several of the cranes are from my visit to Peace Park, Hiroshima, Japan. The tsuru (origami crane) is recognized as an international symbol of peace. It is based on a children's story, *Sadako and the Thousand Paper Cranes* by Eleanor Coerr. Every year many school children fold paper cranes to pay tribute to the victims of the atomic bomb and send them to the Children's Peace Monument in Hiroshima, Japan.

<http://www.hiroshima-is.ac.jp/etomite/index.php?id=63>

The full origami collection consists of over one thousand pieces. It will be donated to the Japanese House and Gardens in Fairmount Park, Pennsylvania and will be on display in their Visitor Center. My vision is that Math in Motion be a part of every grade child's educational experience. I am delighted and honored that my origami collection was selected to be exhibited in Artmobile this year and that my dream of sharing this experience with teachers and students continues to grow. Special thanks to Fran Orlando, Director of Exhibitions and Artmobile, Larissa Mellor, Exhibitions Assistant, and the Artmobile staff for their dedication and commitment to children and the arts. So, whether you are a student or experienced teacher, an engineer, or a mother raising a family, I hope you will unfold the joys and secrets of learning with origami.

To contribute a model to the collection or learn more about Math in Motion, please visit [www.mathinmotion.com](http://www.mathinmotion.com). Workshops, residency programs, teacher inservice, student and Family Math Night are available. [www.mathinmotion.com/workshops](http://www.mathinmotion.com/workshops)

For more information, questions and suggestions, please feel free to contact me at [info@mathinmotion.com](mailto:info@mathinmotion.com) or (215) 321-5556.



# Educational Benefits of Origami



## 101 Ways to Use Origami in the Classroom

### MATHEMATICS

Develop Shape, Size, & Color Recognition  
Develop Geometric Fundamentals • Measurement  
Apply Multiple Intelligences to Learn Math Facts  
Develop Math Concepts & Vocabulary  
Increase Writing in the Math Class • Explore Patterns, Make Connections  
Develop Symmetry • Congruence • Angles  
Develop Fractions • Ratio • Proportion  
Investigate 3-Dimensional Objects • Spatial Sense  
Develop Problem Solving and Analytical Thinking Skills

### SOCIAL STUDIES

Increase Multicultural Awareness & Appreciation  
Illustrate Historical Events & Holidays  
Fold and Send Cranes to Hiroshima, Japan on Peace Day, August 6  
Write to a Pen-Pal for cultural exchange  
Explore the Traditional Language, Music (Koto) & History of the East  
Promote Peace Education and Cultural Diversity  
Fold a Wolf! Learn How to Protect & Conserve Wildlife. Many children's fables give wolves a bad name. Retell the story and give it a new twist. Visit [www.wolfhaven.org](http://www.wolfhaven.org)

### ART

Develop the Ability to be Creative and Inventive  
Decision-Makers & Thinkers  
Explore Varied and Powerful Ways of Communicating Ideas, Thoughts and Feelings  
Nurture Creativity & Challenge Imagination  
Explore Original Ideas with Origami: Mobiles, Jewelry, Panoramas, Decorations  
Experiment with Different Materials, Patterns & Textures  
Recycle: Gift Wrap, Magazines Newspapers, Cards, Posters, Maps, & Calendars  
Create Variations of Small & Large Models  
Decorate a Bulletin Board • Seasonal  
Arrange an Origami Exhibit at your School or Local Library

### LANGUAGE ARTS

Develop Reading Readiness Skills: Recognize Pictorial Symbols (Spatial Skills are Precursors to Reading)  
Develop Verbal, Visual & Vocabulary Cues  
Develop Comprehension Skills  
Interpret Diagrams and Develop Critical Thinking Skills  
Develop Communication Skills • Stimulate Creative Thinking  
Create a Story based on the Arts Experience: Origami & Storytelling  
Illustrate Creative Dramatics with Origami Puppets  
Connect Multicultural Children's Literature & Mathematics

### SCIENCE

Fold Origami Animals, Birds, Insects, Flowers  
Fold a Whale for Earth Day! Research Whales & Other Endangered Species.  
Visit [www.endangeredspecies.com](http://www.endangeredspecies.com)  
Recycle Paper Resources—Environmentally Friendly  
Test the Velocity, Aerodynamics of Paper: Sail Origami Boats, Experiment with paper cups holding water, fly paper airplanes  
Promote Scientific Inquiry: Observe and Measure the Distance of Origami Jumping Frogs & Rabbits

### SOCIAL SKILLS

Develop Pro-Social Skills: Perseverance, Patience, Listening, & Following Directions  
Develop Precision, Sequence, & Organization Skills  
Reinforce Concentration, Memory, & Recall  
Develop Eye-Hand Coordination & Fine Motor Control Skills  
Foster Cooperation & Socialization  
Increase Motivation & Confidence  
Boost Self-Esteem  
Promote School-Home Connection: Encourage Children to Teach Family & Friends

From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl.

Support National and State Standards and Curriculum Requirements. Visit the Math in Motion website at: [www.mathinmotion.com](http://www.mathinmotion.com)

The crane is an international symbol of hope and peace. It is based on *Sadako and the Thousand Paper Cranes* by Eleanor Coerr.

# Classroom Activities

THE FOLLOWING ACTIVITIES will enhance your students' Artmobile experience. You may use the activities as they are described here, or modify them according to your classroom needs. Your creativity and dedication will bring these activities to fruition for your students. There are many resources on origami and its educational benefits. We recommend using the copy of *Math in Motion: Origami in the Classroom* by Barbara Pearl, which Artmobile has supplied for your school's library.

## Pre-Visit Activities

### The Folding Challenge!

*Materials:* 8.5" x 11" sheets of paper

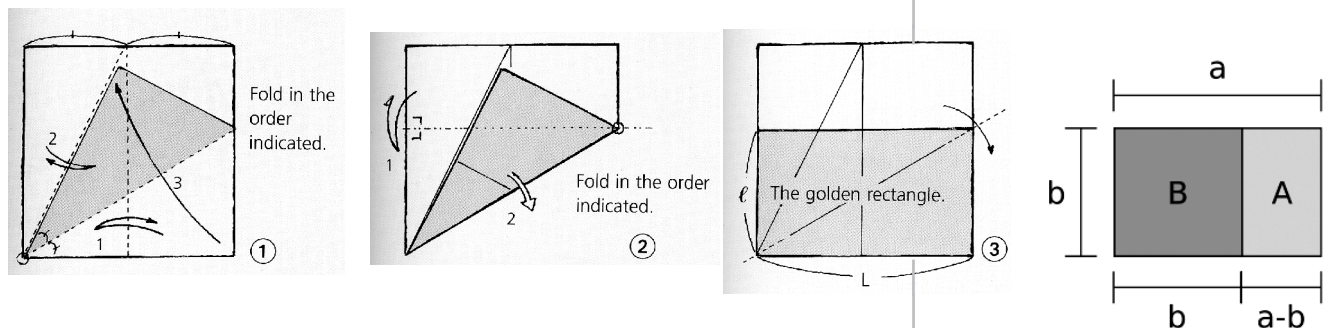
Instruct students to fold their paper in half as many times as they can, i.e. fold in half, then in half again, in half again...you may want to give them a few sheets of paper!

*How many times were students able to fold their paper in half?*

Ask students to describe why they made the decisions they made, how they began, and which fold to use next. Have students describe the shapes that resulted from their folds. Students can unfold their paper and create a color code for each shape. Then, color in the shapes accordingly.

*Additional Activity:*

1. The Golden Rectangle: Students can discover the golden rectangle through folding.



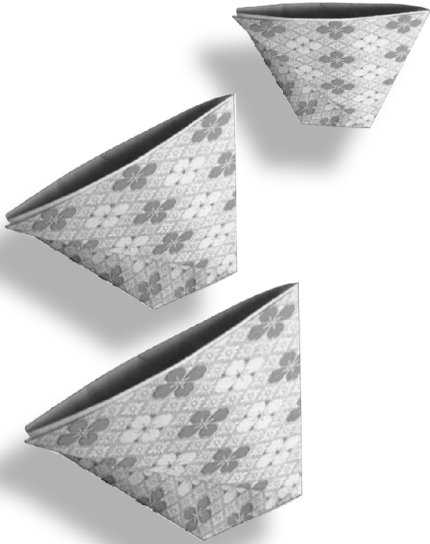
**Fun Fact!** In 2002, when she was a junior in high school, Britney Gallivan did the “impossible”—she folded a sheet of paper in half twelve times.

Before Britney completed the twelve folds, it was generally accepted that eight folds was the limit.

For more information about Britney’s “Impossible Challenge” visit:

<http://pomonahistorical.org/12times.htm>

## Tea Party



*Material:* Square paper

Fold a cup. See *Appendix A* for instructions.

*Discuss:* Tea is a significant aspect of many cultures. Ask students what types of tea they like to drink? What associations do they make with tea?

*Calm associations:* morning and afternoon tea with family and friends.

*Wild associations:* The Boston Tea Party.

*Additional Activities:*

1. **Taste Test:** Bring in a variety of teas (hot or iced) and allow students to sample and compare. Students can record the taste of each tea and then create a graph based on the information.
2. Students can research the Boston Tea Party. Then write about it and create illustrations.
3. Experiment to see if the paper cups will hold water. If the students use different papers, compare the effectiveness of different materials. Make it a contest and see which student's cup holds water the longest. Graph the results.

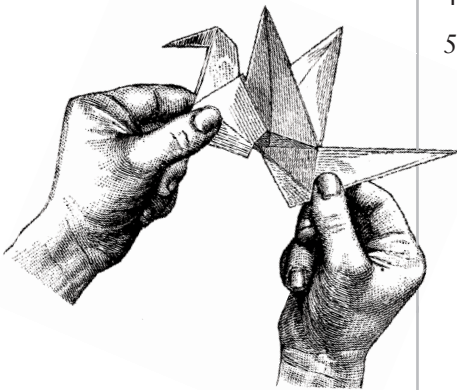
## A Thousand Paper Cranes

Read *Sadako and the Thousand Paper Cranes*, by Eleanor Coerr, (ages 9–12). Encourage students to share their thoughts or feelings about Sadako Sasaki's life story.

Fold a paper crane. (This is a more advanced origami model.) See *Appendix B* for instructions. For animated instruction on how to fold a paper crane, visit <http://www.mathinmotion.com/whalefld.html> and click on the link at the bottom of the page.)

*Additional Activities:*

1. Illustrate a scene from *Sadako and the Thousand Paper Cranes* that conveys a sense of caring and compassion for others.
2. Write a response to the story of Sadako.
3. Write a poem or haiku for peace inspired by their crane. See *Appendix C* for how to write haiku.
4. Measure the angles and identify the shapes made when folding their crane.
5. All cultures have folktales and stories. Ask students to research their ethnicity (they could investigate a popular story, learn about the art of a certain time period, or interview a relative). Have students present their findings. Students could then paint or draw a corresponding scene to a story (or if they learned about an art movement from a specific culture, create an artwork in that style).



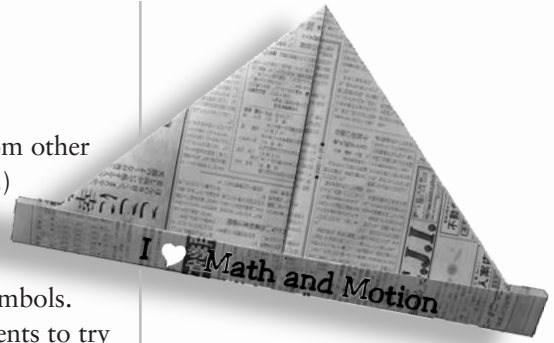
## Hats for Sale

**Materials:** Various papers.

Create a paper hat. It can be decorated with recycled materials from other art projects or from home. (eg. bits of ribbons, beads, sequins, etc.) See *Appendix D* for hat folding instructions.

**Additional Activities:**

1. Create a “store” setting and price tags with dollar and cents symbols. Some students can be venders and others shoppers. Allow students to try on many hats. Discuss the similarities and differences between the hats.
2. Read *Caps for Sale*, by Esphyr Slobodkina, (ages 3–7). Dramatize the story. Discuss peddlers and how they sell their wares. Discuss the students experiences hat shopping.
3. Have students wear their favorite hats to class and ask each to briefly tell why that hat is their favorite.
4. Photograph students in their caps. Then create an origami picture frame, which can be sent home as a holiday present! See *Appendix E* for picture frame folding instructions.
5. Learn about hats from different cultures and time periods. Discuss why different people wear certain hats. Why wouldn’t a medieval knight or an astronaut wear a baseball cap? Look at pictures, then have students create collages of a hat they design. After they have finished, be sure to have them present their creations and tell about the different functions of their design.

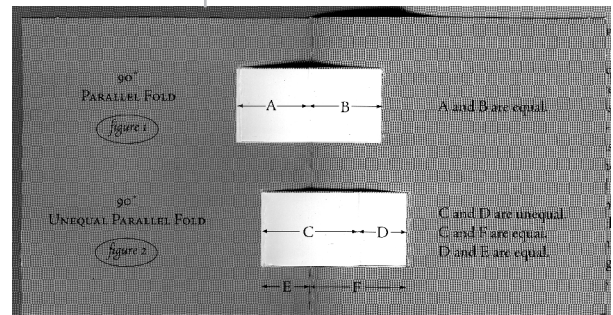
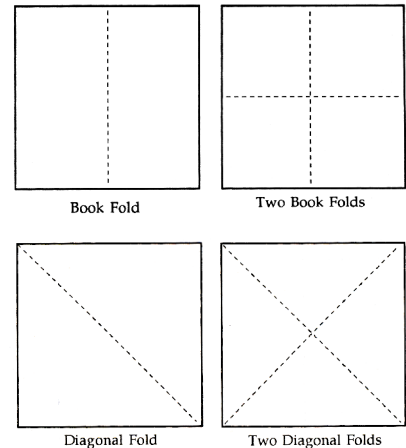


## Angles, Fractions, and More!

Students divide a square into equal parts; first is half, then quarters. How many equal parts can they divide their square into?! Discuss fractions. Ask students to identify the shapes that result from the folds.

**Additional Activities:**

1. Get out your protractors and pencils! Measure the angles that resulted from folding the square. Identify an acute angle, obtuse angle, and right angle. Encourage students to also find complementary and supplementary angles, vertical angles, alternate interior angles, alternate exterior angles, corresponding angles, an angles bisector, and parallel and perpendicular lines.
2. Create pop-up cards using a  $90^\circ$  Parallel Fold (the most basic pop-up). Use one piece of paper for the card. Then fold smaller pieces of paper in half (resulting in two equal parts). These pieces will need to be drawn on or decorated as they will be the pieces that pop up. The edges of each small piece of paper will need to be folded toward the inside crease. This will form a tab that can be glued to the card. This activity can be done on a special holiday or as a card to parents.





**Top, Hiroshige's print *Ohashi Bridge in the Rain*.**

**Bottom, Vincent Van Gogh's *Bridge in the Rain (after Hiroshige)*.**

## Post-Visit Activities

### Origami: The World Over

Students now have seen an array of origami objects created by artists throughout the world. From the history of origami students can learn how information and technology is shared between cultures and across time periods.

In groups or individually, ask students to research and write a brief history of origami. Have students present the information they found. Do they all have the same information? (It is likely that they will not, if they have cited different sources.) Why do they think that there are differences in information?

How does the spread of origami demonstrate the exchange of information between cultures throughout time? How has today's technology, specifically the internet, changed the way information is exchanged globally? What are the consequences of this?

#### *Additional Activities:*

1. Throughout history artists from around the world have influenced each other. Look at Vincent Van Gogh's *Bridge in the Rain (after Hiroshige)*, 1887, and Utagawa Hiroshige's print *Ohashi Bridge in the Rain*. Visit [www.van-gogh-on-canvas.com/prod168.htm](http://www.van-gogh-on-canvas.com/prod168.htm) to see a photo of Van Gogh's painting. For an image of Hiroshige's print please see [http://www.globalgallery.com/prod\\_images/hd-2082.jpg](http://www.globalgallery.com/prod_images/hd-2082.jpg). Discuss similarities and differences in the paintings. How does the color affect the mood of the paintings? How do students feel about Van Gogh "copying"? Then have students create their own paintings inspired by these artists. Or have them create a replica. To learn more about the influence of Japanese art on Van Gogh visit the National Gallery of Art's website: <http://www.nga.gov/press/1998/courtpr.htm>.

### Animal Mania

What are some of the animals students saw in Artmobile? Make a list on the blackboard. What can students tell you about these animals? Where do they live? What do they eat? What sounds do they make?

There are lots of stories about animals. Barbara Pearl's, *Whale of a Tale*, is one example students saw in Artmobile.

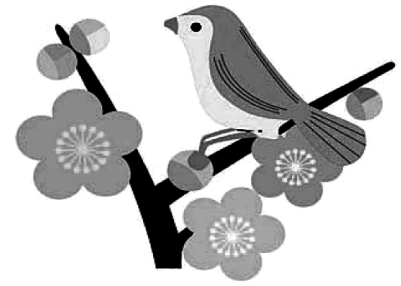
Have students fold an origami animal. Ask students to list the steps they used to fold their origami animal. Have students draw their model and include an environment. It can be realistic or imaginary, from the past or futuristic. Discuss the environment in which the students put their animals. Why did they choose that setting? What is the mood?

#### *Additional Activities:*

1. A **tall tale**, a distinctly American story, is a story that often attempts to explain a natural phenomenon. It is characterized by exaggeration. The tall tale originated during the time of American frontiersmen. Haiku is a Japanese form of poetry often about nature. Compare and contrast elements of the tall tale and haiku.

Ask students to write a tall tale or haiku using their animal or drawing as inspiration. See *Appendix C* for how to write haiku.

2. Many artists throughout time have used animals, real and imagined, in their artwork. Contemporary artist Alexis Rockman is one such artist. Look at Rockman's paintings, such as *The Farm*, 2000. Discuss the use of animals in the paintings and the social implications of the imagery. Please visit the Tang Teaching Museum at Skidmore College's website <http://tang.skidmore.edu/4/exhibitions/doc/590/> for more information and to view images.
3. Create comics or storyboards with their animal as the subject. Use any combination of drawing(s)—from photographs of real animals, drawing from the student's origami model, or gluing one or more models directly into the comic.
4. Encourage kindness to animals. Humane education is about learning to care for the animals in our homes and communities. It is about fostering kindness, respect and empathy for the environment and its diverse habitats. Humane education strives to establish a sense of responsibility and make the world a better, more humane and compassionate place for all. For more ideas read, *So, You Love Animals* by Zoe Weil. Request a free catalog or download an educator's packet from International Institute for Humane Education at: [www.iihed.org](http://www.iihed.org). See "Links & Resources" for "Creating a Humane Curriculum". Other resources include *Public Eye: Artists for Animals, Teaching Compassion through the Arts* at: [www.publiceyephilly.org](http://www.publiceyephilly.org). *Sowing Seeds Workbook: A Humane Education Primer* is an indispensable resource for educators who seek to empower their students to make compassionate choices, think critically, and be respectful. <http://www.teachkind.org/ssw-resources.asp>.



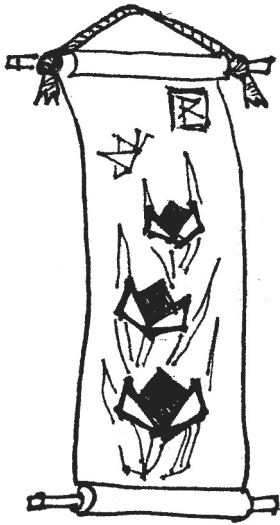
## Mad Scientists

In Artmobile, students looked at origami models through magnifying glasses. Ask students to describe what they saw. Then get out your magnifying glasses and microscopes and examine a variety of items. Have students record what they see in drawings. Discuss the physical properties of the materials.

### *Additional Activities:*

1. Explore texture further by having students create rubbings. Have students place a piece of paper on a variety of surfaces (a wall, desk, blacktop, sidewalk, tire tread, leaves, grass) and color on the paper. They may need to press hard and cover a solid area of the paper!
2. In an opaque garbage bag place a variety of objects. Try to choose ones that students will not be able to readily identify by touch. Have students come to the front of the room and reach in the bag. Ask them to describe an object and then return to their seat and draw what they felt (focusing on texture). After each student has felt inside the bag and drawn the object ask them what they thought the objects were. Then bring them out of the bag for all to see.





## Asian Origami Scrolls

Students saw a Japanese scroll with a landscape in Artmobile. Now is their opportunity to create their own. Discuss the use of landscape and natural elements depicted on many Japanese scrolls. Ask students if they can describe the scroll they saw in Artmobile. Then have students make a scroll. See *Appendix F* for Rhonda Rea's Asian Origami Scroll lesson plan.

*Additional Activity:*

1. Create Japanese fans by decorating and folding paper. See *Appendix H*.



# Bibliographies

## ***Books for Beginning-Intermediate Paper Folders***

- Beech, Rick. *Origami Handbook*. London: Hermes House, 2001. (also published under the name, *Origami: The Complete Guide to the Art of Paper Folding*) (Intermediate)
- Kallevig, Christine Petrell *Fold-Along Stories: Quick & Easy Origami Tales for Beginners*. Newburgh, Indiana: Storytime Ink International, 2001.
- Kasahara, Kunihiko. *Origami Made Easy*. Tokyo: Japan Publication, 1973. (Easy-Intermediate).
- Lewis, Shari and Lillian Oppenheimer. *Folding Paper Toys*, Lanham, Maryland: Scarborough House, 1963. (Easy)
- Pearl, Barbara. *Math in Motion: Origami in the Classroom K-8*. Pennsylvania: Crane Books, 2005. (Easy).
- Levenson, George. *How to Fold a Paper Crane*. 1994. Informed Democracy, P.O. Box 67, Santa Cruz, CA 95063 ( 800-827-0949. www.sadako.com
- Sakata, Hideaki. *Origami*, Tokyo: Harper & Row. 1984. (Easy-Intermediate).

## ***Children's Literature***

- Bang, Molly. *The Paper Crane*. New York: William Morrow & Company, Inc., 1985. (A mysterious man pays for his meal with a paper crane that comes alive, grades K-2.)
- Coerr, Eleanor. *Sadako and the Thousand Paper Cranes*. New York: G.P. Putnam's Sons, 1978. (A story about war, courage and peace, grades 3-6), video available.
- Kroll, Virginia and Nancy L. Clouse. *Pink Paper Swans*. Michigan: William. B. Eerdman, 1994. (A young African American girl and a Japanese woman find friendship through paper folding, grades 3-6.)
- Laurin, Anne. *Perfect Crane*. New York: Harper & Row, 1981. (A lonely magician gains friends through a paper crane he brings to life, grades 2-4.)

- Matsutani, Miyoko. *The Crane Maiden*. New York: Parents Magazine Press, 1968. (folktale, grades 3-5)
- Pearl, Barbara. *Whale of a Tale*. Pennsylvania: Crane Books, 2005. (includes folding instructions and reading readiness learning activities, Grades PreK-2)
- Rey, H. A. *Curious George Rides a Bike*. New York: Houghton. (George recycles his newspapers into an origami fleet of boats, instructions included, grades K-2)
- Tsuchiya, Yukio and Ted Lewin. *The Faithful Elephants: A True Story of Animals, People and War*. Boston: Houghton Mifflin Company, 1988. (grades 3-5)

## ***Mathematics in Origami***

- Fuse, Tomoko, *Unit Origami: Multidimensional Transformations*, Japan Publications, Inc., 1990.
- Kasahara, Kunihiko, *Amazing Origami*, Sterling Publishing Co., Inc., 2002.
- Pearl, Barbara. *Math in Motion: Origami in the Classroom K-8*. Pennsylvania: Crane Books, 2005. (Easy).

## ***Origami Animals***

- Lang, Robert J. and Stephen Weiss, *Origami Zoo*, St. Martin's Press, 1990.
- Rojas, Hector, *Origami Animals*, Sterling Publishing Co., Inc., 1993.

## ***Video***

- Sadako and the Thousand Paper Cranes* (30 minutes) DVD/video, narrated by Liv Ullmann (1991)

# Resources

## *Local Educators*

Barbara Pearl, *Math in Motion*  
phone: 215-321-5556  
email: [info@mathinmotion.com](mailto:info@mathinmotion.com)  
web: [www.mathinmotion.com](http://www.mathinmotion.com)

Rhonda Rea, *school and community programs, parties.*  
phone: 215-493-9505  
email: [jrpiz@aol.com](mailto:jrpiz@aol.com)

Betty Tsai, *tea ceremony programs.*  
email: [tsaib@bucks.edu](mailto:tsaib@bucks.edu)

## *National Membership Organization*

Origami USA. 15 West 77th Street, New York,  
NY 10024 (212-769-5635). [www.origami-usa.org](http://www.origami-usa.org)

## *Paper Sources*

**Math in Motion**—Giant Origami Classroom paper pack (400 sheets) assortment of multicolored 6-inch paper squares (economical) and foil papers. [www.mathinmotion.com/resources](http://www.mathinmotion.com/resources)

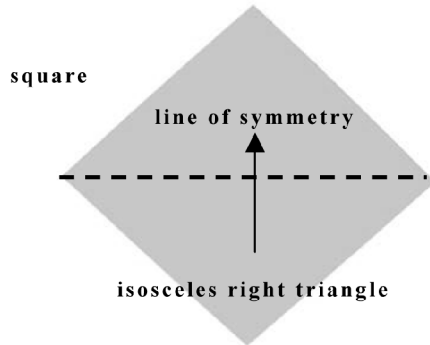
**NASCO Arts and Crafts**—an assortment of origami paper and sizes. [www.nascofa.com](http://www.nascofa.com)

**Paper Jade**—Fine Japanese Papers for Origami includes a wide selection of origami paper, including hand-made washi and metallics. [www.paperjade.com](http://www.paperjade.com)

Local and online craft and art supply stores such as **Michaels**, **AC Moore**, [www.PearlPaint.com](http://www.PearlPaint.com), and **Allegheny Art** offer a variety of origami paper supplies.

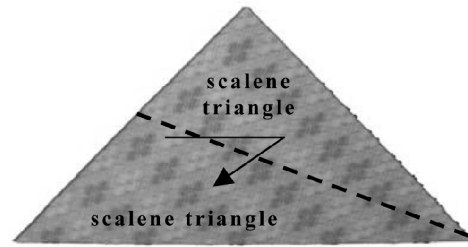
# Appendices

## A. How to Fold A Cup

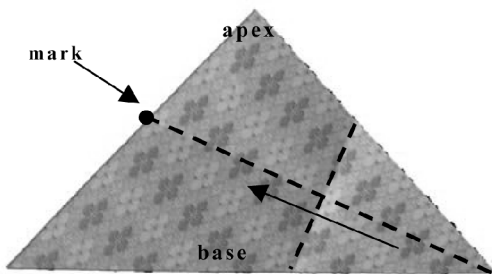


**1** Start with a square, white side up. Fold in half along the dotted line.

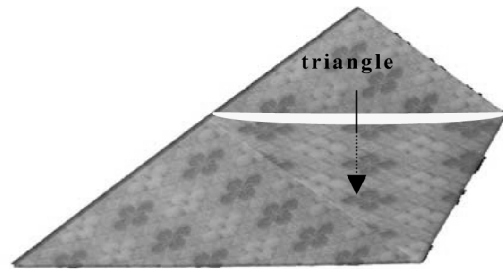
Cup



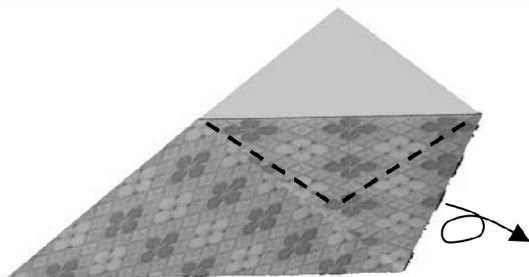
**2** Fold the right edge of the top layer to the bottom edge. Unfold.



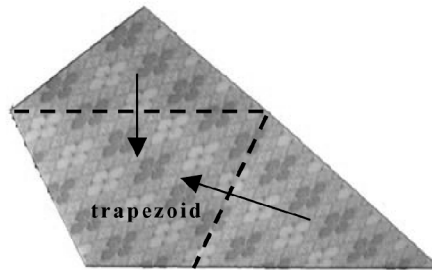
**3** Fold the bottom right corner along the dotted line to the mark on the opposite side. Crease sharply.



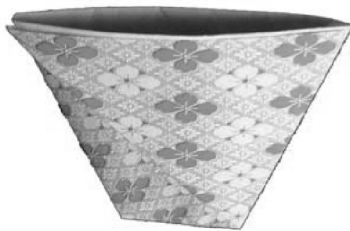
**4** See the pocket in the flap you have just made? Fold the top (front) triangle above the pocket downward and slide the triangle into the pocket of the cup as far as it will go.



**5** The flap is now locked into place. Turn over.



**6** Repeat step #3 and #4.



**7** Finished cup!



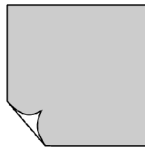
**8** Made of newspaper about 23 inches square, the cup becomes a hat.

From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl [www.mathinmotion.com](http://www.mathinmotion.com)

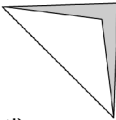
## B. Folding A Paper Crane

# HOW TO FOLD A PAPER CRANE

Begin with a **square** piece of paper — ideally one side colored and the other plain. Place the colored side face up on the table. In all diagrams, the shaded part represents the colored side.

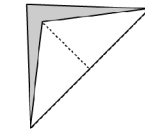


**1** Fold diagonally to form a triangle. Be sure the points line up. Make all creases very sharp. You can even use your thumbnail.

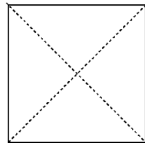


Unfold the paper. (important!)

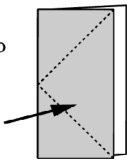
**2** Now fold the paper diagonally in the *opposite* direction, forming a new triangle.



Unfold the paper and **turn it over** so the white side is up. The dotted lines in the diagram are creases you have already made.

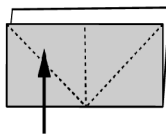


**3** Fold the paper in half to the "east" to form a rectangle.

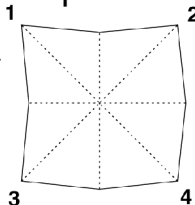


Unfold the paper.

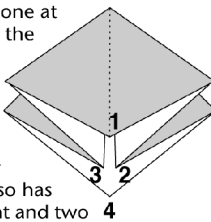
**4** Fold the paper in half to the "north" to form a new rectangle.



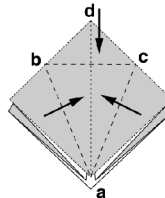
Unfold the rectangle, but don't flatten it out. Your paper will have the creases shown by the dotted lines in the figure on the right.



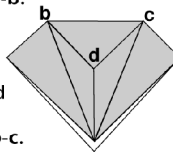
**5** Bring all four corners of the paper together, one at a time. This will fold the paper into the flat square shown on the right. This square has an open end where all four corners of the paper come together. It also has two flaps on the right and two flaps on the left.



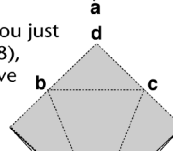
**6** Lift the **upper right** flap, and fold in the direction of the arrow. Crease along line **a-c**.



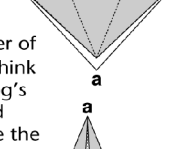
**7** Lift the **upper left** flap and fold in the direction of the arrow. Crease along the line **a-b**.



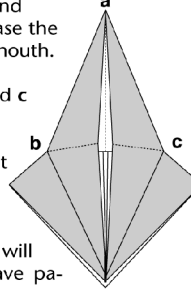
**8** Lift the paper at point **d** (in the upper right diagram) and fold down the triangle **bdc**. Crease along the line **b-c**.



Undo the three folds you just made (steps 6, 7, and 8), and your paper will have the crease lines shown on the right.

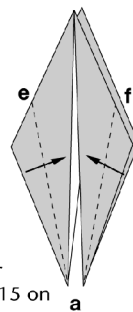


**9** Lift just the top layer of the paper at point **a**. Think of this as opening a frog's mouth. Open it up and back to line **b-c**. Crease the line **b-c** **inside** frog's mouth.



Press on points **b** and **c** to **reverse** the folds along lines **a-b** and **a-c**. The trick is to get the paper to lie flat in the long diamond shape shown on the right. At first it will seem impossible. Have patience.

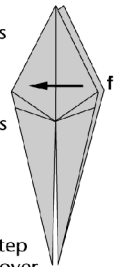
**10 to 13** Turn the paper over. Repeat Steps 6 to 9 on this side. When you have finished, your paper will look like the diamond below with two "legs" at the bottom.



**14 & 15** Taper the diamond at its legs by folding the **top** layer of each side in the direction of the arrows along lines **a-f** and **a-e** so that they meet at the center line.

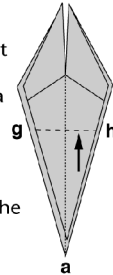
**16 & 17** Flip the paper over. Repeat steps 14 and 15 on this side to complete the tapering of the two legs.

**18** The figure on the right has two skinny legs. Lift the **upper** flap at point **f** (be sure it's just the upper flap), and fold it over in the direction of the arrow — as if turning the page of a book. This is called a "book fold".



Flip the entire figure over.

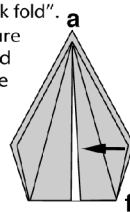
**19** Repeat this "book fold" (step 18) on this side. Be sure to fold over only the **top** "page".



**20** The figure on the right looks like a fox with two pointy ears at the top and a pointy nose at the bottom. Open the **upper** layer of the fox's mouth at point **a**, and crease it along line **g-h** so that fox's nose touches the top of the fox's ears.

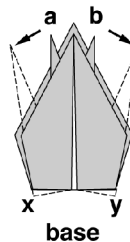
**21** Turn the figure over. Repeat step 20 on this side so that all four points touch.

**22** Now for another "book fold". Lift the **top** layer of the figure on the right (at point **f**), and fold it in the direction of the arrow.

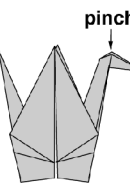


**23** Flip the entire figure over. Repeat the "book fold" (step 22) on this side.

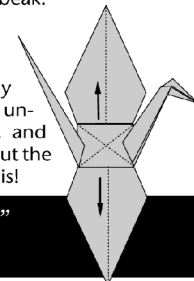
**24 & 25** There are two points, **a** and **b**, below the upper flap. Pull out each one, in the direction of the arrows, as far as the dotted lines. Press down along the base (at points **x** and **y**) to make them stay in place.



**26** Take the end of one of the points, and bend it down to make the head of the crane. Using your thumbnail, **reverse** the crease in the head, and **pinch** it to form the beak. The other point becomes the tail.



Open the body by blowing into the hole underneath the crane, and then gently pulling out the wings. And there it is!



*"I will write 'peace' on your wings, and you will fly all over the world."*

SADAKO SASAKI

© 1998 George Levenson. All rights reserved. These instructions accompany the live action video **HOW TO FOLD A PAPER CRANE**.

Visit our website at [www.sadako.com](http://www.sadako.com) or write Informed Democracy, P.O. Box 67, Santa Cruz, CA 95063. Telephone: 1 800 827-0949

## C. Haiku

# Have Fun With Haiku

Haiku (hai-ku) is a Japanese poem about feelings and nature. It comes from two Japanese words meaning “play” and “poem.” Each poem has **three lines** and contains **17 syllables**. The **first** and **third lines** have **five syllables** each and the **second line** has **seven syllables**. Count the syllables in each line. These haiku poems were written by children.

Flowers are blooming (5)  
birds are singing in the trees (7)  
spring is everywhere. (5)  
-Jason



The graceful crane flies  
high above the mountain tops  
teach me how to soar.  
-Erica

Snow flakes in the sky  
drift slowly to the wet ground  
one cold winter day.  
-Seth



Close your eyes. Think about nature. Write a Japanese haiku poem. Illustrate it on the back.

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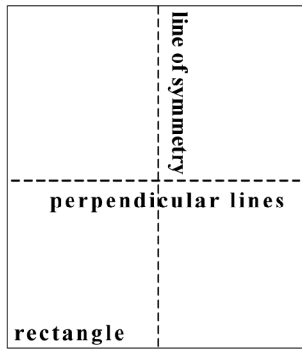
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From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl [www.mathinmotion.com](http://www.mathinmotion.com)

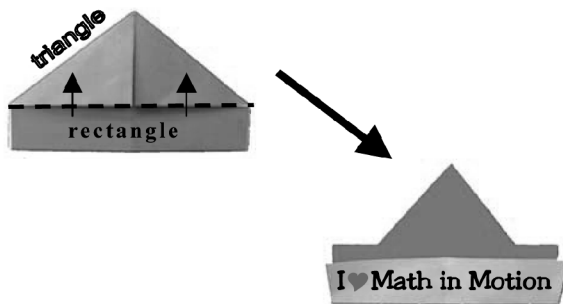
## D. Folding Paper Hats

### Sailor's Hat

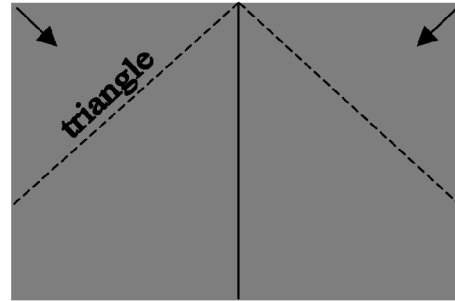


- 1 Start with an 8.5 x 11 inch rectangle or sheet of newspaper 22 x 13 inch. Fold in half lengthwise. Unfold. Fold in half crosswise.

*Fold this step if using 8.5" x 11" paper*

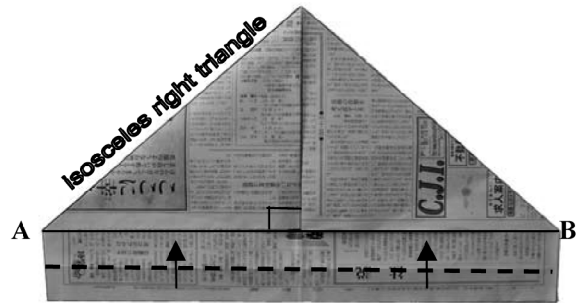


- 3 Fold TOP LAYER OF PAPER ONLY, along the bottom edge of the horizontal dotted line over triangles. Repeat on the other side. Your hat is now finished!

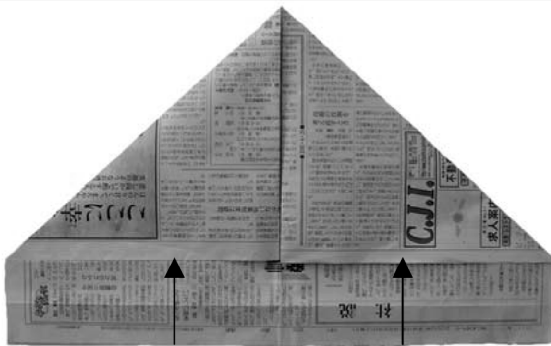


- 2 Fold outer corners along diagonal dotted lines to meet at the centerline.

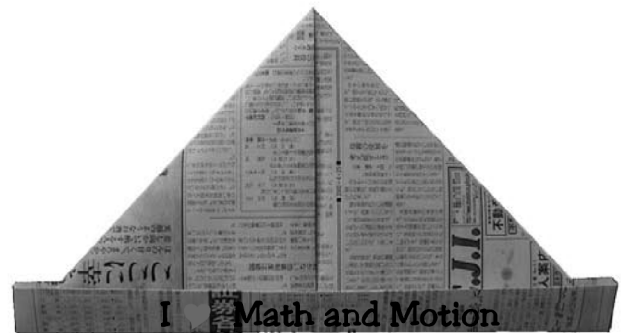
Fold step 3-5 to make a newspaper hat that you can wear.



- 3 Fold TOP LAYER OF PAPER ONLY, along the bottom edge of the horizontal dotted line up to line AB (see arrows).



- 4 Fold the bottom edge up again over the triangles to lock in place. Turn the hat over and repeat steps 3 and 4 on the other side.

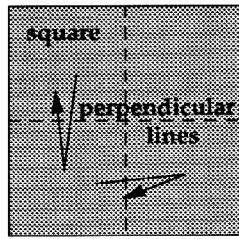


- 5 Aye, aye, Captain! Your newspaper hat is ready to decorate and wear.

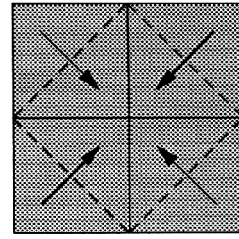
From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl [www.mathinmotion.com](http://www.mathinmotion.com)

## E. Picture Frame

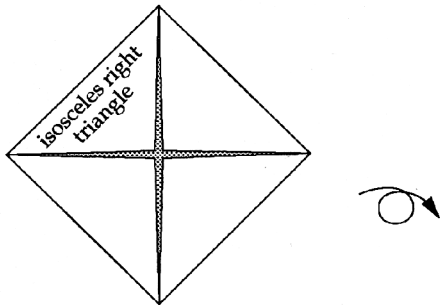
# Picture Frame



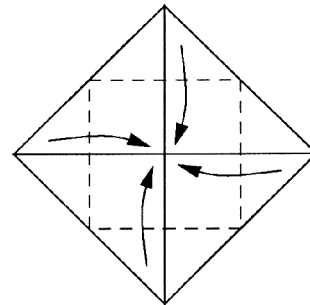
- 1** Start with a square, colored side up. Fold the bottom edge up to the top. Unfold. Fold the left side to the right side. Unfold.



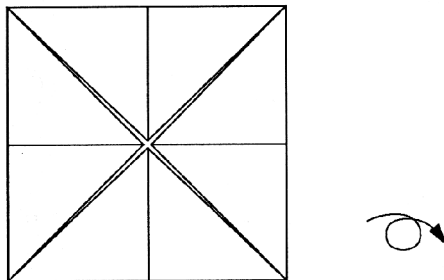
- 2** Fold each corner to the midpoint.



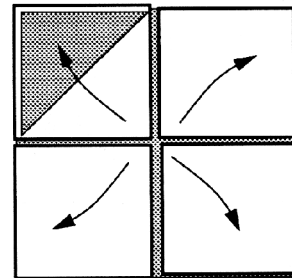
- 3** It looks like this. Turn over.



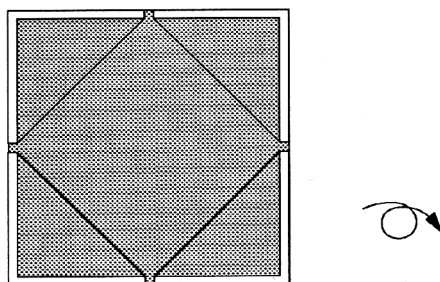
- 4** Fold each corner to the midpoint again.



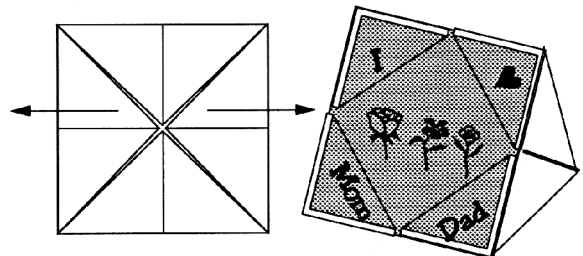
- 5** Now it looks like this. Turn over again.



- 6** Starting at the midpoint, fold each inside corner of each square to the outside corner forming small triangles.



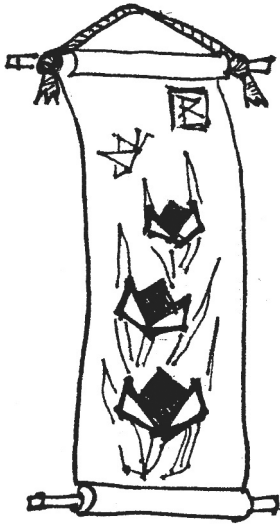
- 7** Turn the picture frame over.



- 8** Unfold opposite triangle flaps (see arrows) so that they are perpendicular to the side edges of the frame (pointing up). The frame will lean slightly backwards as it rests on the slanted edges of the flaps.

From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl [www.mathinmotion.com](http://www.mathinmotion.com)

## F. Asian Origami Scroll



### Objectives:

- To understand that some Asian art is based on elements found in nature;
- To use the basic vocabulary of geometry while folding triangles and squares;
- To learn concepts of small and large (-er,-est) and how they are visually related to placement on the page and the illusion of space;
- To be exposed to elements of Japanese culture (chopsticks, hand-made paper and artist's signature stamp).

### Materials:

3 isosceles right triangles of *duo origami paper*, graduated in size\*

- (1) at 4.5"
- (1) at 3.5"
- (1) at 2.75"

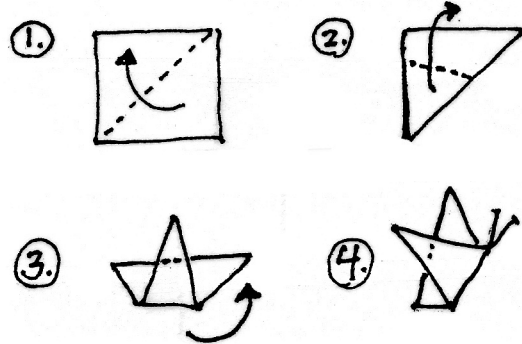
OR use above size triangles of white paper that students can color themselves.

- (1) 2" square of origami paper for butterfly
- (1) sheet of handmade paper 6" X 18" for scroll (look for 24"x 36" and cut to 8 strips)\*
- (1) set of chopsticks
- (1) 12" piece of ribbon or yarn
- Glue stick
- Crayons or markers
- Red stamp pad
- (2) pieces approx. 1" X 1.25" of styrofoam produce trays
- Paper clips
- Scotch tape

### Procedure:

1. GLUE one chopstick to both the top and bottom of the scroll strip of paper (short sides).  
*Tip:* Place glue on the paper edge and then roll the chop stick onto the paper edge. Add more glue to the new paper edge and roll again.
2. FOLD all 3 triangular pieces into tulips (See Tulip instructions).
3. GLUE largest tulip first near the bottom of the scroll paper, the medium tulip above the largest and

- then the smallest tulip above the medium tulip, leaving some space between them to color leaves.
4. USE MARKERS or CRAYONS and draw leaves for the tulips leaving room for artist's signature stamp and the butterfly at the top of the paper.
5. BUTTERFLY: Glue it above the smallest flower. Draw in antennae for fun.



6. STAMP: Create an Asian artist's signature stamp—
  - A. Tape one foam piece on top of another in a cross shape.
  - B. Turn the foam stamp over and use the straight end of a paper clip to carve into the foam to create a stamp. Students can use their initials or any other symbol that they identify with.  
*NOTE: Initials will be reversed in the printing process.*
  - C. Practice inking the signature stamp on red ink pad and print a few times on scrap paper.
  - D. Stamp it once in the upper corner of the scroll, in the traditional way of Asian artists.
7. To hang the scroll, tie the ribbon to the top chop stick and enjoy!

\*Notes: Duo origami paper is color on both sides. It is available in arts and crafts store. An alternative is to color the white side of the paper or glue another color sheet of paper to the plain side.

- More advanced students can prepare their own isosceles triangles from an 8.5" x 11" paper by measuring 4.5" from both directions of a right angle corner and then connecting the 2 points with a ruler and accurately cutting the paper. Then they can create the 3.5" and 2.75" triangles using the same technique with the remaining corners of the paper.
- Scroll Paper. *Kozo* paper is available at Allegheny Art Co., for \$2.72/sheet yields 8 student scrolls per sheet.

*Lesson Plan by Rhonda Rea*



## G. Post-Visit Hand-Out



Name \_\_\_\_\_ Date \_\_\_\_\_

1. The origami in Artmobile is part of the collection of Barbara Pearl. If you were going to start a collection at your house which piece of origami in Artmobile would you want to take home? Why? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. Rhonda Rea made two pieces especially for Artmobile. What were they?

\_\_\_\_\_

3. What culture did you learn about in Artmobile? \_\_\_\_\_  
List three things that you learned about this culture: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. *Ori* means \_\_\_\_\_ *Kami* means \_\_\_\_\_

5. The crane is a symbol of \_\_\_\_\_ and \_\_\_\_\_

6. In Artmobile you saw many shapes. Look around your classroom. How many different shapes can you find? Draw them on the back of this page. *Hint: This paper is a rectangle.*

7. Many pieces of paper were used to make the teapot. Into what shape was each folded? \_\_\_\_\_  
How many pieces were used? \_\_\_\_\_  
What is the special term for origami made in this way? \_\_\_\_\_

*Answer Key:*

2. The Large Elephant and the Moving Lips.
3. Part 1: Japanese.  
Part 2: Examples include: origami, the kimono, the story of Sadako, the crane.
4. Ori—"to fold" Kami—"paper"
5. Peace and Good Luck.
7. Part 1: a triangle  
Part 2: about 300  
Part 3: unit origami

## H. Japanese Fan

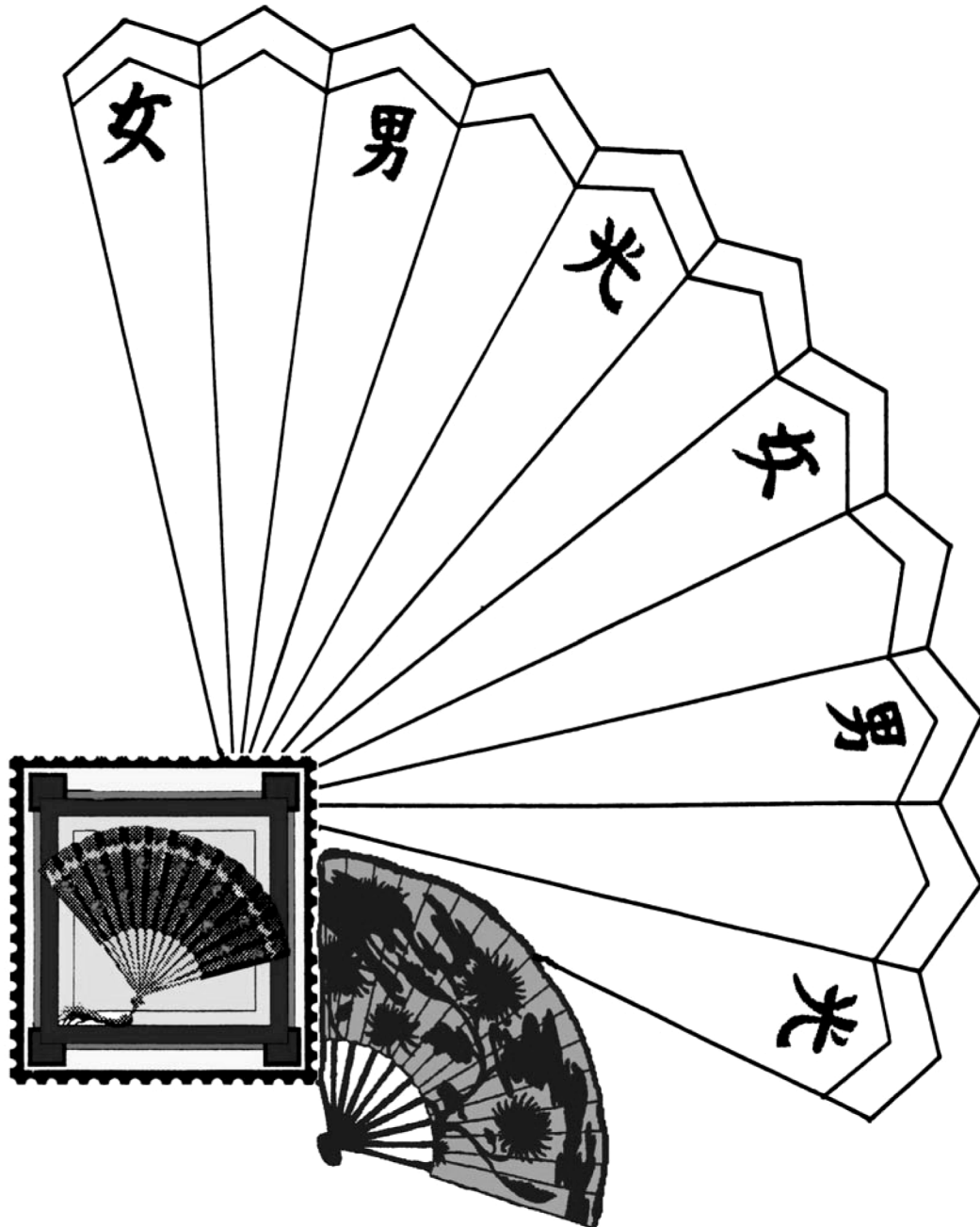
# I'm a Japanese Fan

The fan is a symbol of good luck.

It represents the unfolding future.

Write something new that you have learned  
about today inside each section of the fan.

Color the fan bright ✨ colors.



From: *Math in Motion: Origami in the Classroom K-8* by Barbara Pearl [www.mathinmotion.com](http://www.mathinmotion.com)



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