# Table of Contents

ŧ

# Part I

### Introduction

Introduction	<b>5</b>
History of Origami	
Mathematics and Origa	imi
Carrers   Opportunities	• Choices

#### Part II

**Fundamentals** 

Educational Benefits of Origami
Square Power
Folding Concepts
Enter the Fold (Analyzing a Diagram)

## **Part III**



Principles of Paper folding	
Paper Resources (Budget Friendly)	63
Pattern Papers	T
10 Teaching Techniques	10

# **Part IV**

### **Teaching Guidelines**

Lesson Plan Guide (Read First) <>>	35
Procedure (Review before Teaching)	36
Cross-Reference Chart	37
Origami isn't Just for Squares	38

### Part V **Paper Folding Projects**

	Symbols	41
	Models made from Rectangles	
	Heart 🦊 🔺	42
	Sailor's Hat (Newspaper)	44
	*Box - How to Fold a Box	46
-	Journal	50
	*Jumping Frog – How to Fold a Frog	52
	*	
	How to Make a Square	56
	Models Made from Squares	
	*Whales – How to Fold a Whale	
	Quadrilaterals – Square Motion	57
	Wolf	62
	Pig 🔽 😯	64
	Candy Cane	66
	Cup 🔰 📷	68
	Picture Frame	70
	How to make an Isospeles Triangle	72
	Models Made from Triangles	
	*Dog — How to Fold a Dog – Math	
	Word Search - Try-Angles - Triangle Tow	er –
	How to make an Equilateral Triangle from	a
	Rectangle	73
	Cat 🧨	80
	Sailboat	82
	Sailboat 🥏 Tulip 🍆 Dog 🥨	84

\*Teacher Scripts

#### Part VI Cultural & Educational Enrichment

Math in Motion Poster	87
Book Marks	88
Math Journals	89
Pearls of Wisdom	90
I'm a Japanese Fan	91
Dot to Dot	92
Maze Craze	93
Fun with Haiku	94
Fish are Fascinating Animals	95
Can you Speak Japanese?	96
Writing Japanese Numbers 日本語	97
Tangram Puzzles	98
Fortune Cookies	99
A Thousand Cranes of Origami	100
How to make an Origami Mobile	101
Mathematics 6/2	102
Math Word Scramble	103
Draw a Diagram 🥖 🗌 🛜	104
· · · · · · · · · · · · · · · · · · ·	

#### Part VII Resources

What to Do with Origami  🧏	107
Children's Origami Exhibit	108
Certificate of Accomplishment	109
Glossary (English/Español)	110
Numbers/Números	113
Suggested Readings & Resources	114
Notes 📃 🤌 🦉	117
About the Author	118



#### **Models Made from Squares**





This fishy model is easy and good for beginners. Have a whale of a time! **FUN FACTS:** The whistle of the blue whale is the loudest sound produced by any animal at 188 decibels.

Strand: Geometry • Spatial Sense • Patterns • Connections • Science

Materials: A 6-inch or larger square (15 cm), start white side up

Concepts	&	Voca	bular	γ:
----------	---	------	-------	----

square	quadrilateral	triangle	scalene triangle
congruent	vertical	center	isosceles right triangle
right	left	point	line of symmetry

#### Additional Activities:

**1.** How many ways can a square be divided into 4 equal parts?



2. Make a whale as a Father's Day card for a "Whale of a Dad." Use as name tags for the first day of school "a school of fish" or "Back to School" Night.



- **3.** Did you know whales sing? Nobody knows for sure, but perhaps they are singing the blues. Listen to Paul Winter's, "Lullaby from the Great Mother Whale for the Baby Seal Pups," *Concert for the Earth, Live at the United Nations*. Younger children will enjoy singing "Baby Beluga" with *Raffi in Concert*.
- **4.** Read *A Thousand Pails of Water* by R. Roy (K-2), *Whale of a Tale* by Barbara Pearl (PreK-2) includes a study guide available at: www.mathinmotion.com/studyguides, *Humphrey, The Wayward Whale* by E. Callenbach (K-6) and other stories about fish-like mammals (dolphins, manatees, porpoises, seals, and walruses). The *Whale's Stomach* lesson plan (Grades 4+) by the Institute for Humane Education raises awareness about ocean pollution and its effect on sea animals. See lesson plan at: www.info@mathinmotion.com/whalesstomach. To adopt a whale, contact:

Greenpeace 1436 U Street, N.W. Washington, D.C. 20009 1-800-456-4029 www.greenpeace.org Save the Whales 1192 Waring Street Seaside, CA 93955 1-800-942-5365 www.savethewhales.org



Visit: www.mathinmotion.com



1. Place a square sheet of paper on the table so it looks like a diamond shape.

What shape is the paper?	Square.
How many sides does a square have?	4 sides.
What else can you say about the sides?	The sides are the same or <b>congruent.</b>
Another name for a four sided figure is	quadrilateral (see Quadrilaterals, p. 60).
Can you think of other quadrilaterals?	Rectangle, parallelogram, rhombus,
	trapezoid.
Name other quadrilaterals in the room.	Book, chalkboard, desk, table, window.

2. Fold the right point over to the left point. Unfold.

What is the <b>vertical</b> line?	Line of Symmetry.
What is a line of symmetry?	A line of folding so that the two halves of a figure match.
What shape did it create?	Triangles.
What kind of triangles?	Isosceles right triangles.
What is an isosceles right triangle?	It has two sides that are congruent and a
	square corner.

Fold the lower left and right sides to the vertical line of symmetry. Unfold the paper and discover more triangles.
 What kind of triangles?

what kind of triangles?	Scalene triangles.
What are scalene triangles?	They have no congruent sides.
How many triangles are there?	Six. Refold the model.
What does it look like?	It looks like a kite or an ice cream cone.

4. Fold the apex (top point) down to the base (widest part of the kite) to form a small triangle ▲. Unfold.

How many triangles are there?

What other shapes do you see on the kite?

11. See triangles ABD, ABC, ADC, AEG, AEF, AGF, AEH, AGH, EFH, GFH, EHG.

G

Trapezoid. Quadrilateral.

- 5. Refold the model. Fold the **right** side over to meet the **left** side.
- 6. Put your finger on the bottom point as you turn the whale sideways.
- 7. Fold the **point** up to make a tail. Draw a happy face. Have a whale of a day!  $\underbrace{!!}$

**Challenge/Cooperative Activity** 

# Quadrilateral

Quad-ri-lat-er-al is Latin for a figure that has four sides. "Quad," means four and "lateral," means side. Find other quadrilaterals.

- 1) Look for objects in the room that are similar in shape.
- 2) Trace the geometric shapes below and draw another one.
- 3) See *Tangram Puzzles*, p. 98 and make a quadrilateral.
- **1. Square -** a figure that has four right angles and four sides of equal length. Every square is a rectangle.
- **2.** Rectangle a quadrilateral that has four right angles. Every rectangle is a parallelogram.
- **3. Parallelogram -** a quadrilateral that has two pairs of parallel sides and two pairs of congruent sides.
- **4. Rhombus -** a parallelogram that has four congruent sides. Every rhombus is a parallelogram.
- **5. Trapezoid** a quadrilateral that has exactly one pair of parallel sides.