

**Young Audiences  
of Northeast Texas, Inc. presents:**

## **Evelyn James**



### **Teacher Expectations**

Young Audiences of Northeast Texas thanks teachers for helping maximize the learning experience by adhering to the following guidelines.

1. **Please remain in the performance area with your class.** The performers cannot present the program without the teacher present.
2. Please have each student wear a nametag so that the performing artist can call each student by his/her name.
3. Please help minimize the need for a student to leave the performance by having a restroom break before the performance, if necessary.
4. Please assist the artists in maintaining appropriate student behavior during the performance. All attendees should be attentive to the artist.

### **Student Expectations**

1. Listening is very important. Wait for your turn to speak and use good listening skills while the artist is performing: hands in lap, feet still, and face toward the performance.
2. When you appreciate a performance, you show that appreciation through applause. Once the performance is over you may applaud, or if you appreciate something during a performance, you may applaud.

## **Power of Math**

**Grades 3 - 5**

**45 minutes**

### **About the Artist**

Evelyn James is Programming Associate at Tyler Public Library. She is responsible for programs, events, and exhibits for all ages at the library.

Ms. James holds an MA in English, speech, and theatre, a BA in speech communications, and a BS in printing. She has been touring nationally as a professional storyteller since 1900. Ms. James also is an actress and director, teaches on the staff of Tyler Civic Theatre's Acting Conservatory, and has taught as an adjunct instructor in UT Tyler's theatre program.

Founder of East Texas Storytellers, Ms. James helps produce Squatty Pines Storytelling Festival each year. She also teaches drama workshops for adults, youth, and children in speech, theatre, arts, and storytelling.

### **About the Program**

In this fun and interactive program, Ms. James engages students in stories and activities involving multiplication, probability, and shapes. Students will learn about math and chess and can create their own shapes to make tangrams.

### **Word List**

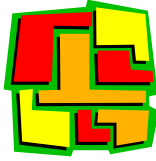
**Chess:** a board game played by two players, each with 16 pieces representing a king and his attendants. The object is to capture (checkmate) the opponent's king.

**Tangrams:** a puzzle originating in China that involves putting together seven pieces, usually a square, a parallelogram, and five triangles, to form different shapes

### **Workshop Needs**

1. Please clear a place 12' deep and 12' wide for the storyteller. Lights on.
2. Set up time: 15 minutes.

## Pre-performance Activities



### Math

- Discuss tangrams with your students.
  - A tangram is a Chinese puzzle. It consists of 7 pieces, called tans, that fit together to form a square.
  - These pieces are: 5 right isosceles triangles, 1 square, 1 parallelogram.
  - Famous people who have been associated with tangrams are: 1) Jacob Bronowsky proved the Pythagorean theorem with it; Lewis Carroll was a great enthusiast of tangrams; Napoleon allegedly passed time on Elba working tangrams.
- Invite your students to make their own set of tangrams (see attached instruction sheet).
  - Ask them to create designs (examples attached) using the tans that they have created.
  - Use the following vocabulary as they perform these activities: acute angle, congruent angle, obtuse angle, parallel lines, parallelogram, trapezoid.

Math TEKS 3.9A-C; 4.8A-C; 5.7A, B



## Post-performance Activities



### Math

- Invite your students to consider a chess game. You can mark off with masking tape on the floor a chess board. Encourage your students to play the game (rules and instructions can be found at [www.princeton.edu/~jedwards/cif/chess](http://www.princeton.edu/~jedwards/cif/chess) ).
  - Ask them what math concepts are active in this game and how they use them.



### Language Arts

- Invite your students to write two paragraphs explaining the way in which one plays chess and strategies to help win.
- Ask them to write a letter to persuade their school's principal to make chess a part of the math curriculum.

Language Arts TEKS 3.14B, 3.14C;

Thank you for allowing Young Audiences of Northeast Texas to share these artists and performances with your students. The children's written thank you notes may be sent to:

### Young Audiences of Northeast Texas

C/O Dana Sudduth  
200 East Amherst  
Tyler, Texas 75701

## Making Tangram Pieces by Folding Paper

### Curriculum Tie:

- **Mathematics**  
3rd Grade  
[Standard II](#)  
[Objective 1](#)

### Summary:

This activity provides step-by-step directions for making tangram pieces.

### Main Curriculum Tie:

Mathematics - 3rd Grade

[Standard III Objective 1](#)

Describe, identify, and create geometric shapes.

### Materials:

- One sheet of construction paper per student
- Scissors

### Additional Resources

#### Book

- *Grandfather Tang's Story*, by Ann Tompert; ISBN 0517885581

### Web Sites

- [National Library of Virtual Manipulatives](#)

### Background For Teachers:

#### Geometry Definitions

*Acute*—an angle that is smaller than a right angle (i.e., measures less than 90 degrees)

*Congruent*—figures, segments, or angles that have the same size and shape

*Obtuse*—an angle that is greater than a right angle (i.e., measures more than 90 degrees)

*Parallel*—lines that do not intersect

*Parallelogram*—a quadrilateral with two pairs of parallel sides

*Trapezoid*—a quadrilateral with exactly one pair of parallel sides

### Intended Learning Outcomes:

1. Demonstrate a positive learning attitude toward mathematics.
2. Become mathematical problem solvers.
3. Reason mathematically.
4. Communicate mathematically.

### Instructional Procedures:

#### Invitation to Learn

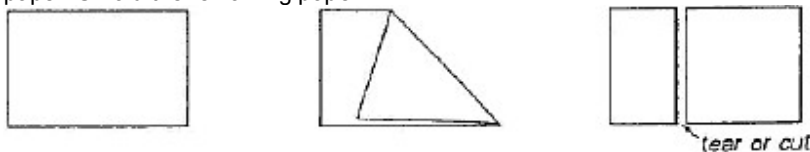
Tell or read *Grandfather Tang's Story*.

#### Instructional Procedures

Use the following step-by-step directions (word for word if you choose) to direct this activity. [*In brackets are discussion suggestions that emphasize geometric concepts.*] At each step along the way, it's helpful if you fold and tear a large piece of paper as a demonstration.

By the way, instead of cutting, fold back and forth, then lick, fold, and tear! It works!

1. First we need to make a square piece of paper. Fold your sheet so that a shorter side coincides with a longer side. Tear (or cut) off the excess strip of paper. Unfold the remaining paper.



*[Discuss the original shape (rectangle), and the shape you now have (square).]*

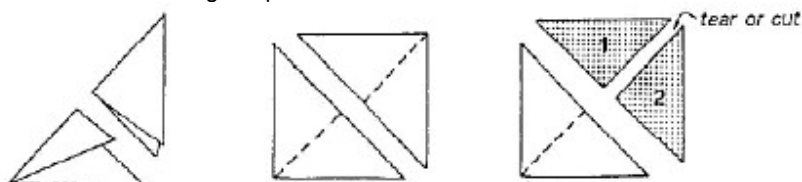
*Note: After each of the following steps, have students reassemble the torn pieces into a square before going on.*

2. Fold along the diagonal in the square. Tear along the fold.



*[Discuss the two shapes. The two triangles are alike or congruent; each has one square corner called a right angle.]*

3. Fold each triangle in half. Unfold each. Tear one triangle along the fold to make the first two tangram pieces. Set them aside.



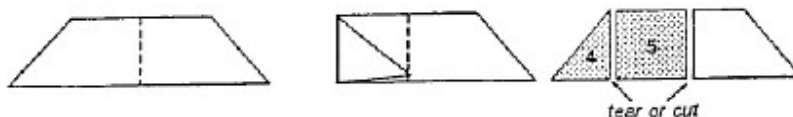
*[Discuss the shapes. All are right triangles; the two small triangles are alike or congruent; the small triangles are the same shape or similar to the large triangle.]*

4. Take the large triangle and fold its square corner (right angle) to the middle of the opposite side (hypotenuse). Tear along the new fold to make the third piece. Set this triangle aside.



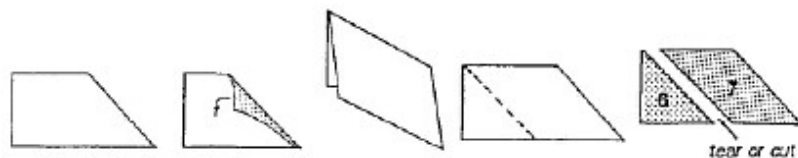
*[Discuss the resulting shapes and angles. A trapezoid is a four-sided figure with one pair of opposite sides parallel; in this case, the triangle has a right angle but the trapezoid does not; two angles in the triangle are congruent to two angles in the trapezoid.]*

5. Hold the figure (trapezoid) with the longest side toward you. Notice the fold line down the middle. Fold the lower left corner (acute angle) to the middle of the bottom side. Unfold it. Tear along the two fold lines to make the fourth and fifth pieces (triangle and square).



*[Discuss the shapes. The triangle is similar but not congruent to the other triangles; the square is similar but not congruent to the original square; the trapezoid has two right angles.]*

6. Hold the figure (trapezoid) with the longest side toward you and right angles to the left. Fold the top right corner (obtuse angle) to the opposite corner (right angle) so that the top side now coincides with the left side. Unfold it. Tear along the fold to make the sixth and seventh pieces.



*[Discuss these last two shapes. The triangle is congruent to the other small triangles; the parallelogram, a four-sided figure with opposite side parallel, has two angles congruent to the smaller angles in the triangles.]*

#### Attachments

- [fold1.gif](#)
- [fold2.gif](#)
- [fold3.gif](#)
- [fold4.gif](#)
- [fold5.gif](#)
- [fold6.gif](#)

#### Extensions:

- [Tangram-graphing Grid activity](#) (pdf)
- Rearrange tangram pieces to make something other than a square (e.g., a sail boat, a bird, etc.)
- [Geometry Triangle Puzzle](#) (pdf)

#### Attachments

- [tangram-graphing\\_grid.pdf](#)
- [geometry\\_triangle\\_puzzle.pdf](#)

#### Author:

[Utah LessonPlans](#)

#### Created Date :

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# Tangram Activities

## Classroom Puzzles (K-2)

Prepare sets of tangrams for your students ahead of time. You should make 2 sets for each student. Explain a little of the history of tangrams and show your students some of the many pictures that can be made.

Challenge your students to create their own designs with their tangrams. Can they make a fish? A cat? A strange-looking plant? When students have had opportunity to explore and create, have them create their favorite design and then glue the arrangement onto construction paper. Later, when the glue has dried, use these designs as a classroom set of puzzles. Hand out the designs and new sets of tangrams and have students try to recreate their classmates' designs. With younger students, the designs may be recreated by matching the pieces directly on top of the puzzles. After the activity, use the puzzles to decorate your classroom.

## Folding Tangrams (3-8)

Creating a set of tangrams from written instructions is a great exercise in geometry vocabulary and following directions. You can do this to have your students make tangrams and use them with some of the other activities. Here's the instructions I use with my students. With younger students, you'll want to lead the class in this construction; with older students, you may wish to supply written instructions and have them work on the construction in groups.

1. Start with a square piece of construction paper.
2. Fold in half along the diagonal and cut along the resulting crease.
3. Fold one of the resultant triangles in half and cut. Set these two pieces aside (1 & 2).
4. Find the midpoint of the hypotenuse of the remaining large triangle by folding and lightly creasing.
5. Fold the triangle so that the vertex of the right angle touches the midpoint of the hypotenuse. Cut along the resulting crease, and set aside the small triangle (3).
6. Fold the remaining trapezoid in half along its line of symmetry and cut into two smaller trapezoids.
7. Fold one trapezoid so that the vertices at the ends of the longest edge meet. Cut along the crease to make a small triangle and a square (4 & 5).
8. Fold the other trapezoid so that the obtuse angle meets the right angle at the opposite vertex. Cut along the crease to make another small triangle and a parallelogram (6 & 7).

### **Grandfather Tang (3-4)**

Read your class the book “Grandfather Tang’s Story” (by Ann Tompert, published by Dragonfly Books). Divide your students into 11 groups and give each group a picture of one of the animals from the story. Each student should try to make their group’s assigned animal and then glue the pieces to construction paper. Retell the story using the students’ pictures.

### **Tangram Challenges 1 (3-5)**

Use these tangram math puzzles to help your students get acquainted with how the pieces fit together.

1. How many shapes can be made using just the two large triangles, placing them edge to edge? (answer: There are three).
2. Make a square using three triangles.
3. Make a polygon with the least number of sides possible (answer: a right triangle is possible).
4. Make a polygon with the maximum number of sides (answer: by offsetting the pieces slightly, irregular polygons with 23 sides are possible!)
5. What fraction of the original square does each of the tangram pieces represent? How can you tell?

### **Tangram Challenges 2 (6-8)**

1. Construct squares using 1 piece, 2 pieces, 3 pieces, etc., all the way up to 7 pieces. Sketch your solutions. One arrangement is not possible - which is it? (answer: 6 pieces is not possible).
2. If the original square has an edge length of 2, what are the edge lengths of each piece? (hint: the diagonal of a square has length square root of 2 times the edge length.)
3. Construct a convex hexagon. There are only 13 possible convex shapes - how many can you find?

### **Shape Race (3-8)**

Copy six to eight tangram designs onto one piece of paper. Make photocopies, one for each pair of students, and cut apart the designs to make small “packs of cards.” Each pair of students should receive one pack of designs. Your students should choose one of these pictures and either race or work cooperatively to recreate the design. This activity builds spatial reasoning and visualization and is a favorite with my students.

You can download a page of designs ready to print by clicking [HERE](#). (Press the CTRL button while clicking on the word “HERE”.)

