2.16 Geometry Lesson Plan

**Introduction**

* **Lesson topic** – Geometry (Plane Figures) with Tangrams
* **Length of Lesson** – 75:00
* **VA Standards of Learning** –
* 2.16: The student will identify, describe, compare and contrast plane and solid figures (circle/sphere, square/cube, and rectangle/rectangular prism).
* **Context** – In the next lesson, students will be introduced to solid geometric shapes and new vocabulary. In order to effectively compare, contrast and analyze solid geometric shapes, students will need to accurately and automatically identify and define plane geometric shapes.
* **Global Themes** – By studying and working with geometric shapes and the relationship between them, students will develop spatial sense, reasoning and analytical skills that will prepare them for higher-level mathematical thinking.

**Content Objectives**

Students will:

* Identify congruent shapes, and
* Label lines of symmetry.

**Assessment Aligned to Objectives**

***Formative***

The students will:

* Identify congruent shapes;
* Draw lines of symmetry in various figures;
* Solve tangram puzzles and record their results in their journals.

The teacher will look and listen for:

* Students successfully identifying congruent shapes;
* Students drawing lines of symmetry accurately;
* Accurate and meaningful use of new vocabulary words during teacher station.

***Summative***

The students will:

* Create their own puzzles for peers to solve and record their results.
* Write a brief story and illustrate it using tangrams.

The teacher will look and listen for:

* Completed student tangram puzzles (journals);
* Completed short story and tangram illustrations

**Materials/Technology and Advanced Preparation**

* SMARTBoard File
* Individual white boards and markers (one each per student)
* Student math journals (and writing implements)
* Student writer’s notebook
* Tangram sets (one per two students)
* Stations (prepare puzzles and handouts for each station prior to students breaking for station work.)
	+ Teacher station: tangram sets for each student (five); student whiteboards/markers
	+ Games station: Shape sort, tangram sets, tangram puzzles, math journals, paper, pencils
	+ Literacy station: 2 copies of *Grandfather Tang’s Story*, tangram puzzles, math journals

**Teaching and Learning Sequence**

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| **TIME** | **TEACHER ACTIONS** | **STUDENT ACTIONS** |
| *Introduction/Anticipatory Set – Whole Group Instruction* |
| 10:00 | * Prepare SMARTBoard lesson and play the theme music as students transition between blocks. (First page.)
* Tell students that this music means that it is time to start our math lesson – they should be preparing to come to the floor in front of the SB. (Whenever this theme music is played, students will begin to prepare for math without teacher direction.)
* *Ask students to come sit in front of the SMART Board with their whiteboards, markers, math journals and pencil. This will become moot as students learn to prepare without teacher instruction when they hear the math block theme music. Today, students will need their Writer’s Notebooks as well for work in the Literacy Station.*
* Ask students to turn to their elbow partner and hand out Tangram sets to groups of two and ask them to take them out and explore with them. Give them 3:00 minutes.
* Ask students what they think the tangrams are used for. Why?
* Ask: what can you tell me about these things? Ask students to describe them (shape\*, color, size) Ask what can we do with them? (Ask them to predict the task).
* Direct their attention to the second page of the SB file.
* Ask if anyone can come to the board and reveal the correct answers … choose a different student for each word.
* Open the **Geometric Plane Shapes graphic organizer.**
* Ask students to open up their **math journals** to the same graphic organizer.
* We will review the definitions students came up with for the plane figures.
* Go to the next page (3) and ask if anyone can tell us the definition of **SYMMETRY**. Ask if they can give an example (use the shapes on the page).
* Ask, what does it mean to be symmetrical?
* Ask if students can give examples.
* Ask another student if they can draw a line of symmetry on the orange rectangle.
* Ask if there is another way to draw a line of symmetry (horizontal, vertical, diagonal). Ask for two more volunteers.
* Move to page 4 and ask a student to draw a horizontal line of symmetry on the green circle. (Move the half-circles apart for visualization.)
* Ask if the pieces are the same or different (they are **congruent**).
* Ask someone to come up to the board to see if the pieces are the same (manipulate shapes over one another).
* Explain to students that these shapes are **congruent: if you can turn, flip and/or slide one shape to flip over the other exactly.**
* Ask students to pull out their math journals and add **CONGRUENT** to their geometry glossary and draw an illustration of it (math journal).
* Add congruent to the word wall.
* Repeat with symmetry and symmetrical.
* Ask students to hold up two pieces (tans) that are congruent (formative assessment).
* Ask them if they can find two more tans that are congruent.
* Ask them if they can put two pieces (tans) together to make a square, then ask them to find another congruent square (the square tan).
* Move to page 5 and ask a student to come to the board and use a pen to outline geometric plane shapes in the picture.
* Ask if there are any shapes that were missed, what shapes were highlighted and how does the student know the shape is a square, etc.
* Move to page 6 and repeat with a new picture.
* Go to page 7 and ask students if they know what Tangrams are.
* Tell them they are going to watch a video about tangrams and their origins.
* Ask them to look for the shapes we’ve been studying and see if they notice something about the illustrations (they’re all made with the same 7 tans the pairs of students have).
* Play video (5:00).
* Stop video when parallelogram is mentioned. (3:56)
* Ask students if they can tell me what a parallelogram is.
* Define parallelogram and show its shape on page 8. Tell them that we will be working more with parallelograms in the future – this is third and fourth grade stuff! (Wink, wink.)
* Finish video.
* Ask students what shapes they saw in the video. How were the shapes used? (illustrations). Lots of different things can be made with these shapes.
* Tell students we are going to use these tans to make shapes just like in the video and we will do this in our math stations.
* Show the next slide to let the math groups know which station they will be going to first (groups are five or six students).
* Before dismissing students to go to stations, show them the first tangram puzzle and how to solve it by modeling how to slide, flip or rotate the tans to fit into the puzzle.
 | * Prepare for Math block; bring whiteboards, markers, math journals and pencils to the floor in front of the SMART Board (SB).
* Find elbow partners and explore tans.
* Consider tans and answer questions.
* Students will discuss with each other, answer teacher questions, respond to questions using whiteboards for formative assessment and interact with the curriculum using the SB.
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| *Lesson Development – Math Stations 15:00 per station (4)* |
| 60:00 | * Students will move to math stations and complete the tasks prepared previously by the teacher.
* Each station will be 15:00.
* Give the students a two minute warning, then a one minute warning for them to wrap up and begin cleaning the station.
* After 15:00 is up, tell them that the group at Station 1 will move to Station 2; the group at Station 2 will move to Station 3; and so on.
* Remind them that we move quietly and carefully.
* The teacher will work with groups for 13:00; then move around the room to assess group station activity.
* After all stations have been completed and cleaned up, bring students back to the SB for lesson closure.
 | Students will complete the following tasks at these stations: **Station #1 (Teacher Station)*** Students and teacher will discuss plane figures, angles, vertices and other properties of plane figures
* The teacher will assess student fluency in vocabulary and comprehension while students draw shapes, lines of symmetry and manipulate tans and other shapes to find congruency
* The teacher will also discuss parallelograms and other shapes to prepare for identification of other polygons.

**Station #2 (Games/Sorts)*** Using tangrams and prepared puzzles, students will manipulate tans to solve them. Students will use spatial awareness, problem solving skills and creativity in order to complete the tasks.
* Students will have the opportunity to complete two tasks of their choosing, record their results and share them with the teacher.

**Station #3 (SMART Board)*** Students will work together to solve tangram puzzles on the SB and then an online site (PBS Kids).

**Station #4 (Literacy Station)*** Students will read Grandfather Tang’s Story and then write their own short story.
* Students will use tangrams to illustrate their story in their writing journals.
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| *Closure*  |
| 5:00 | * Ask students if they liked working with the tangrams. What was their favorite part? Why?
* Ask if anyone would like to share their tangram/short story creations with the rest of the class.
* Ask others if they recognize the shapes (name them) the student used in creating a new puzzle.
* Ask students if they can see any congruent shapes.
* Tell students that next time we will talk about 3 dimensional shapes. Ask if anyone knows what that could mean. Can they give examples?
* Ask: why is it important that we know our shapes?
* Tell students that we will continue working on our shapes and continue to learn new shapes and new ways to use those shapes.
* Ask students to go back to their tables for the next lesson.
 | * Answer teacher questions.
* Share short stories.
* Prepare for next block.
* Answer teacher questions.
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**References**

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*A Sage’s Journey: The Story of Tangrams by Mathverick*, http://www.youtube.com/watch?v=X5mc-dkYLfI

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Tangram Booklet [Being Inspired]. (2012). Retrieved March 18, 2014, from http://beinginspired-blog.blogspot.ie/

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Orvieto Cathedral photo: http://www.wondermondo.com/Countries/E/IT/Umbria/OrvietoCathedral.htm

Chan Chhaya Pavilion photo: WikiMedia Commons, http://commons.wikimedia.org/wiki/File:Chan\_Chhaya\_Pavilion.JPG

*Shapes Song* [Video]. (2014, January 30). Retrieved March 17, 2014, from http://www.youtube.com/watch?v=j-I0beQHSM8**Lesson Organizer**

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| **Prior Knowledge and NEW Instructional Content** |
| **Prior Knowledge:** The students will:* recognize, draw and describe the plane figures circles, squares, triangles and rectangles
* define vertex (vertices), right angles and sides

**New Content:** The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:* Identify figures with at least one line of symmetry, using various concrete materials.
* Draw a line of symmetry — horizontal, vertical, and diagonal — in a figure.
* Create figures with at least one line of symmetry using various concrete materials.
* Define congruent and manipulate shapes to illustrate this.

**Vocabulary*** Symmetry and symmetrical
* Congruent
* Tangram
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| **Instructional Modifications to** **ASSIST Students** | **Main Events of Instruction** | **Instructional Modifications to** **CHALLENGE Students** |
| * Use a variety of activities to address multiple intelligences (music, video, manipulatives, literacy/writing).
* Pair with higher achieving students.
* ESL: Use Spanish Shapes video for native Spanish speakers. (Or search for videos for other languages.)
* Use simpler puzzles for greater success.
* Allow students to choose the games/puzzles they would like to solve.
 | * Whole group lesson.
	+ Discussion
	+ Video
	+ Journaling
* Math Stations.
* Closure.
 | * Allow students to choose which game to play at the games station.
* Offer more challenging Tangram puzzles.
* Offer fraction puzzle worksheet.
* Ask students to write a short story and illustrate the story using Tangrams.
* Ask students to remove their math journals (containing graphic organizers, etc.) while working in Stations.
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