



Mathematical Melodies

Transformation Nation

Music and Lyrics by Lisa Fenwick

Transformation Nation

(math, math, math, math)
Let's do the transformation jive,
Come and join me for the ride.
Jump aboard the math train, let's go!!!

(chorus) Let's all do the transformation,
A new dance across the nation.
It's a new math sensation,
Ahh, ahh, math

Let's turn to the left
Let's turn to the right
Oh, let's transform, all through the nigh-ight!

(chorus)

Let's flip round and round
Let's flip to the sound
Oh, let's transform, all arou-ound!

(chorus)

Let's slide to the left
Let's slide back again
Oh, let's transform, round the be-end!

(chorus repeated)



Transformation Nation

Primary/Junior: Grade 3, Grade 4 and Grade 5



The Big Ideas

Shapes can be located in space and relocated by using mathematical processes.

Transformation is a change in a figure that results in a different position, orientation, or size. Transformations include:

Translation: It is a transformation that moves every point on a shape the same distance, in the same direction, to form a congruent shape. Also known as a **slide**.

Reflection: It is a transformation that flips a shape over an axis to form a congruent shape. A reflection image is the mirror image that results from a reflection. Also known as a **flip**.

Rotation: A transformation that turns a shape about a fixed point to form a congruent shape. A rotation image is the result of rotation. Also called a **turn**.



Hands On

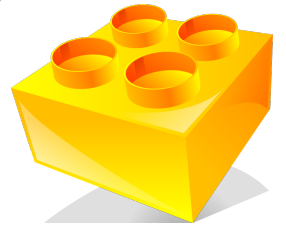
Students trace their hands onto construction paper. Using their paper hand students practice slides, flips and turns in groups of 2 or 4 using large sheets of graph paper on the floor. The hands can later be used to decorate the classroom.

Curriculum Connections Geometry and Spatial Sense

Location and Movement

Grade 3

- identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations (e.g., a slide to the right is a translation; a turn is a rotation).
- complete and describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry (Sample problem: Draw the missing portion of the given butterfly on grid paper.)



Grade 4

- identify, perform, and describe reflections using a variety of tools (e.g., Mira, dot paper, technology).
- create and analyse symmetrical designs by reflecting a shape, or shapes, using a variety of tools (e.g., pattern blocks, Mira, geoboard, drawings), and identify the congruent shapes in the designs.

Grade 5

- identify, perform, and describe translations, using a variety of tools (e.g., geoboard, dot paper, computer program).
- create and analyse designs by translating and/ or reflecting a shape, or shapes, using a variety of tools (e.g., geoboard, grid paper, computer program) (Sample problem: Identify translations and/ or reflections that map congruent shapes onto each other in a given design).

Inaugural Voyage

Transformation Tumble...

Students will work individually using free space in the classroom to move. This activity can be done in a classroom but the gym would provide extra room and using gymnastic mats would be helpful. Directions (North, South, East and West) are displayed prominently in the space used.

Ask the students if they have ever slid down a hill on a toboggan? or How many of them have turned around when someone has called their name? or Have any of them done a back flip during gymnastics or into the water off of a dock? We use slides, flips and turns often in our daily life. Today we are going practice them on the floor.

Students will begin by lying on the floor (on their backs to start). Students are then directed to show a slide with their bodies. If your feet are pointing North to start, where are they pointing after a slide? (in the same direction).

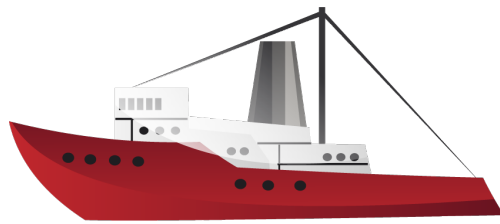
Students will then demonstrate a flip by moving from their backs to their stomachs. Practicing flips on both sides (left and right) would occur next. For a right or left flip the head and feet point in the same direction as before, but what is right is now left and vice versa.

Now, try a head/feet flip. If your head was pointing away from me when you started where is it pointing now? (in the opposite direction).

Finally, let's do a turn. What should you remember about a turn? (the pivot point). How would you do a turn? Allow children time to demonstrate a turn using a pivot point.

GAME:

Elimination: Once the students are familiar with flips, turns and slides play this game to practice all three transformations. First, have students start pointing in the same direction and laying on the same side (on their backs) then call out an action (flip, right) for the students to do. Begin to speed up the directions. Once a few trials have been completed begin to eliminate students who get it wrong. The student who remains wins the Transformation Tumble Trophy.



Paper Quilts

A Unit provided by Illumination
<http://illuminations.nctm.org/LessonDetail.aspx?id=U104>

In this unit, children use translations, reflections, rotations, and line symmetry to make four-part quilt squares. Teams of students make paper quilts from squares they have designed. Each team presents its quilt design to the class and describes how they arrived at the design. The teams analyze the different quilt designs and discuss the numerical and geometrical similarities and differences among them. There are many chances to integrate Social Studies and Visual Art in this unit.

EduKits from ROM - Resource Box
<http://www.rom.on.ca/programs/edukits/boxesD.php>

Books

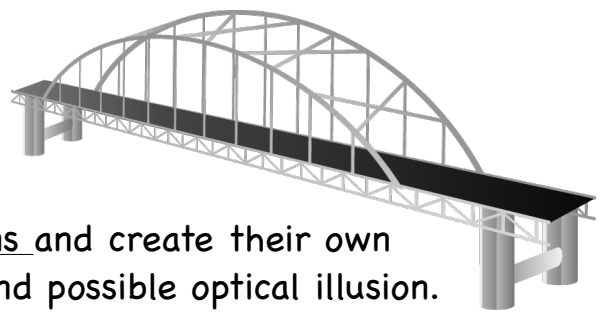
The Quiltmaker's Gift by Jeff Brumbeau
The Keeping Quilt by Patricia Polacco
Sweet Clara and the Freedom Quilt by Deborah Hopkinson
Under the Quilt of Night by Deborah Hopkinson



Cross Curricular

Visual Arts

Students will use Ann Jonas's book Reflections and create their own work of art that demonstrates a reflection and possible optical illusion.



Character Education

Reflections. Teaching self-reflection is integral in helping our children understand themselves better as students and as human beings. Self-reflection is particularly important in helping students assess their learning. It can also be used to build a positive community when students share their positive thoughts/reflections about others with each other.

Discussion questions to explore:

What are self-reflections? How can they help us - as students? As human beings? How can positive reflections help us build a positive learning community in our classroom?



Group Activity

This exercise will use the hands your students created in the transformation exercise from page 1 (or if you did not complete this exercise, have your students trace one hand on construction paper). Using these hands, have students

write their name (clearly) on the thumb. Then place them in a bucket. Each student will pick one hand out of the bucket. Once chosen, the student will write a positive reflection about the student whose hand they have chosen. The positive reflection will be written on the palm. The hands can be used to decorate the classroom. When finished they can be sent home with each student.

Book Connection:

How Full is Your Bucket by Tom Rath

How Full is your Bucket creates a visual feel of the effects of our actions on ourselves and others.

Multi-Media

Websites:

(start with this one first)

Space Station: Build robots by moving geometric shapes to fit a pattern

<http://www.primarygames.com/science/spacestation/index.htm>

(then do this one)

Robo Packer - Can you pack a suitcase of shapes using translations, reflections, and rotations?

http://www.eduplace.com/kids/mw/swfs/robopacker_grade6.html

Post the Shape Game (involves rotation, reflection and translation)

<http://www.mathsonline.co.uk/nonmembers/gamesroom/transform/postshape.html>

Illuminations -

Archimedes Puzzle

<http://illuminations.nctm.org/LessonDetail.aspx?id=L720>



SmartBoard: Alphabet Geometry

<http://exchange.smarttech.com/details.html?id=291b82b3-21fa-4ec6-8689-7488b5a764d9>



Thematic
Imaginings

Thinking With Our Feet First!

Supplies: BBQ charcoal (crushed into powder), shallow rectangular trays (to hold powder), long pieces of newsprint, shallow buckets of warm water and soap, paper towel, classroom floor space.

Charcoal foot patterns provide students with a physical exemplification of transformations. Using multiple stations set up throughout the classroom students use their feet to create a variety of transformations. The stations are as follows:

Vertical Reflection: Our two feet have vertical reflection, and as students move their right leg over their left one, it creates a vertical reflection for them.



Reflection with Rotation: Two foot jump pattern.



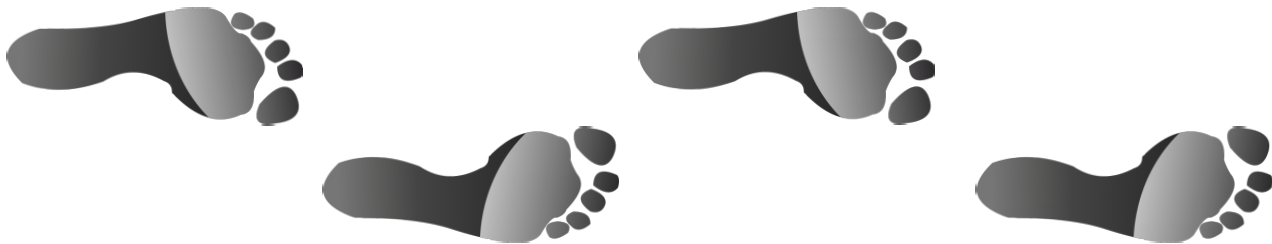
Simple Translation: A one foot hop - heel to toe.



Translation with a Horizontal Reflection: A two foot hop.



Glide Reflection: A simple walk.



Once students have completed each station a teacher led debriefing session will review reflections, translations and rotations including a discussion about their unique combinations. Allowing students an opportunity to think of their own foot patterns could be a natural extension.

Picture This!

More Literature Links for geometrical transformations...



Teacher Resource:

Mathematical ART-O-FACTS (2008) by Catherine Kuhns

Are these art projects or are they math activities? The answer is yes! Use these lessons to introduce, reinforce, or assess specific measurement and geometry skills. You'll love how these clever ideas promote mathematical thinking and creativity through problem-solving. Includes full-color photos and reproducibles.

Fiction:

Reflections by Ann Jonas (1987)

Chronicles a child's busy day by the sea, in a forest, and then home with the hope of going to a carnival or concert. The illustrations change when the book is turned upside down.

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