INTRODUCING A NEW MATH SERIES
from Robin Ward!

See inside for sample activities for grades 6-8
In a three-volume series by grade level, author Robin Ward provides easy-to-implement, literature-based activities that integrate standards-based content from science, social studies, and the arts with standards-based elementary mathematics content. Beginning with the rationale for and research to support interdisciplinary teaching, each book outlines a wealth of lessons that provide you with detailed instructions for implementing the activities and offers your students the benefits of integrated instruction. Each volume in the series offers literature summaries, NCTM and other national standards, assessment notes, and related websites and books, making it a perfect classroom companion for teaching in any K-8 classroom.

Literature-Based Activities for Integrating Mathematics with Other Content Areas, Grades K-2

Literature-Based Activities for Integrating Mathematics with Other Content Areas, Grades 3-5

Literature-Based Activities for Integrating Mathematics with Other Content Areas, Grades 6-8

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Visit www.allynbaconmerrill.com to learn more!
Thank you for your interest in my newest mathematics series. I realize you have a wide-range of choices when selecting your professional development resources, and I appreciate that you have taken the time to test these sample activities from *Literature-Based Activities for Integrating Mathematics with Other Content Areas*.

Integrating children’s literature into the teaching and learning of mathematics, science, social studies, and the arts is more than just reading a book to students. By exploring picture books and reading works of fiction, nonfiction, and poetry, you help students to engage in worthwhile and stimulating mathematical activities that encourage them to communicate their ideas verbally or through drawing or writing. In short, mathematics can be viewed as “a vehicle for thinking, a medium for creating, and a language for communicating” (Kleiman, 1991, p.48). In addition, using children’s literature requires students to listen and comprehend — two vital skills needed for academic success. Thus, the goal of integrating children’s literature across the content areas is to improve the overall literacy of your students.

I hope that you agree with this philosophy and goal, and find them reflected on the pages you are about to read. Feel free to use these activities any time or any place they fit into your curriculum. I’m sure you’ll love them!

Best wishes.

Robin

Robin A. Ward

Robin Ward has masterfully taken the guesswork and time out of creating exciting and engaging lessons to teach math across the content areas by integrating children’s literature for the classroom teacher. In her new series, *Literature-Based Activities for Integrating Mathematics with Other Content Areas*, Robin facilitates content integration by presenting easy-to-implement, literature-based activities that integrate standards-based content from science, social studies, and the arts with standards-based math content. Divided into three grade-band volumes, K-2, 3-5, and 6-8, each book provides a wealth of grade-specific, classroom-tested activities that every teacher needs!!
Each chapter opens with a brief overview that pinpoints the connection between mathematics and the specific content area (whether it be science, social studies, or the visual arts).

In addition, a list of concepts and skills featured in the literature-based activities are noted for the teacher.
The chapter matrix found after the overview lists each piece of children's literature used in that chapter's integrated activities, and offers teachers other relevant cross-curricular concepts and skills.

### Matrix of Mathematics and Science Activities

<table>
<thead>
<tr>
<th>BOOK TITLE</th>
<th>MATHEMATICAL CONCEPTS AND SKILLS</th>
<th>SCIENCE CONCEPTS AND SKILLS</th>
<th>SOCIAL STUDIES CONCEPTS AND SKILLS</th>
<th>VISUAL ARTS CONCEPTS AND SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Zebra Question” (a poem in “A Light in the Attic”); My Light</td>
<td>number line, positive and negative numbers, integers, addition of positive and negative numbers</td>
<td>electricity, light, positive and negative charges</td>
<td>alternate sources of power, exploration of a biographical piece</td>
<td>artists’ renditions of light and electricity, positive and negative images</td>
</tr>
<tr>
<td>“The Planet of Mars” (a poem in Where the Sidewalk Ends); The Planets in Our Solar System</td>
<td>fractions, decimals, measurement, ratio, size and scale, estimation</td>
<td>relative size of the planets, planets in the solar system</td>
<td>exploration of a biographical piece</td>
<td>artists’ renditions of the night sky, space, or solar system</td>
</tr>
<tr>
<td>Wild Fibonacci: Nature’s Secret Code Revealed</td>
<td>patterns, pattern recognition, prediction</td>
<td>characteristics of organisms, scientific inquiry</td>
<td>exploration of a biographical piece, patterns in population growth</td>
<td>golden mean in architecture, artists who have used the golden mean</td>
</tr>
<tr>
<td>“Strange Wind” (a poem in A Light in the Attic); Let’s Fly a Kite</td>
<td>line symmetry attributes of quadrilaterals (kites)</td>
<td>wind, aerodynamics of flight</td>
<td>cultural history of kites, exploration of a biographical piece, fallout and implications of historic hurricanes and tornadoes</td>
<td>artists’ renditions of windy scenes</td>
</tr>
<tr>
<td>“Me and My Giant” (a poem in Where the Sidewalk Ends); Beanstalk: The Measure of a Giant</td>
<td>measurement, ratio, proportional reasoning, data collection and interpretation, line graphs, estimation</td>
<td>life cycles of organisms, scientific inquiry</td>
<td>mapping of grasslands, jungles, rain forests; exploration of a biographical piece on Johnny Appleseed</td>
<td>van Gogh’s renditions of trees</td>
</tr>
<tr>
<td>If You Hopped Like a Frog</td>
<td>measurement, size and scale, ratio, proportional reasoning, estimation</td>
<td>characteristics of organisms</td>
<td>expanding populations’ and industry’s impact on animal habitats; interplay between geography, climate, and habitat</td>
<td>collage of animals</td>
</tr>
</tbody>
</table>
Activities Featuring Number and Operations

"Zebra Question" (a poem in A Light in the Attic) (1981)
by Shel Silverstein

My Light (2005)
by Molly Bang

Overview of Focus and Book:
Learn about opposites in Silverstein’s humorous “Zebra Question.” Then, discuss everything you learned about light and how it is transferred into the energy we use in our homes by exploring the captivating fact-filled book My Light.

Mathematical Concepts and Skills:
number line, positive and negative numbers, integers, addition of positive and negative numbers.

Science Concepts and Skills:
electricity, light, positive and negative changes.

Overview of Activities:
Students explore characteristics of static electricity, a real-life example of combing positive and negative values. Students also gain practice with understanding and identifying negative numbers and adding positive and negative numbers.

National Science Standards (1996):
Students in grades 3 through 5 should “explore numbers less than zero by extending the number line and through familiar applications” (Number and Operations Standards [p. 192]).

National Science Standards (2000):
Students in grades 3-4 should “develop an understanding of light, heat, electricity, and magnetism” (p. 131). “By experimenting with light, heat, electricity, magnetism, and sound, students begin to understand that phenomena are seen, heard, felt, or experienced and controlled in various ways” (Physical Science, Content Standard B [p. 124]). Also, as a result of activities, students should “develop abilities necessary to do scientific inquiry” and “develop understanding about scientific inquiry” (Science as Inquiry, Content Standard A [p. 121]).

Materials:
- light squares, scribners, black marker or pen, string, tape, salt, pepper, combs

Assessment:
1. Did students locate positive and negative numbers on a number line?
2. Did students correctly compute problems involving positive and negative numbers?
3. Did students recognize meaningful word problems that involve negative numbers?
4. Did students provide a reasonable definition for electricity?
5. Did students record meaningful predictions for each experiment?
6. Did students record accurate observations of each experiment?
7. Did students develop a creative essay or paragraph about light and electricity?

Activity Extensions:
- Explore a biography of the nineteenth-century Kyoto mathematician, Kikuchi Rokkaku, who is noted to be the first to express the concept of zero and infinity. Expand this exploration by exploring a biography of sixteenth-century French mathematician, François Viète, who was the first to use a minus sign to indicate a negative number. Explore biographies of other mathematicians who experimented and attempted to explain negative numbers in their work (e.g., Girolamo Cardano, François Viète, Leonard Euler, etc.).

Description of Activities:
1. Read the short poem “Zebra Question” by Shel Silverstein to set the stage for the upcoming activity involving numbers of opposite signs.
2. To provide a rationale and to excite students about the upcoming exploration of positive and negative numbers, introduce the book My Light and read the third paragraph about lighting located at the end of the book. Students will learn that lighting is a form of electricity that occurs due to an exchange of positive and negative energy.
3. Prior to class, purchase enough light squares for each student to have an equal amount. At this space looks like a plus sign. Manipulate the light space to resemble a minus sign by cutting off its top and bottom tips. Distribute to students five light spaces that look like plus signs and five light spaces manipulated to look like minus signs.
4. Begin a discussion about negative numbers by challenging students to think of real-life examples of negative numbers (e.g., below-zero temperatures, being in debt, below sea level, negative charges, below par in golf, etc.).
5. Have students on a number line where negative numbers reside and also the symbolic notation of a minus sign and zero to represent a negative number.
6. Model several problems involving integers using the light spaces. For example, to help students make sense of the problem: 5 + (–1) =? ask students to place a row of three of the plus signs (i.e., three uncut tile squares) and place one minus sign underneath a separate row. Remind students how a positive plus a negative sum to zero (consider putting this into a more meaningful and familiar context by pointing out if you have two pencils and someone takes one away, then you have none). Remove the one vertical pair of positive and negative signs since they add to zero, and notice that two plus signs are left over. Thus, 5 + (–1) = 4. Model this same problem using the number line. Next, model 3 + (–5) by placing three minus signs in a row and one plus sign underneath. Since a positive and a negative sum to zero, remove the one vertical pair of the positive and negative signs leaving two minus signs. Thus, 3 + (–5) = –2. Model this same problem again using the number line.
In addition, more than 100 citations of instructional resources to support the teacher are included.
The Appendix of each book features several assessment tools and rubrics to aid in evaluating student performance, skills, and abilities.

### Observation Log

<table>
<thead>
<tr>
<th>Name: __________________________________________________________</th>
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<tbody>
<tr>
<td>Activity: ________________________________________________________</td>
</tr>
<tr>
<td>Date: ___________________________</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives or Goals</th>
<th>Observed Behavior</th>
<th>Comments</th>
</tr>
</thead>
</table>

### Inventory of Student's Mathematical Disposition

<table>
<thead>
<tr>
<th>Name: __________________________________________________________</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
</table>

- Confident in using mathematics
- Flexible in doing mathematics
- Perseveres at mathematical tasks
- Shows curiosity in doing mathematics
- Reflects on own thinking
- Values applications of mathematics
- Appreciates role of mathematics

(Derived from Stenmark, 1991, p. 34)

### Group Assessment

Group members: _______________________________________

Activity title: _______________________________________

<table>
<thead>
<tr>
<th>Did your group...</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk about the Task</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finish the Task</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What went well? _______________________________________

_______________________________________________________________________

_______________________________________________________________________

What would you do differently? _______________________________

_______________________________________________________________________

_______________________________________________________________________

( Derived from Stenmark, 1991, p. 34)

### Sample Writing Prompts

- In your own words, explain the meaning of . . .
- The most important thing I learned in math class today (or this week) is . . .
- The most important thing to understand about polygons is . . .
  (Note: change polygons to the concept explored)
- I discovered that . . .
- Explain your reasoning about . . .
- I know my solution is correct because . . .
- I feel confident about my solution because . . .
- I am still uncertain about . . .
- Describe any instances during which you became stuck and how you became “unstuck” while solving the problem.
- Describe a real-world experience/connection to the mathematical concept you learned about today.
- Write a letter to a classmate who did not attend class today so that he or she will understand what you learned about.
- Draw a picture or diagram showing how the concepts you learned about today are connected.

( Derived from Stenmark, 1991, p. 34)
Helpful Hints

• Read through the entire activity before class to assess whether you need to modify any steps for any reason or substitute materials.

• Capitalize on those teaching moments. Remember to use your judgement and pedagogical ingenuity to take tangents in the activities as deemed appropriate.

• Read each piece of literature in its entirety, then move onto implementing the activity with students. You’ll be familiar with the story and have questions ready to ask the students during the activity. Everyone will want to participate. Take the time to stop and allow students to ask questions about the literature.

• Keep each piece of children’s literature that you use in your classroom. You never know when students will want to view it again.

• Have fun!
Easy Origami (2004)

by John Montroll

Dover, ISBN #0486272982


by Eleanor Coerr

Penguin Young Readers, ISBN #0142401137

Overview of Books: Discover the ancient Japanese art of paper folding known as origami and create a variety of shapes, animals, and figures in Easy Origami. Then, learn the true story of a young girl named Sadako who lived in Hiroshima, Japan, when the atomic bomb was dropped during World War II. Upon being diagnosed with leukemia, Sadako set out on a quest to fold a thousand paper cranes, so that the gods would grant her wish to become well. This heartwarming story teaches young readers about the power of one person to create change, the long-term consequences of war, and values cherished by all cultures.

Mathematical Concepts and Skills: two- and three-dimensional shapes, spatial skills, angles (acute, right, obtuse, reflex, complementary, and supplementary), angle measurement, estimation

Social Studies Concepts and Skills: causes, repercussions, and implications of war

Overview of Activities: Students work in small groups to create an origami shape and estimate and measure its angles. Students also identify which angles are acute, right, obtuse, complementary, and supplementary. Students then learn of the true story of a young Japanese girl and her quest to make one thousand paper cranes in hopes to fight her leukemia, caused by the dropping of the atomic bomb on Hiroshima. Students discuss and debate whether the United States was justified in its use of the atomic bomb.

Students in grades 6–8 should “precisely describe, classify, and understand relationships among types of two- and three-dimensional figures using their defining properties” and “understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar figures” (p. 397). Students should also “recognize and apply geometric ideas and relationships in areas outside of the mathematics classroom, such as art, science, and everyday life” (p. 397) (Geometry Standard). Students in grades 6–8 should “select and apply techniques and tools to accurately find length and angle measures to appropriate levels of precision” (p. 399) (Measurement Standard).

National Social Studies Standards (1994):

Social studies programs for the middle grades should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can “explain conditions, actions, and motivations that contribute to conflict and cooperation within and among nations” (p. 94).

Materials: origami paper, copy of folding instructions (appearing on page 6 in Easy Origami), protractors, map of Japan, two New York Times articles (see websites below)

Description of Activities:

1. Introduce students to origami, an ancient Japanese art of paper folding. Display on an overhead a copy (or make a hard copy for students) of the folding symbols used in origami appearing on page 6 in Easy Origami. Model each of the various folds with students.

2. Using the Origami Cranes website, students gain practice with the art of origami by creating an origami crane. (Students might also create the swan appearing on p. 30 in Easy Origami.)

3. Break students into small groups (two or three members) and give each group a copy of one page from Easy Origami, which displays the folding instructions for creating a particular figure. (Working in small groups will provide assurance that the students are folding their paper correctly as they create their origami figure.)

4. Students label each angle on their origami figure using letters of the alphabet. Students create a four-column table in their notebook where they list each angle by letter name (column 1), and then record their estimate of each angle’s measure (column 2). Students use protractors to measure and record each angle (in column 3). (Column 4 is used in step 5.) As students perform each fold, they should identify any complementary or supplementary angles they encounter.
5. After creating their origami figures, students collaboratively compare their recorded angle measurements (in column 3), verifying the accuracy of their measurements. Students then compare their estimations for angle measurement (column 2) to the actual angle measurements (column 3). How accurate were their estimations for angle measure? In column 4 of their table, students classify each angles as acute, right, obtuse, or reflex.

6. Introduce the book *Sadako and the Thousand Paper Cranes*, informing students that this is a true story of a young girl named Sadako who lived in Hiroshima, Japan, in 1945 when the atomic bomb was dropped during World War II. Sadly, at age eleven, Sadako was diagnosed with leukemia, also known as the “atomic bomb disease.” Inspired by a Japanese legend, Sadako begins folding a thousand paper cranes, trusting that the gods will grant her wish to become well and run again.

7. Using a world map, show the location of Japan and Hiroshima. Show the location of Nagasaki, the site of the second dropped atomic bomb. Facilitate a discussion as to why these sites were selected as targets.

8. Read all or excerpts from *Sadako and the Thousand Paper Cranes*. Pause to introduce and explain Japanese vocabulary or answer questions.

9. Using the *New York Times* websites listed below, distribute to students a copy of both articles that reported that the United States had dropped an atomic bomb on Hiroshima as well as Nagasaki. Facilitate a discussion or create a debate scenario in which students vocalize their thoughts on whether the United States was justified in its use of force and whether this type of force should be employed today.

**Assessment:**

- Did students accurately estimate and measure the angles in their origami figures?
- Did students correctly divide their origami figures into the smallest number of triangles and accurately compute the sum of all of the angles in their figures?
- Did students participate in a discussion (or debate) about the use of the atomic bomb?
Activity Extensions:

- Students time how long it takes for them to create an origami crane. Students then compute how long it would take them to make 1,000 cranes, accounting for stopping for daily activities including, sleep, school, meals, and so on. Students share their calculations with the class. Are students surprised that Sadako completed 644 cranes, despite her illness?

- Students compose a haiku (three-line Japanese verse) describing a personal wish.

- Students create a timeline of the major events leading up to World War II.

Cross-Curricular Connections:

Science

- Explore and discuss a biography of a scientist involved in the development of the atomic bomb (e.g., J. Robert Oppenheimer, Arthur Compton, Enrico Fermi, etc.).

- Research the ill effects of radiation on humans, the earth, and the environment.

Visual Arts

- Create a collage of images depicting war and its effects.
Chapter 2 Literature-Based Mathematics and Social Studies Activities

Related Literature


Related Instructional Resources


Related Websites

History of Origami
http://library.thinkquest.org/5402/history.html

New York Times Article (dated August 6, 1945)
http://www.nytimes.com/learning/general/onthisday/big/0806.html#article

New York Times Article (dated August 9, 1945)
http://www.nytimes.com/learning/general/onthisday/big/0809.html#article

Origami Cranes
http://www.savingcranes.org/teachers/kids/origami.cfm

Origami and Paper-folding.com
http://www.paperfolding.com/
http://dev.origami.com/diagram.cfm

Origami Space Telescope
http://www.californiawww.connected.org/tv/archives/147
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<td>Research References</td>
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<td>Appendix</td>
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</table>
Refreshingly unlike other books and resources! I was pleasantly surprised that [these books are] full of content and ideas that are easily implemented. Teachers need more books like this!

— Amanda Guinn, Kindergarten Teacher, Monroe County Community Schools, Bloomington, IL

With all of the demands in our schedules these days, teachers need to be better at incorporating content within literacy [instruction]...these book do a great job of this.

— Tammy Brown, Early Education Staff Developer, Denver Public Schools

The math-visual arts connections are exciting! As I was reading [Robin’s] suggestions for activities, I wanted to collect a group of eight- to ten-year-old students and begin working and learning with them. [She has] incorporated excitement for students who need to have concrete examples of math as well as attracting kinesthetic learners through hands-on activities. Well done!

— Kris O’Clair, Math and Science Intervention Coordinator, Denver Public Schools

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