Navigating through Geometry Grades 3-5

Presented by

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Navigations Writer

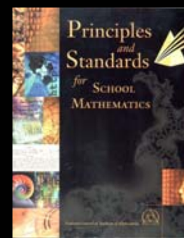
Navigating through Algebra Grades 3 5

Navigating through Number and Operations Grades 3 5

Navigation Grade Level Specific Investigation Series

NCTM Academy Presenter

Principles and Standards for School Mathematics



Content Standards

Process Standards

Principles

Content Standards

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability

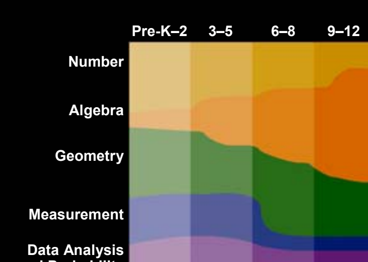
Process Standards

- Problem Solving
- Communication
- Connections
- Representation
- Reasoning & Proof

Principles

- Equity
- Assessment
- Teaching
- Learning
- Curriculum
- Technology

Emphasis across the Grades



The Navigation Series

- An instructional resource for the implementation of the Principles and Standards
- Illustrative guide to the development of ideas in each of the content strands
- Tools to incorporate the instructional principles identified in the Standards
- A source of professional development content.

Navigating *through* Geometry in Grades 3-5

- Written by
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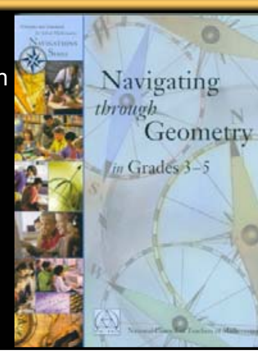

Geometry Standard

Instructional programs from prekindergarten through grade 12 should enable all students to—

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- Apply transformations and use symmetry to analyze mathematical situations
- Use visualization, spatial reasoning, and geometric modeling to solve problems

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- Chapter 1

Shapes

- Build What I've Created
- Thinking about Triangles
- Roping in Quadrilaterals
- Building Solids
- Searching for the Perfect Solids

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- Chapter 2

Location

- Find the Hidden Figure
- Xs and Os
- Can They Be the Same?

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- Chapter 3

Transformations

- Patchwork Symmetry
- Symmetry Detectives – Learn the Secret Code
- Going Logo for Symmetry!
- Tetrominoes Cover Up
- Motion Commotion
- Zany Tessellations

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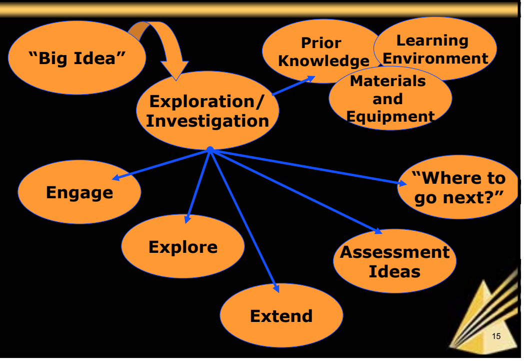
Organization of Lessons



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Searching for the Perfect Solids

- **How many Perfect Solids are there?**
- **What are the names of the Perfect Solids?**
- **Tell something that you know about Perfect Solids.**

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Searching for the Perfect Solids

- **There are 5 Perfect Solids**
- **The names of the Perfect Solids are:**
  1. **Tetrahedron**
  2. **Octahedron**
  3. **Icosahedron**
  4. **Hexahedron (cube)**
  5. **Dodecahedron**

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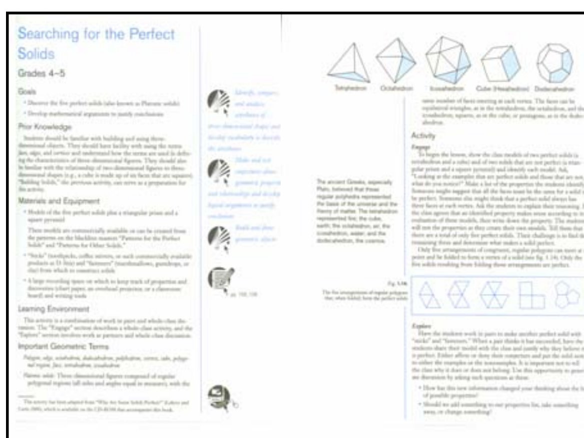

Searching for the Perfect Solids

Grades 4–5

Where to Go Next in Instruction?

All perfect solids are regular polyhedra; that is, each is made up of a single type of regular polygon, either an equilateral triangle, a square, or a regular pentagon. At each vertex, the same number of polygons intersects. In a cube, for example, three squares intersect at each vertex.

Searching for the Perfect Solids

- Goals
  - Discover the five perfect solids (Platonic Solids)
  - Develop mathematical arguments to justify conclusions.
- Prior Knowledge
  - Be familiar with three-dimensional objects and terms, faces, edges, and vertices
- Materials and Equipment
  - Models of the five perfect solids
  - Sticks and fasteners
  - BLM – Patterns for the Perfect Solids
  - CD-ROM - Exploring Geometric Solids and Properties

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Searching for the Perfect Solids

- Learning Environment
  - Combination of working in pairs and whole-class activities and discussions
- Important Geometric Terms
  - faces, edges, vertices, polygons, dodecahedron, polyhedron, cube, tetrahedron, icosahedron, octahedron, platonic solids
- Engage
  - Show the class the models of two perfect solids and two solids that are not perfect.

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Searching for the Perfect Solids

- Explore
  - Have students work in pairs to make the other perfect solids.
  - Have students justify why they believe their solid is perfect.
- Assess
  - Have students write a letter to a friend explaining what they have learned about perfect solids.

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Searching for the Perfect Solids

- Engage
  - Make a list of the properties of each solid.

- All perfect solids are regular polyhedra; that is, each is made up of a single type of regular polygon, either an equilateral triangle, a square, or a regular pentagon.
- At each vertex, the same number of polygons intersects.
- In a cube, for example, three square intersect at each vertex.

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Exploring Geometric Solids and Properties CD-ROM Applet

Did you know that—
- Each solid has flat sides called *faces?*
- Each solid has *edges* to connect

Directions
- Choose a shape: Click on the New Shape button.
- Rotate the shape: Place the mouse pointer on the shape. Move the mouse while holding down the mouse button.
- Color the shape: Click on a color. Hold the shift key while clicking the mouse where you want to paint. You can paint a face in a color, an edge in white, or a corner in black. Remove the color: Click on the Reset Shape button.
- See through the shape: Click the box by Transparent.
- Change the size of the shape: Use the mouse to move

Xs and Os

- Goals
  - Locate points on a rectangular coordinate plane using ordered pairs.
  - Use the point of origin as a point of reference
  - Understand and use positive and negative integers to identify points in four quadrants.
- Materials
  - BLM – Coordinate Grids
  - Overhead projector and markers

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Xs and Os

- Engage
  - Play a game similar to tick tac toe.
  - Half the class will be X and the others O.
  - Display the coordinate grid on the overhead projector
  - One person from each group will tell you where to place an X or an O by naming the ordered pairs.

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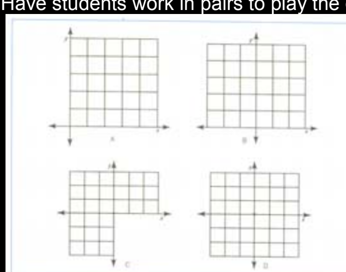
Xs and Os

- Extend
  - Have students work in pairs to play the game.



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Motion Commotion

- Goals
  - Manipulative a figure using the following basic transformations:
    - Translations (slides)
    - Reflections (flips)
    - Rotations (turns)
- Materials
  - BLM- Motion Commotion
  - Overhead projector
  - Scissors, markers and pencils
  - Coffee stirrers

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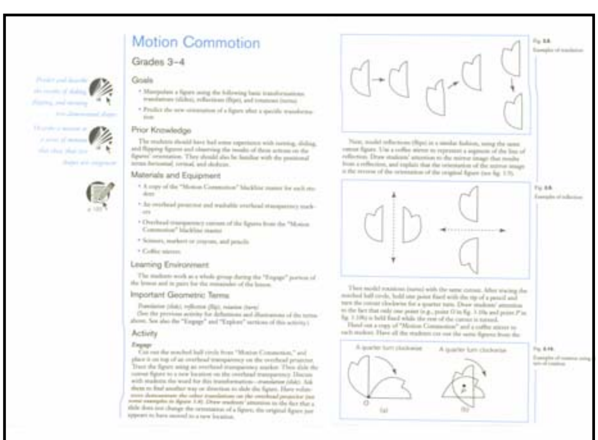
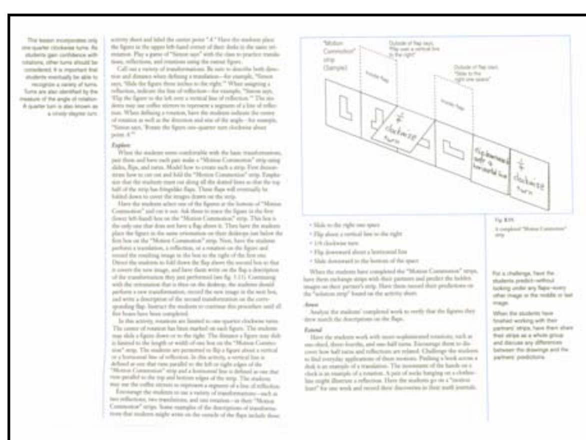


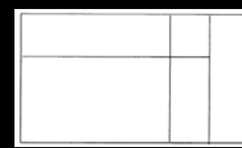


Puzzles with Pizzazz

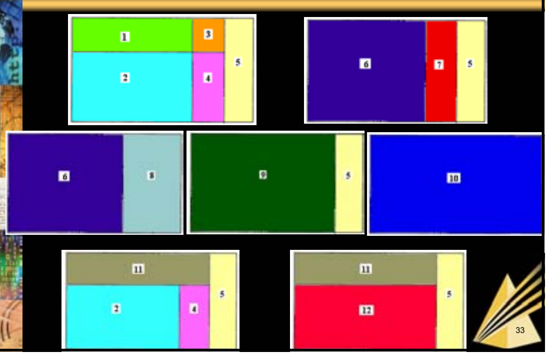
- Goals
  - Practice mentally manipulating shapes
  - Develop strategies to solve visual logic puzzles
  - Combine shapes to create different shapes
- Materials
  - A variety of spatial-visualization and logic puzzles
  - BLM masters – Puzzles and Tangrams
  - CD-ROM – Tangrams

Puzzles with Pizzazz

How many rectangles are in the rectangle puzzle?

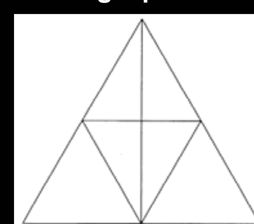


Solution



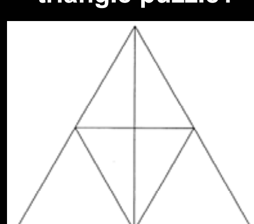
Puzzles with Pizzazz

How many triangles are in the triangle puzzle?



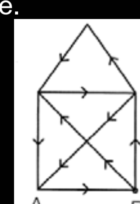
Puzzles with Pizzazz

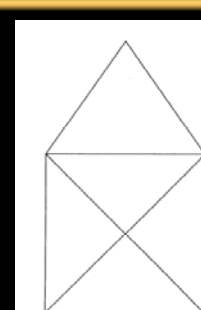
How many other shapes are in the triangle puzzle?



Puzzles with Pizzazz

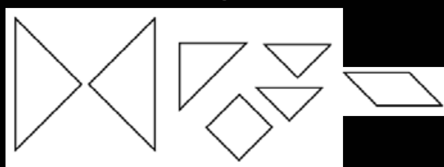
Without lifting your pencil or retracing the lines, trace this figure.



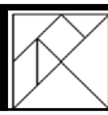


Tangram Puzzles with Pizzazz

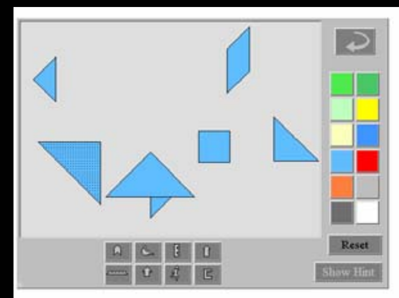
Try to create a square using 1, 2, 3, 4, 5, 6, or 7 tangram pieces.



SOLUTION



Tangram Challenges CD-ROM Applet



Pattern Patch CD-ROM Applet

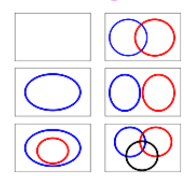
- To begin, click on a shape to place them in the work space.
- The Slide, Turn, Flip, and Delete buttons can be used on any shape.
- Have the students examine the designs to see if they can rearrange the pattern blocks to find new shapes with five, six, or seven sides.
- They should record which blocks make up the new figure, trace around the new shapes, and verify the number of edges by counting the sides in the diagram.
- They can also discuss the number of angles in their diagrams and compare that number with the number of sides.

Shape Sorter CD-ROM Applet

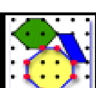
Students use the Shape Sorter applet to become familiar with the characteristics of quadrilaterals, including parallelograms, trapezoids, rectangles, rhombuses, and squares.

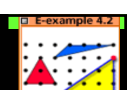
Click on and move the cursor into the work space. Place the figure in the in the diagram. A total of sixteen quadrilateral pieces are generated.

Use to select one of the following Venn diagrams.



Geoboard CD ROM Applet





Directions:
Click on the rubber-band box and drag a rubber band to the geoboard. Click on a node to attach one end of the rubber band to that node.

Discussion Questions:
- Is it possible for a triangle to have two right angles?
- How many different right triangles can be made on the geoboard?
- If you could make a triangle that was as large as you wanted, would you be able to make one that had two right angles?
- Write everything you know that is true about all right triangles.
- Write in your own words the definitions for the new geometric terms we have found (isosceles, scalene, acute, and obtuse).

Additional CD-ROM Resources

- Templates
- Puzzle Sets
- Students' Tessellation Art
- Articles