

## Geometry

### Activity 1: Pentominos

<p><u>Learning Objectives related to Curriculum:</u></p> <p>Plane, spatial awareness: Construction of two dimensional objects using pentominos</p> <p>G-16, G-25</p>	<p><u>Number of Students:</u> 1 or 2</p>
<p><u>Resources/Materials:</u></p> <p>Pentomino Grid</p> <p>Pentomino Figures Patterns</p> <p>Pentominos - make your own 2D pentominos with the patterns provided or purchase 3D pentominos.</p> <p><u>Source Acknowledgment:</u></p> <p>Adapted from</p> <p>Cornelius M and Parr, M. <i>What's Your Game?</i></p>	<p><u>Activity Description</u></p> <p>Players alternately place a chosen pentomino on the grid (one dimension only). Play continues until one player is unable to make a move and loses.</p> <p>Alternate Ideas:</p> <p>a) place pieces on the board to build desired shapes</p> <p>b) design three dimensional shapes with pentomino pieces</p> <p>****</p> <p>Have students build the figures shown on the sheets with grids using the pentominos shown at the top of each page.</p> <p>HINTS:</p> <p>a) The first figure is actual size - place pieces directly on the page.</p> <p>b) To build the figures on the pages with grids, use only the shapes as indicated on the top of each section.</p>
<p><u>CELS:</u> Numeracy, Communication</p> <p>Social Skills ( working together to build shapes) Critical and Creative Thinking (decision making)</p>	<p><u>Adaptation/Variation/Extension:</u></p> <p>-to make it easier, shapes using fewer pieces could be designed</p> <p>-for extra challenge, build three dimensional shapes (if 3D petominos are available)</p>

Evaluation:

self assessment,  
anecdotal records,  
performance assessment - notebook,  
learning contract,  
observation checklist

Reflection/Additional Comments:

Students could design their own shapes and have a partner try to build them.

Students can create their own pentomino sets out of paper.

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### Activity 2: Newt Tessellations

<p><u>Learning Objectives related to Curriculum:</u></p> <p>Plane: Creating tessellations and covering a surface with tessellating shapes. Recognize that area of the shape remains constant</p> <p>G- 26, 28,29</p>	<p><u>Number of Students:</u> 1 or small group</p>
<p><u>Resources/Materials:</u></p> <p>Pattern</p> <p>Hexagon shape for tessellating</p> <p>Pencil and paper</p> <p><u>Source Acknowledgment:</u></p> <p>Adapted from <i>Good Apple Magazine</i>, November, 1997</p>	<p><u>Activity Description</u></p> <ol style="list-style-type: none"><li>1. Trace hexagon pattern and draw in shaded sections as shown.</li><li>2. Carefully letter (a - f) and cut out shaded sections</li><li>3. Tape cut- out sections to matching letter sections. Do not flip! Keep letters face up. Use tiny pieces of tape to join.</li><li>4. Trace your pattern in the middle of a sheet of paper.</li><li>5. Rotate the pattern so that it fits into the side of the newt already traced, like a puzzle piece. Trace again.</li><li>6. Continue rotating and tracing until sheet is filled, even those whose edges extend off the paper.</li><li>7. Decorate with eyes, stripes, etc.</li></ol>
<p><u>CELS:</u> Numeracy, Critical and Creative Thinking</p>	<p><u>Adaptation/Variation/Extension:</u></p> <ul style="list-style-type: none"><li>- more difficult: design original tessellating shapes</li><li>- easier: have an easier pattern to follow</li></ul>

Evaluation:

self assessment  
anecdotal records  
performance assessment - notebook  
learning contract

Reflection/Additional Comments:

Many possibilities exist with tessellations. This project could become a class project with little extra work (more patterns) or individuals could create their own tessellating shapes.

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### Activity 3: Two Halves Make a Whole

<p><u>Learning Objectives related to Curriculum:</u></p> <p>Spatial awareness, Plane: Making congruent two dimensional figures</p> <p>G-19</p>	<p><u>Number of Students:</u> 1 or 2</p>
<p><u>Resources/Materials:</u></p> <p>Drawn shapes</p> <p>Puzzle pieces</p> <p><u>Source Acknowledgment:</u></p> <p>Adapted from</p> <p>Bolt, B. <i>Mathematical Activities</i></p>	<p><u>Activity Description</u></p> <p>Use the red shapes and see how quickly you can match them to the drawn shapes.</p> <p>Suggestion: Use a timer or a clock to see how long it takes you. Challenge a friend to beat or match your time.</p>
<p><u>CELS:</u> Numeracy, Critical and Creative Thinking</p>	<p><u>Adaptation/Variation/Extension:</u></p> <p>- to make it more difficult, add more pieces to make additional shapes (tangrams)</p>
<p><u>Evaluation:</u></p> <p>self assessment</p> <p>anecdotal records</p> <p>performance assessment</p> <p>notebook</p> <p>learning contract</p> <p>observation checklist (if class activity)</p>	<p><u>Reflection/Additional Comments:</u></p> <p>Many possibilities exist for tangram-type activities. Each student could make their own set of tangrams to use out of stiff paper, and these could be used both to design shapes and match various given shapes, all activities working on spatial awareness</p>

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### Activity 4: Making Boxes

<p><u>Learning Objectives related to Curriculum::</u></p> <p>Construction of cubes - recognizing how the faces of a three dimensional object come together to form the object.</p> <p>G-5,6,7</p>	<p><u>Number of Students:</u> 1 or more, depending on materials available</p>
<p><u>Resources/Materials:</u></p> <p>pencil, graph paper</p> <p>square pattern (thin cardboard ~ 3.7 cm by 3.7 cm)</p> <p><u>Source Acknowledgment:</u></p> <p>Adapted from Cathcart, W., Pothier, Y., James, H. Learning Mathematics in Elementary and Middle Schools, Second Edition, 1997. All rights reserved. Used by permission of Allyn &amp; Bacon. Reproduction of material without written permission from the publisher is prohibited.</p>	<p><u>Activity Description</u></p> <ol style="list-style-type: none"><li>1. Imagine you are a box manufacturer and you want to ship boxes flattened out. How many possible shapes of 6 squares could be folded into a box?</li><li>2. Using the square pattern and graph paper, make as many designs as possible. (Trace 6 adjoining teddy bear squares in a pattern you decide upon.)</li><li>3. Cut out your pattern and fold to see if you can make a box of each in order to check your work.</li></ol>

<p><u>CELS: Numeracy, Critical and Creative Thinking</u></p>	<p><u>Adaptation/Variation/Extension:</u></p> <p>- have students design other shapes and cut and fold to make 3-dimensional objects (ex: pyramid)</p>
<p><u>Evaluation:</u></p> <p>self assessment</p> <p>anecdotal records</p> <p>performance assessment - notebook</p> <p>learning contract</p> <p>observation checklist</p>	<p><u>Reflection/Additional Comments:</u></p> <p>Since there are not many materials for this activity, it would be easy to extend to use for a larger group of children. It would also be a good activity to work at in pairs , with cooperation of students.</p>

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### Activity 5: Making A Quilt Block

<p><u>Learning Objectives related to Curriculum:</u></p> <p>Plane: Recognize and design patterns that can be made with congruent triangles. (Also definition of diagonal, congruent)</p> <p>G-16, G-22</p>	<p><u>Number of Students:</u> 1 or 2, or groups of 2 working together</p>
<p><u>Resources/Materials:</u></p> <p>plain square of paper large enough to contain "quilt square"</p> <p>16 squares of paper for each student, 8 each of contrasting colors</p> <p><u>Source Acknowledgment:</u></p> <p>Adapted from Cathcart, W., Pothier, Y., James, H. Learning Mathematics in Elementary and Middle Schools, Second Edition, 1997. All rights reserved. Used by permission of Allyn &amp; Bacon. Reproduction of material without written permission from the publisher is prohibited.</p>	<p><u>Activity Description:</u></p> <ol style="list-style-type: none"><li>1. Choose 16 squares of contrasting colors. (8 each of 2 colors)</li><li>2. Cut each square diagonally to form 2 congruent triangles</li><li>3. Arrange in an interesting pattern</li><li>4. When you have decided on a pattern, glue triangles on a piece of paper.</li></ol>

<p><u>CELS:</u></p> <p>Numeracy, Critical and Creative Thinking, Personal and Social Values and Skills if working as a team</p>	<p><u>Adaptation/Variation/Extension:</u></p> <ul style="list-style-type: none"> <li>- have students use 9 squares rather than 16 squares to make it easier</li> <li>- have all children work in a pairs (less material required, more cooperation!)</li> </ul>
<p><u>Evaluation:</u></p> <p>self assessment</p> <p>anecdotal records</p> <p>performance assessment - notebook</p> <p>learning contract</p> <p>observation checklist</p>	<p><u>Reflection/Additional Comments:</u></p> <p>Important to stress that the pattern be made BEFORE beginning to glue on the shapes. The "whole picture" must be seen to see the pattern and then, after making any desirable changes, the gluing can be done!</p>

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### Activity 6: Figures on a Geoboard

<p><u>Learning Objectives related to Curriculum:</u></p> <p>Plane: Make shapes on a geoboard based on knowledge of angles, triangles, rectangles. Demonstrate knowledge of polygons.</p> <p>G-13 to G-19</p>	<p><u>Number of Students:</u> 1 or more. Could be the whole class if there are enough supplies (geoboards), or if students have the appropriate paper to use.</p>
<p><u>Resources/Materials:</u></p> <p>Geoboards OR geoboard sheets OR graph paper.</p> <p>Pencil, ruler or rubber bands of using the geoboards</p>	<p><u>Activity Description:</u></p> <ol style="list-style-type: none"><li>1. Use geoboards in the classroom OR geoboard sheets provided OR graph paper, using the intersections of lines as the "posts" on the geoboard.</li><li>2. Try making the following:<ol style="list-style-type: none"><li>a) triangle with a right angle</li><li>b) triangle with no right angle</li><li>c) a house containing right, acute, and obtuse angles.</li><li>d) a sailboat with no right angles</li><li>e) a Christmas tree using at least three triangles</li><li>f) a rocket ship made of rectangles and squares</li><li>g) a five sided figure</li><li>h) a parallelogram that is not a rhombus, square, or rectangle.</li></ol></li><li>3. If playing with a partner, make a shape and have your partner copy it. Describe it in geometric terms.</li></ol>

<p><u>CELS:</u></p> <p>Numeracy, Critical and Creative Thinking, Personal and Social Values and Skills if working as a team</p>	<p><u>Adaptation/Variation/Extension:</u></p> <ul style="list-style-type: none"> <li>-students could work in pairs or small groups to work on answering together.</li> <li>- additional figures could be added to the list, becoming more challenging</li> </ul>
<p><u>Evaluation:</u></p> <p>self assessment, anecdotal records  performance assessment - notebook  observation checklist</p>	<p><u>Reflection/Additional Comments:</u></p> <p>Possibilities with geoboards are abundant! Many resources and ideas available in a variety of books, or make your own according to objectives</p>