

Geometry and Tactile Graphics for Students in Grades 3 to 8

Lesson 3: Materials and Strategies for Geometry Instruction Part 2



University of South Carolina Upstate

Linear Measurement

- 3rd grade skill (to $\frac{1}{4}$ ")
- 4th grade skill (relative size, conversion tables)
- 5th grade skill (unit conversions)
- Ask the general education teacher
 - Standard or metric?
 - What length (e.g., foot, yard)?
- Skill of lining up what to measure so there is a clear "0 point".
- APH yard stick – look at the "0" on the print side vs. the braille side!
- Tactile caliper from multiple sources (not APH)



Linear Measurement Tools

Standard

- Yardstick (braille/print)
- 18" flexible ruler (braille/print)
- 1 foot ruler (braille only)
- Tactile measuring tape (tactile/print)
- Tactile Caliper (braille only)

Metric

- Meterstick (braille only)
- 30 cm flexible ruler (braille/print)
- Tactile measuring tape (tactile/print)
- Tactile Caliper (braille only)

Combined

Standard/Metric

- 1 foot braille ruler (braille)
- Toss-Away Ruler (7 in/17 cm) (braille/print)
- Talking tape measure

Coordinate Graphs

- 5th grade skill (1st quadrant only)
 - Components: axes, origin, coordinates, ordered pairs
 - Basic graphing (horizontal then vertical)
- 6th grade skill
 - Polygons in a coordinate plane
 - Distance between points with same x or same y-coordinate
- Use:
 - Graphic Aid for Mathematics
 - Tactile graph paper
 - Push pins, brass fasteners, tactile stickers, etc. to represent points



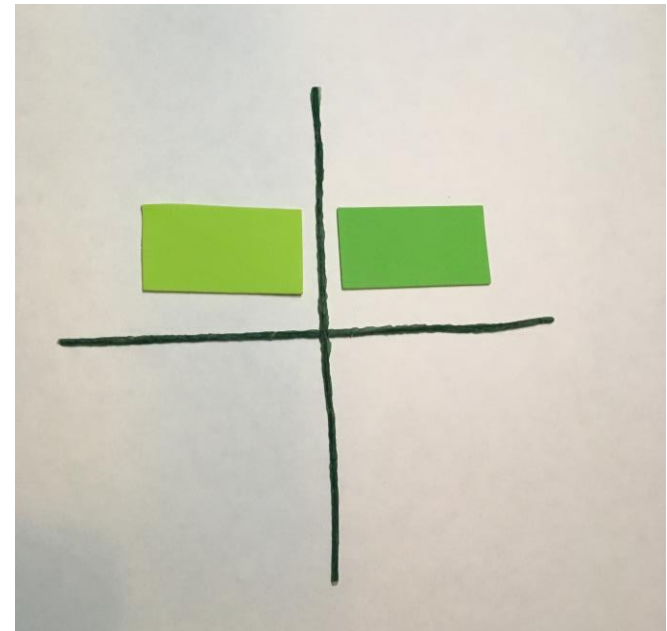
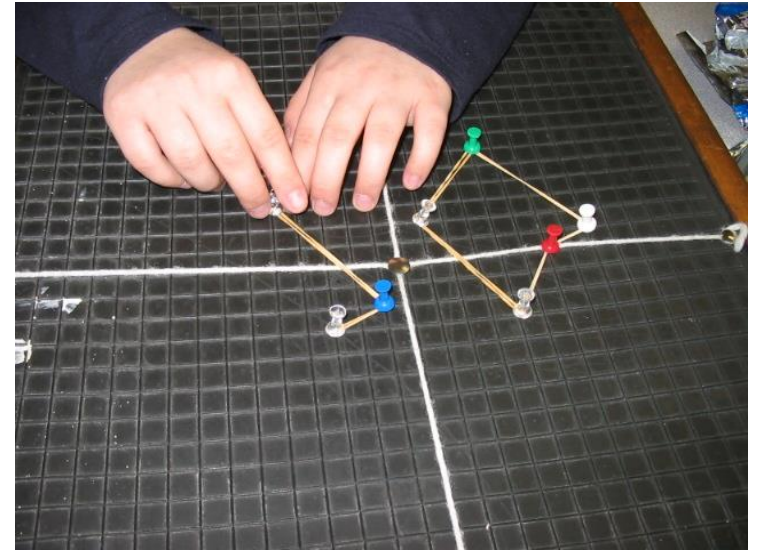
Scale Drawings

- 7th grade skill
- Solving problems involving scale drawings of geometric figures
- Computing actual lengths and area based on scale
- Use:
 - Graphic Aid for Mathematics
 - Tactile graph paper
 - Push pins, brass fasteners, tactile stickers, etc. to represent points



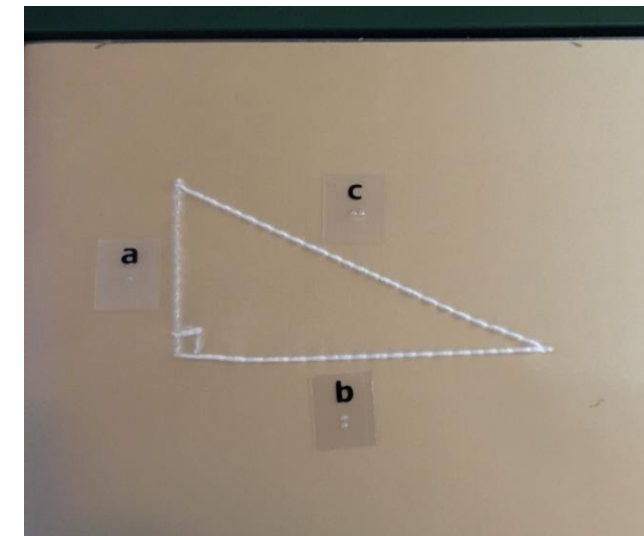
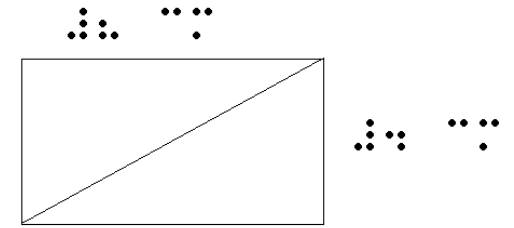
Transformations

- 8th grade skill
- Concepts
 - Reflections - flip
 - Translations - shift
 - Rotations - turn
 - Dilations - make larger or smaller
- Use:
 - Graphic Aid for Mathematics
 - Tactile graph paper
 - Push pins, brass fasteners, tactile stickers, etc. to represent points



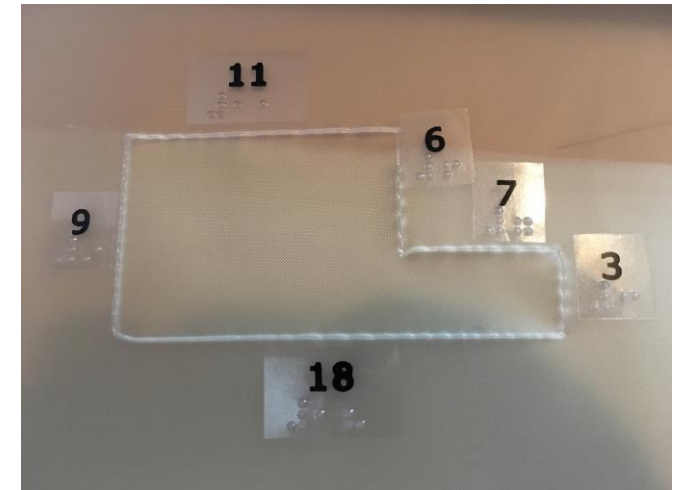
Pythagorean Theorem

- 8th grade skill
- Legs (a and b) – by the right angle
- Hypotenuse (c) – opposite the right angle
- Solving for unknown sides using $a^2 + b^2 = c^2$
- Finding distance between two points in a coordinate grid
- Use: graph paper or Draftsman for drawings
- Use: braillewriter for solving problems



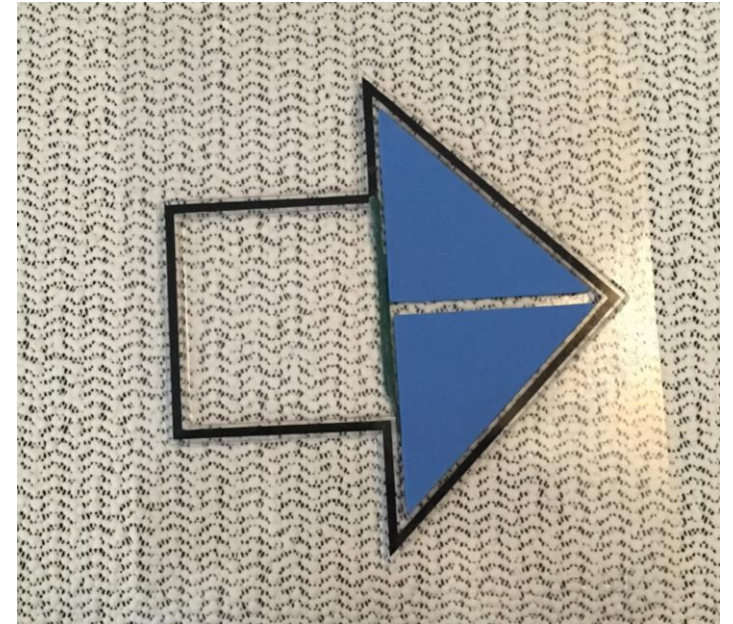
Perimeter

- 3rd grade skill
- Students need to learn:
 - To count squares on graph paper to determine perimeter
 - To find labels for lengths of sides
 - To determine length of a missing side
- Teach students to use Feel n Peel number stickers to label missing side lengths
- Use graph paper, Draftsman, Geoboard, student's textbook



Area

- 3rd grade skill (tiling)
- 4th - 7th grade skill (using formulas)
- Tiling a figure with unit squares – use graph paper with stickers, poster putty, or Wikki Stix to mark the squares already counted
- Students **systematically** count squares on grid paper.
- Using formulas to find area
- Decomposing shapes – use Graphic Art Tape, Wikki Stix or other tools to divide up shapes
- Use: Tactile Tangrams, Geoboards



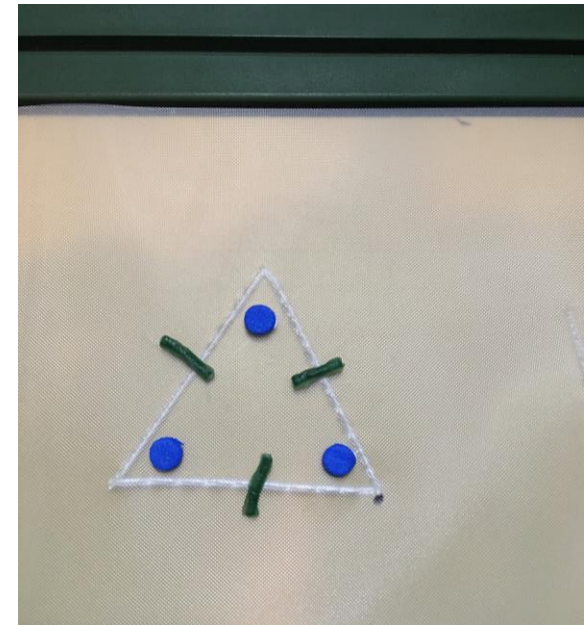
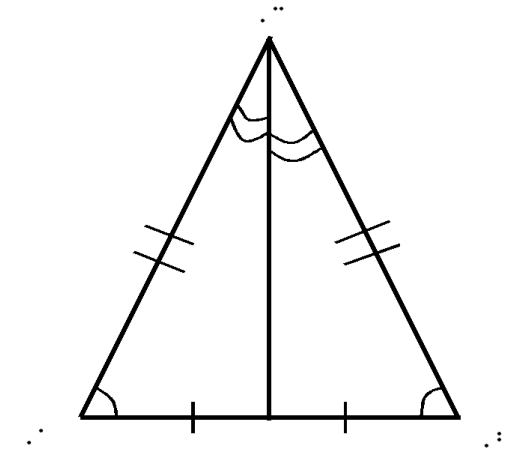
Circles

- 7th grade skill
- Concepts
 - Radius
 - Diameter
 - Pi
 - Circumference
 - Area
- To calculate circumference and area have the student use a scientific calculator
- Use: Draftsman board, rubber pad, tactile compass for math and art



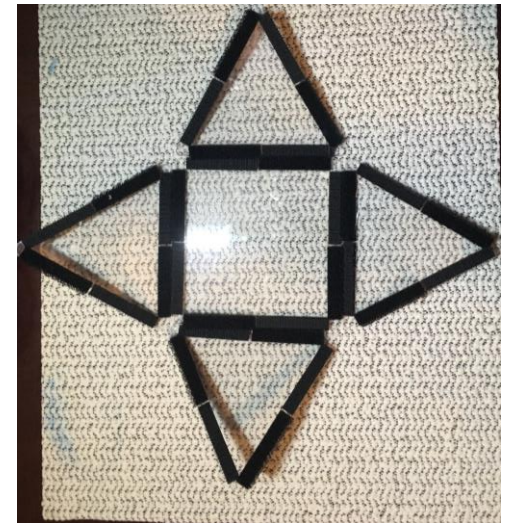
Congruence

- 8th grade skill
- Same shape and size
- Reading tactile markings on a graphic to tell when sides or angles are congruent.
- Using length or measure to find congruence
 - Estimations (Index Card)
 - Exact (Ruler or Protractor)
- Use Geometry Tactile Graphics Kit, Draftsman, stickers, Wikki Stix



3-Dimensional Shapes

- 6th grade skill: Representing 3-D shapes using nets made up of rectangles and triangles
- 7th grade skill: Describing 2-D figures that result from slicing 3-D figures
- Use:
 - Geometric Forms
 - Geometro Sets (mini, medium, large)



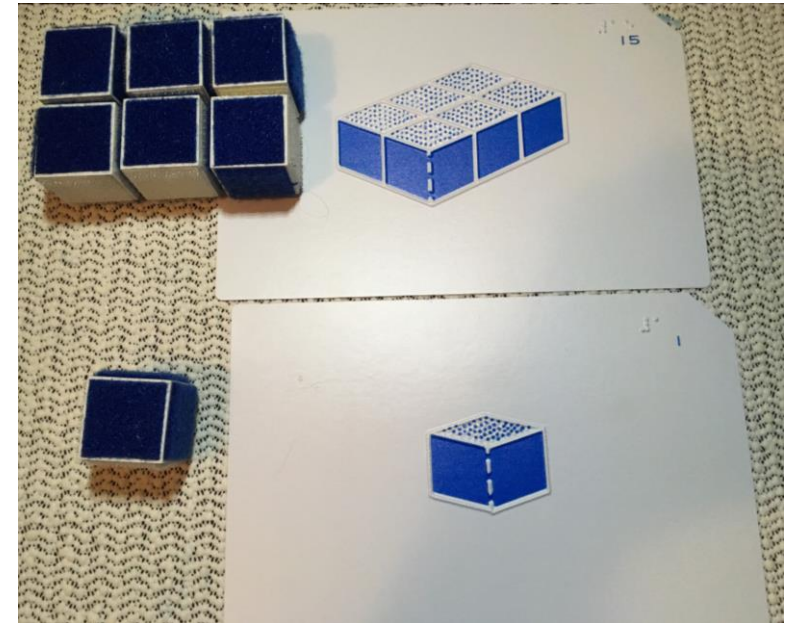
Surface Area

- 6th - 7th grade skill
- Using nets to find surface area of 3-D figures
- Using formulas to find surface area
- Use:
 - Geometric Forms
 - Geometro Velcro Solids
 - StackUps: Spatial Reasoning Using Cubes & Isometric Drawings



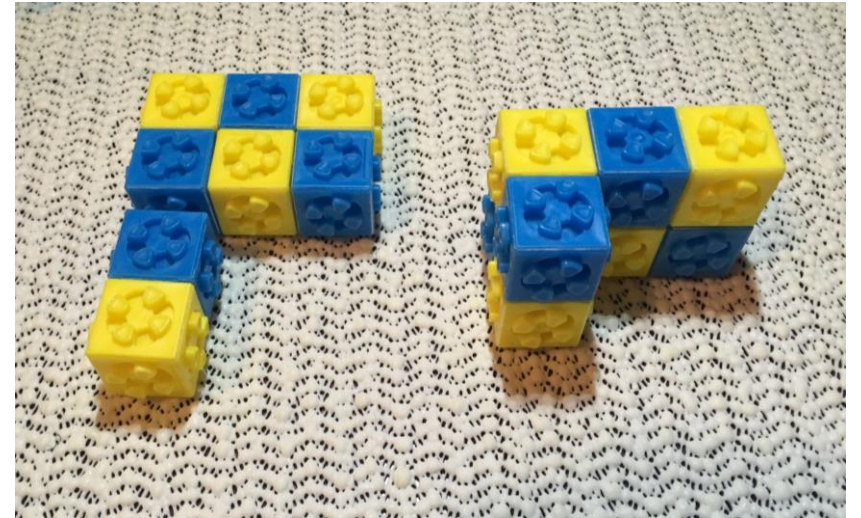
Volume of Prisms

- 5th - 6th grade skill
- Using unit cubes to form a solid figure
- Finding volume by counting cubes
- Finding volume of rectangular prisms by using the lengths of edges and the formula
 - $V = lwh$
- Once a student masters volume with the cubes, they can move to the cards in the StackUps.
- Use: OmniFix Cubes, StackUps: Spatial Reasoning Using Cubes & Isometric Drawings



Volume of Prisms and Pyramids

- 7th grade skill
- Finding volume of solid figures by decomposing into rectangular prisms
- Start with basic prisms and advance into 3-D figures that are more complex.



Volume of Cones, Cylinders, and Spheres

- 8th grade skill
- Find radius in cones, cylinders, and spheres
- Find height in cones and cylinders
- Understand and know the formulas for volume
- Use: Scientific calculator, tactile graphics from textbooks

Bolstering Conceptual Understanding for the Student in the Classroom

- Build familiarity with graphics in the textbook
- Prepare the student for the types of graphics they'll see in testing situations