Using Coffee Stirrers to Develop Reasoning about Geometric Shapes and their Attributes

2-D Shapes

Triangle Rectangle Circle Octagon Square Pentagon Hexagon Semicircle

3-D Shapes

Cube Cuboid Cone Cylinder Sphere Prism
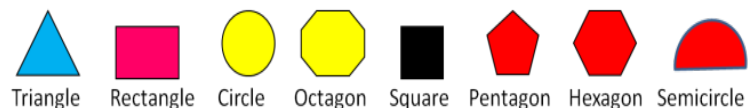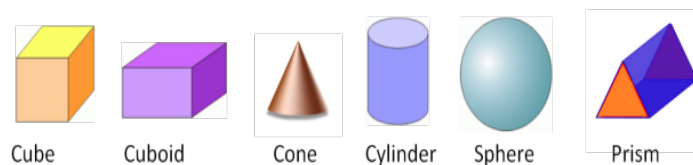
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NCTM Standards

All students in grades 3-5 should be able to:

- identify, compare, and analyze attributes of two-and three-dimensional shapes

- develop vocabulary to describe the attributes

- classify two- and three-dimensional shapes according to their properties

- develop definitions of classes of shapes such as triangles and pyramids

- make and test conjectures about geometric properties and relationships

- develop logical arguments to justify conclusions

Gavin, M. K., Belkin, L. P., Spinelli, A. M., & St. Marie, J. (2001). *Navigating through geometry in grades 3-5*. Reston, VA: NCTM.

Level 0 Visual level

Students judge shapes by the way they look.

Level 1 Descriptive level

Students identify shapes according to properties.

Level 2 Informal Deduction level

Students are able to see the interrelationships between figures.

Level 3 Formal Deduction level-Proofs
       Students give reasons for steps in a proof.
       At this level, students are able to work with
       abstract statements about geometric properties
       and make conclusions based more on logic
       than intuition.

Level 4 Rigor
       Students supply reasons for contradictions for
       a proof and rigorously compare different
       axiomatic systems.

*Mayberry, J. (1983). The van Hiele levels of geometric thought in undergraduate preservice teachers. *Journal of Research in Mathematics Education*, *14*(1), 58-69.

Types of Angles

- **Right**
- **Acute**
- **Obtuse**
- **Straight**
- **Reflex**

Types of Lines

- **Parallel**
- **Intersecting**
- **Perpendicular**

Shapes in *The Greedy Triangle*

Name of Shape	Number of Sides	Number of Angles	Number of Vertices	Real-world Examples

Let's explore polygon concepts

- What is a polygon?
- Polygon Vocabulary
  - Regular
  - Sides vs Edges

Based on Side Lengths

- Equilateral
- Isosceles
- Scalene

Based on Angles

- Acute
- Right
- Obtuse

Use your coffee stirrers and chenille sticks to create different quadrilaterals.

- Square

- Rectangle

- Parallelogram

- Rhombus

- Kite

- Trapezoid

Build a:

1. Triangle with congruent sides
2. Rectangle with four congruent sides
3. Parallelogram with four congruent sides
4. Closed figure with five sides
5. Triangle with a right angle
6. Shapes that are congruent
7. Triangle with an angle whose measure is larger than the measure of a right angle
8. Quadrilateral with exactly one pair of parallel sides
9. Shape with six lines of symmetry
10. Shape with three lines of symmetry

Bonus:
- Build a shape with two diagonals
- Build a shape with nine diagonals
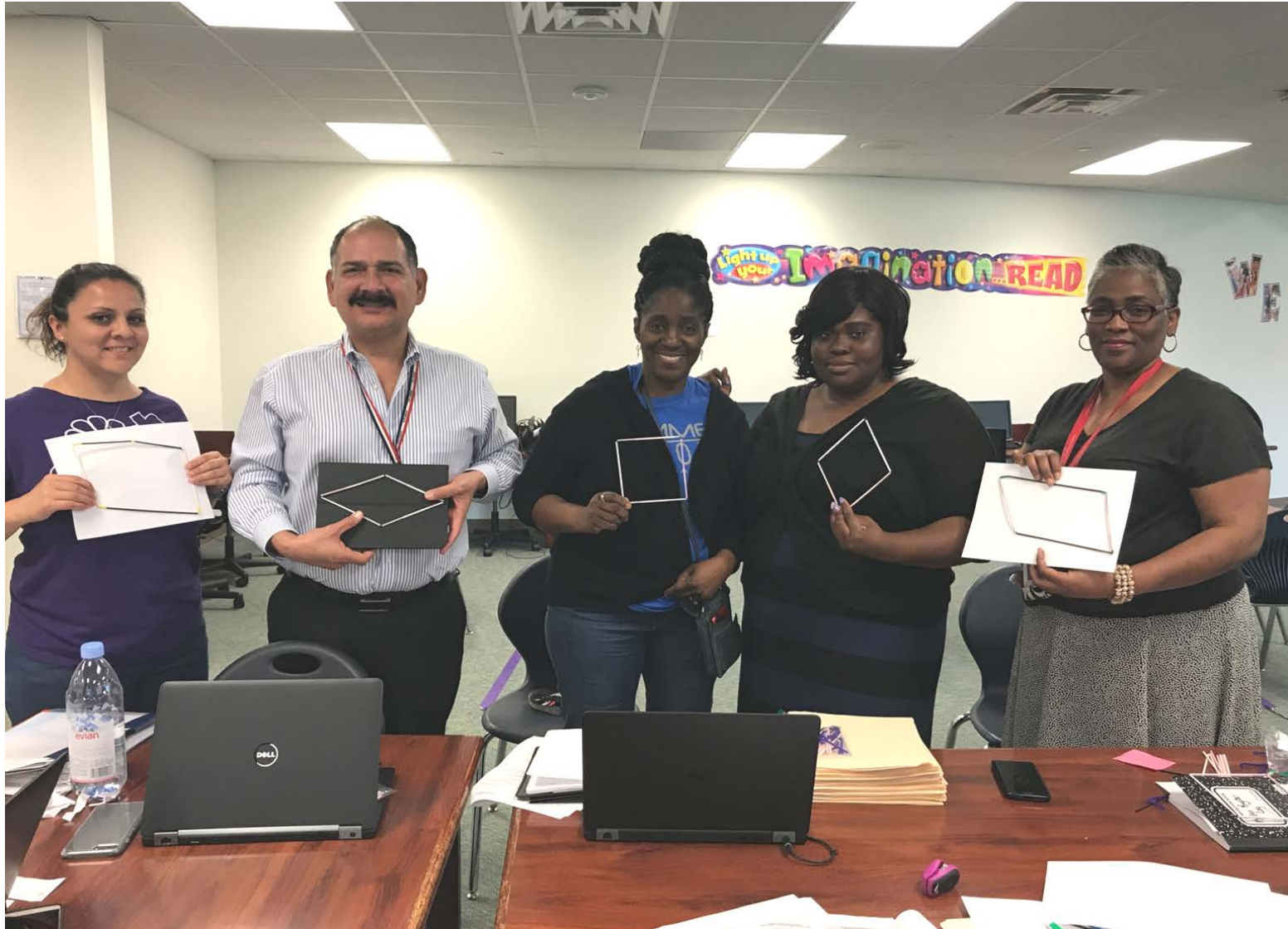
Stick Figures

Cooperative Learning Activity

from *Get It Together*
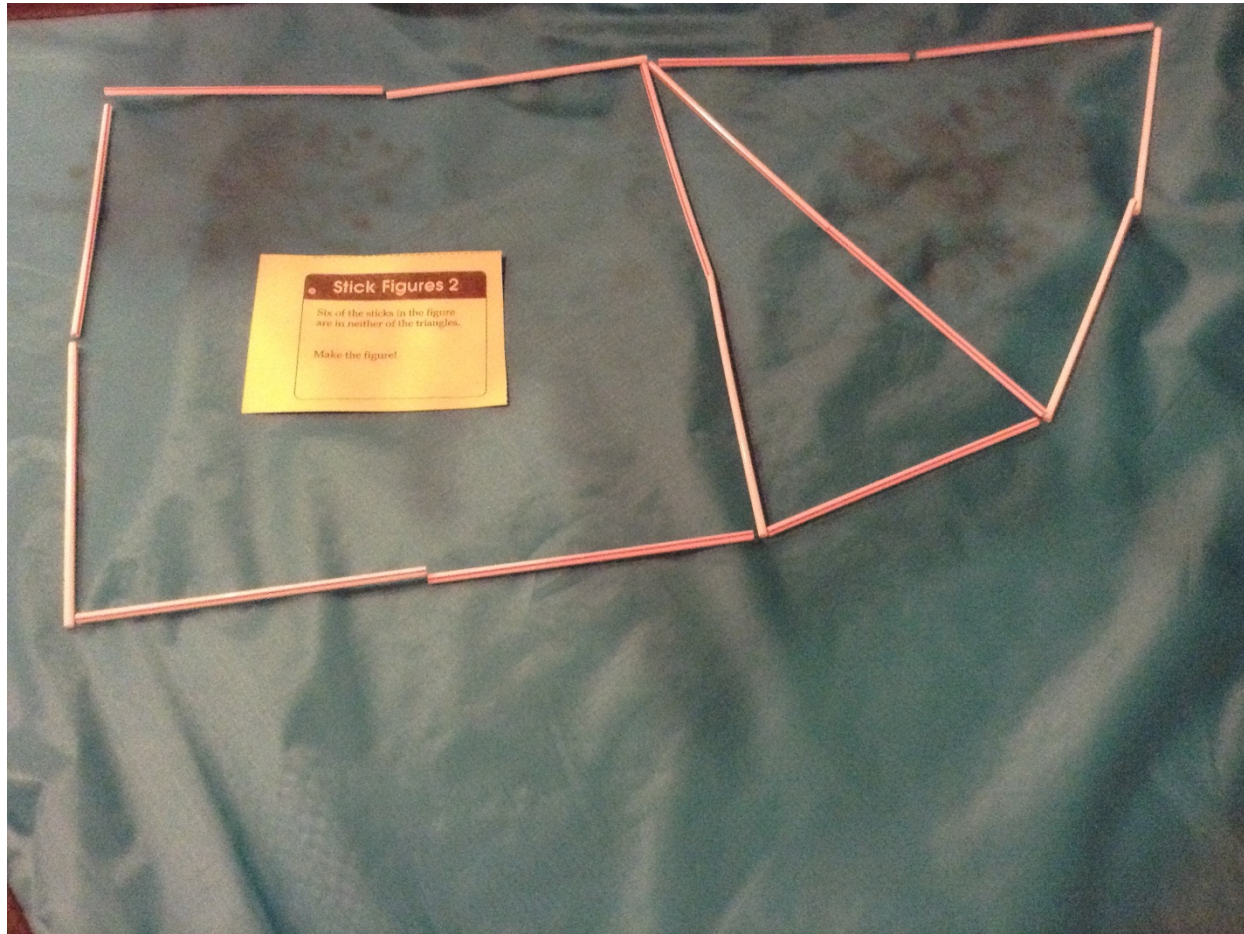
Let's build three-dimensional shapes

- Cube
- Rectangular Prism
- Triangular Prism
- Square Pyramid
- Triangular Pyramid

Three Dimensional Figures

Name of Figure	Number of Edges	Number of Faces	Number of Vertices	Conjecture
Cube				
Rectangular Prism				
Triangular Prism				
Square Pyramid				
Triangular Pyramid				

APPS

https://rusmp.rice.edu/resources/symbaloo

Resources

Burns, M. (1994). *The Greedy Triangle.* New York: Scholastic, Inc.

Erickson, T. (1989). *Get it Together*. Berkeley, CA: Equals, Lawrence Hall of Science.

Gavin, M. K., Belkin, L. P., Spinelli, A. M., & St. Marie, J. (2001). *Navigating through geometry in grades 3-5*. Reston, VA: NCTM.

Greene, R. G. (1997). *When a Line Bends . . . A Shape Begins*. Boston: Houghton Mifflin Company.

Mayberry, J. (1983). The van Hiele levels of geometric thought in undergraduate preservice teachers. *Journal of Research in Mathematics Education, 14*(1), 58-69.