**Fold It, Move It, Use It**

**Please access my Weebly page to get the handouts and worksheets mentioned below. These documents are in Microsoft Word, so they are editable. There is a Contact tab on the Weebly that you can use to send me an email if you have any questions or problems accessing any of the information I posted.**

[**www.rohmscience.weebly.com**](http://www.rohmscience.weebly.com)

**Why spend the time to make things hands-on?**

* Van Hiele Levels of Geometric Understanding. Research shows that students cannot be expected to perform higher levels of thinking if they are lacking in the lower levels. The lower levels of geometric understanding involve touching, measuring, folding, moving . . . If you teach at a higher level than your students are thinking, they will have difficulty understanding and remembering. (See resource list below.)
* "To state a theorem and then to show examples of it is literally to teach backwards." H. Eves
* “The universe cannot be read until we have learnt the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word." Galilei, Galileo (1564 - 1642)
* “I often say that when you can measure something and express it in numbers, you know something about it. When you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science, whatever it may be.” Lord Kelvin

**Activities and Ideas**

1. Reviewing – Divide students into groups. Each group gets a different color pen. Either rotate the groups or rotate the paper. Time each stop. Brainstorm for the word / topic on the paper. First stop is shortest time. Rotate. At each stop give longer time. Go back at discuss each paper at the end of the activity. Different color ink indicates the work of each group.
2. Fun with boxes: calculate volume, area, surface area, find area by Area Addition Postulate for irregular shapes, measure angles.
3. Use Patty Paper. You can use this to: compare angle relationships in parallel lines, find angle bisectors, midpoints, perpendicular bisectors, medians, altitudes, circumcenter, incenter, centroid, properties of quadrilaterals, central angles of circles, tangents to a circle, angles inscribed, central angles, arcs, chords, congruent triangles, transformations, symmetry, and tessellations.
4. Use drinking straws and pipe cleaners to explore triangle inequality. \*
5. SSS Activity. Make triangles with string and coffee stirrers. Explore SSS congruence. \*
6. Triangle = 180. Rip off the corners of a triangle and line it up. Observe sum of angles = 180.
7. Proof Practice. Cut out steps of proof. Have students arrange them in order. \*
8. Line of symmetry, reflection, rotation. Use cut-outs to explore these relationships. Can also use mirrors. \*
9. Similar Triangles. Put a mirror on the floor. Look into the mirror to see the top of a high place. Measure: eye height, distance from feet to mirror, distance from mirror to base of high object. Since angle of incidence = angle of reflection, and heights are perpendicular, you have similar (proportional) triangles by AA. Use proportion to find unknown height.
10. Archaeology simulation. Use chords and perpendicular bisectors to find size of circle.\*
11. Right Triangles- use right triangles to explore and measure things like: slope, tangent = slope, and Pythagorean Theorem.
12. Points around the room. Position points around the room. Use all 4 walls, floor and ceiling. Ask students to name planes, lines, intersection of planes, coplanar points . . .\*
13. Cutting the tree down to size. Use graphing calculator LIST tool to manipulate data to change the size and shape of a tree.\*
14. Spaghetti graphs. Use Spaghetti to graph y = sin x or y = cos x.\*
15. Noisy Graph. Drop hex nuts from a great height to explore relationship in quadratic y = x2.\*
16. Probability for SMARTIES. Use candy to answer questions about probability.\*
17. Fundamental Counting Principle. Create a flip book to demonstrate the number of outfits possible. Cut out picture of tops, bottoms, ties, scarfs, handbags, etc. to make books showing the number of possible outfits. For instance: 2 shirts, 3 bottoms, 2 bags = 12 outfits.
18. Use Tangrams. Find a pattern on the internet. I made a set from felt. The felt sets can easily be passed around the room without dropping any pieces. You can also put it on a bulletin board for students to work on when they finish other assignments.
19. The Magic of Santa. Have fun calculating the impossibility of Santa Clause.\*
20. Graph or solve problems using white board markers and paper in plastic sleeves. Students can hold up their solutions for you to see. Try using dry-erase makers on your desktop. Wipes off with tissue or paper towel.

**Resources:**

1. Mason, Marguerite. “The van Heile Levels of Geometric Understanding.” *Professional Handbook for Teachers.*  uga.edu. 09/21/2014

http://jwilson.coe.uga.edu/EMAT8990/GEOMETRY/Mason,%20Marguerite.%20The%20van%20Hiele%20Levels%20of%20Geometric%20Understanding.%202002.pdf

1. Application of trig ratios to find angles of elevation / depression:
2. http://makematheasy.wikispaces.com/file/history/Clinometers,+Angles+of+Elevations+and+Trigonometry.doc
3. <http://users.wfu.edu/mccoy/outdoor/aj.pdf>
4. <http://www.cartesiancartoons.com/> FREE PRINTABLE ACTIVITIES! Cartesian Cartoons provides math students with practice using ordered pairs to plot point on graphs in an amusing way.
5. Book**: Patty Paper Geometry**. By Michael Serra. Available on Amazon for a few dollars. I LOVE THIS BOOK. It is so much easier to fold things than it is to use a compass and a straightedge.
6. Book**: Hands-On Algebra! Ready to use Games and Activities by Frances M. Thompson**. Available on Amazon for a few dollars. This book has instruction for a paper version of algebra tiles. There are many activities that use small paper squares and mats to model different types of equations. Some activities are very tedious but there are some good ideas. One idea is to show the students a set of block in a certain pattern. Show three set of progressions of the blocks, increasing the pattern a certain way. They are to chart the step #, and the total number of blocks used. Then they are to predict the number of blocks for a different step, say for the tenth step. They are to build it to check their prediction. You help them determine how to write an equation for the number of blocks for the Nth step. You can also use graph paper to model the relationship between the step # and the total number of blocks.
7. Book: **Algebra Teacher’s Activities Kit. 150 Ready-to-Use Activities with Real-World Applications**. By Judith A. Muschla and Gary Robert Muschla. Available on Amazon for a few dollars. This book has activities that involve “real-life” numbers. Like scientific notation number from astronomy and real life inequalities (only ages 12 and under may order from the children’s menu). There is an activity devoted to helping students understand how “math tricks” work. They write their own equation where you say things like “think of a number” and then you give a series of steps. At the end you can tell the person the original number.