



# EXCITE-Ability™ Kit: Elementary Geometry

## Instructional Guide

### Product Description

The Elementary Geometry EXCITE-Ability™ Kit has four components: Geometry Quizmo™, the 360° degree Circle Protractor, the Triman® Safe Drawing Compass/Ruler, and *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools* by Gary Walton. Each component is an excellent supplement to have in the classroom, but when the components are combined in hands-on activities, students will learn and apply the concepts of geometry in a more meaningful manner. There are nine activities in this Instructional Guide that can be used immediately in the classroom. Everything needed is in the Elementary Geometry EXCITE-Ability™ Kit. The *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools* has many lessons that can be used in the classroom. There are individual Instructional Guides in this kit for Geometry Quizmo™, the 360° Circle Protractor, and the Triman® Safe Drawing Compass/Ruler, where many more classroom activities can be found.

### Educational Objectives

- To learn basic geometry definitions, shapes, and symbols in a fun, game format
- To visualize geometric symbols and apply them to real world examples
- To draw straight lines, circles, and geometric shapes
- To create complex artistic designs
- To measure and convert customary and metric measurement
- To read, construct, and recognize right, acute, obtuse, and straight angles
- To explore the differences of angle and side measurements in quadrilaterals

- To construct various quadrilaterals using the 360° Circle Protractor and the Triman® Safe Drawing Compass/Ruler
- To compare regular and irregular polygons
- To construct circles of different diameters

### Materials in this Kit

- Geometry Quizmo™ (MM4046)
- *Explore to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools* by Gary Walton (EJ8250)
- 5-360° Circle Protractors (BB8158H)
- 4 Triman® Safe Drawing Compass/Ruler (BB8157H)
- 1 Overhead Triman® Safe Drawing Compass/Ruler (NB6837H)

### Other Materials Needed

- Colored pencils
- Construction paper
- Index cards
- Pencils
- Photocopier
- Scissors

### Activity One

*Free Play*

**Materials:** 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, construction paper, colored pencils

**Objective:** To discover uses for the tools before formal instruction; to produce artistic designs with the tools

### Procedure:

- Distribute the 360° Circle Protractor, the Triman® Safe Drawing Compass/Ruler, construction paper, and pencils to students.
- Tell them to experiment with the tools and draw the designs with colored pencils on the construction paper.
- Encourage students to work together in small groups and share their discoveries.
- In the whole group, allow students to share their drawings. Give the correct geometric names to the designs students have made. For example, if a student has drawn a triangle, tell the group the proper name of the triangle (equilateral, scalene, isosceles, acute, right and obtuse).

## Activity Two

### *Learning the Language of Geometry: Definitions, Terms, Shapes, Symbols*

**Materials:** Geometry Quizmo™, index cards, pencils, 360° Protractor, Triman® Safe Drawing Compass/Ruler

**Objective:** To learn geometry definitions and the corresponding symbol or shape

### Procedure:

- Demonstrate to students how to make flashcards using Geometry Quizmo™ calling cards. Write the geometry definition on the front of the card and the term and shape or symbol on the back of the card. A list of terms can be photocopied from the back page of the Geometry Quizmo™ Instructional Guide. Then students can cross off the term as they complete their flash card. Students should work in small groups and share the calling cards. Each student should complete his/her own set of flashcards. Allow a few class periods for students to complete this exercise.

### Ways to Practice:

- Individually- students can self-correct
- Partners- students quiz each other
- Teams- teacher divides the whole class into two teams; students line up in a row; teacher reads the definition from the Geometry Quizmo™ call-

ing card; the first student to call out the answer gets a point for his/her group and moves to the back of the line; continue for several rounds; the group with the most points wins.

- Whole group-play Geometry Quizmo™. Refer to the Geometry Quizmo™ Instructional Guide for playing directions.

## Activity Three

### *Scavenger Hunt*

**Materials:** Geometry Quizmo™, a photocopied list of the items below, 360° Circle Protractor, and the Triman® Safe Drawing Compass/Ruler

**Objective:** To recognize real life examples of Geometry shapes and symbols and use tools to measure them

### Procedure:

- Use the symbol side of the Geometry Quizmo™ calling cards or the flashcards created in Activity One to review geometry symbols and shapes.
- Tell students that they will be working in pairs to find real life examples of geometry in the classroom. Remind them to record their answers. Tell them that they will get extra points if they can measure some of the items with the protractor or compass/ruler.

### Scavenger Hunt Items

acute angle  
circle  
cube  
cylinder  
line segment  
obtuse angle  
parallel lines  
perpendicular lines  
point  
rectangle  
rectangular prism  
right angle  
sphere  
square

- Challenge students to make up their own scavenger hunt list to give to their parents and friends to solve.

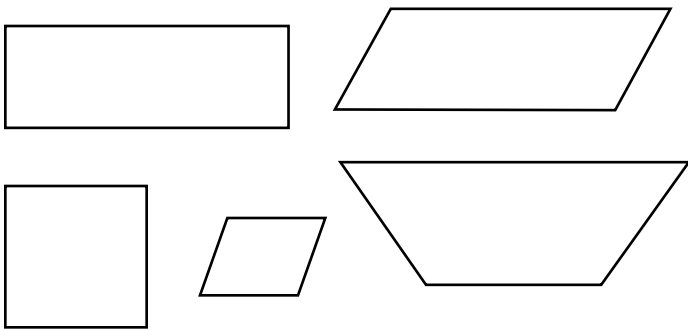
## Activity Four

### Quadrilaterals

**Materials:** *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools* by Gary Walton, 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, pencils, and enlarged copies of quadrilaterals shown below.

**Objective:** To identify and construct quadrilaterals; to measure lines and angles accurately

#### Procedure:



- Using enlarged copies of the quadrilaterals shown above, demonstrate to students how to use the Triman® Safe Drawing Compass/Ruler to measure a line segment of the square. Use the overhead projector and the clear Triman® Safe Drawing Compass/Ruler to demonstrate. Write the measurement of the line.
- Instruct students to measure and record the measurements of all sides of the quadrilaterals. Specify which measurement, customary or metric, they are to use. Discuss results.
- Demonstrate how to measure an angle of the trapezoid using the 360° Circle Protractor. This can be done on the overhead projector. Use the Triman® Safe Drawing Compass/Ruler to extend line segments, if needed. Record the measurement by the vertex of the angle.
- Instruct students to measure and record all of the angles of the quadrilaterals. Discuss findings of the angle measurements.

- Guide students in composing definitions of each quadrilateral by the side and angle measurements. Refer to the glossary, if needed.
- For independent practice, have students complete the following from *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*:

*Constructing a Parallelogram: pp. 50-51*

*Constructing a Square: pp. 52-53*

*Constructing a Rhombus: pp. 54-55*

*Constructing a Rectangle: pp. 56-57*

*Constructing a Trapezoid: pp. 58-61*

- A good assessment to use is the Quadrilateral.

## Activity Five

### Angles

**Materials:** 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*, construction paper, pencils, scissors

**Objective:** To identify and construct straight, acute, right, and obtuse angles

#### Procedure:

- Tell students to use the 360° Circle Protractor to trace the outside of the circle.
- Next, tell students to use the Triman® Safe Drawing Compass/Ruler to draw a line through the center of the circle. Tell them that this line is called the diameter.
- Have students use scissors to cut the circle in half on the diameter. Show students how to measure this straight angle with the 360° Circle Protractor.
- Next, tell students to fold one of the semi-circles in half. The result will be two right angles. Have the students cut the semi-circle along the fold and measure the angle with the protractor.

*It should like like this:*

- Using the second half of the original circle and

the Triman® Safe Drawing Compass/Ruler, demonstrate how to draw a line from the center (midpoint of the diameter of the original circle) to the outside of the semi-circle. The result will be one small part, which will be an acute angle, and one larger part, which will be an obtuse angle.

*An example is below:*

- Tell students to use their semi-circles to do the same thing demonstrated previously. Check to make sure that no one has drawn a line that will result in a right angle before allowing them to cut along the line.
- Have students use the 360° Circle Protractor to measure their angles. Tell them to record the angle measurements by the vertex.
- For additional practice refer to the following lessons in the book *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*:

*Constructing an Acute Angle: pp. 14-15*

*Constructing a Right Angle: pp. 16-17*

*Constructing an Obtuse Angle: pp.18-19*

## Activity Six

*Triangles*

**Materials:** Geometry Quizmo™ or student-created flashcards from Activity Two, 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*

**Objective:** To classify triangles according to angles and sides; to construct and label the six types of triangles

**Procedure:**

- Review the definitions of the six types of triangles: equilateral, isosceles, scalene, acute, right, and obtuse. The Geometry Quizmo™ calling cards or the student-created flashcards can be used.
- Have students attempt to classify each triangle shown on page 49 of *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the*

*Triman® Safe Drawing Tools*. Remind students to give each triangle a side name (equilateral, isosceles, or scalene) and an angle name (acute, right, obtuse).

- Instruct students to use their Triman® Safe Drawing Compass/Rulers to measure the legs of the triangle, record the measurements, and label the triangle according to its side name.
- Next, have students use the 360° Circle Protractor to measure the angles of the triangles, record the measurements, and label the triangle according to its angle name.
- Demonstrate the process of constructing the six types of triangles. To demonstrate to the whole class, use the 360° Circle Protractor and the overhead Triman® Safe Drawing Compass/Ruler.
- Students can use their 360° Circle Protractor and Compass/Ruler to construct triangles in the following sections of *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*:

*Constructing an Equilateral Triangle: pp. 36-37*

*Constructing an Isosceles Triangle: pp. 38-39*

*Constructing a Scalene Triangle: pp. 40-41*

*Constructing a Right Triangle: pp. 42-43*

*Constructing an Acute Triangle: pp. 44-45*

*Constructing an Obtuse Triangle: pp. 46-47*

## Activity Seven

*Geometry Land*

**Materials:** Geometry Quizmo™ or student-created flashcards from Activity Two, 360° Circle Protractor and Triman® Safe Drawing Compass/Ruler, colored pencils, construction paper

**Objective:** To create and label a picture including many geometric shapes

**Procedure:**

- Review geometric terms, shapes, and symbols by playing a couple of games of Geometry Quizmo™ or reviewing flashcards or Quizmo™ calling cards.
- Tell students that they will be making a picture including many geometric shapes and symbols.

Tell them to label each part.

- This is the list of geometric shapes and symbols students will incorporate into their picture:

acute angle  
circles  
cone  
cube  
cylinder  
hexagon  
intersecting lines  
line  
line segment  
obtuse angle  
octagon  
parallel lines  
parallelogram  
pentagon  
perpendicular lines  
ray  
rectangle  
rhombus  
right angle  
sphere  
square  
trapezoid

- Students can add color to their pictures to make them more interesting. The pictures can be displayed.

## Activity Eight

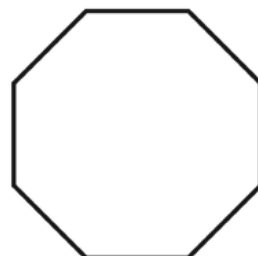
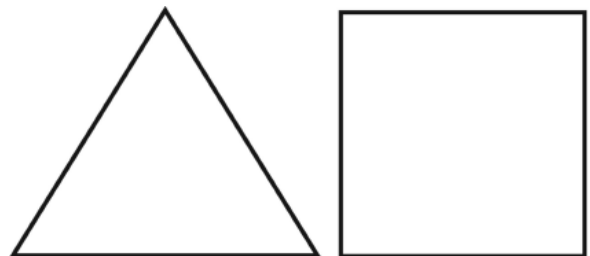
*Regular and Irregular Polygons*

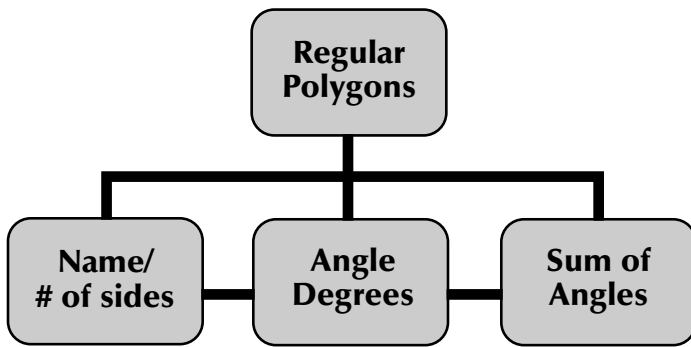
**Materials:** Geometry Quizmo™, 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, photocopied polygons (shown at the right), pencils

**Objective:** To measure the sides and angles of regular and irregular polygons; to find the sums of the angles in regular and irregular polygons; and to discover what the difference is between regular and irregular polygons (the angle measurements, not the sum of the angles)

### Procedure:

- Play a couple of games of Geometry Quizmo™ to review geometry terms, shapes, and symbols.
- Give students copies of the regular polygons and the chart .
- On an overhead projector, demonstrate how to measure the sides of the first regular polygon – an equilateral triangle – using the Triman® Safe Drawing Compass/Ruler. The sides will be the same measurement.
- Next, on the overhead projector, demonstrate the process of measuring the angles of the triangle, using the 360° Circle Protractor. All three angles will be 60 degrees.
- Instruct students to measure the regular polygons. Remind them to measure both the sides and the angles and record the measurements on the line segments (for side measurements) and on the vertex (for angle measurements). Tell students that they will have to extend the line segments in order to get an accurate measurement. Have them complete the Regular Polygon table shown below as they work.





- After students have had sufficient time to complete the activity, discuss the results with the group. The students will see that regular polygons have sides equal in length and angles equal in measurement. Make sure they have the correct answers for the sum of the angles before proceeding (triangle=180 degrees, square=360 degree, pentagon=560 degrees, hexagon=720 degrees, octagon=1,120 degrees).
- Finally, have students construct polygons with sides of different lengths on paper, using the Triman® Safe Drawing Compass/Ruler. Then have them use the 360° Circle Protractor to measure the angles. Students should find that the sums of the angles in irregular polygons are the same as regular polygons, but the length of the sides and the measurement of the angles in irregular polygons are different.

## Activity Nine

### Circles

**Materials:** 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, paper, pencils

**Objectives:** To construct circles of various diameters

#### Procedure:

- Tell students to use the circle templates on the 360° Circle Protractor to trace the four circles. Have them use the Triman® Safe Drawing Compass/Ruler to measure the diameter of each of the circles. Explain that the diameter is found by measuring any line that passes through the center of the circle. They will find that the circles have diameters of 1 cm, 1.5 cm, 2 cm, and 2.5 cm.
- Use the clear Triman® Safe Drawing Compass/Ruler and a thin overhead marker to

demonstrate the process of making a circle. Slide the cursor to the 2 cm position (explain that 2 cm will be the radius of the circle), place the marker point into the pencil opening, press down on the swivel disc, and draw the circle. Explain that the circle has a diameter of 4 cm because the radius is half of the diameter.

- Next, have the students make many circles of different diameters in both systems of measurement (metric and customary) on a sheet of construction paper. Have them label the diameters of each circle.
- For independent practice, have the students follow the directions and complete pages 32 and 33 in *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*.

## Activity Ten

### Symmetrical Designs

**Materials:** 360° Circle Protractor, Triman® Safe Drawing Compass/Ruler, *Explore Acute to Obtuse: Step by Step Beginning Geometry Using the Triman® Safe Drawing Tools*, pencil

**Objective:** To use the tools to create symmetrical designs

#### Procedure:

- Review the meaning of line symmetry. Line symmetry is a line that passes through any shape and divides it into two congruent parts. Demonstrate with an example.
- Using photocopies of page 62 from *Explore Acute to Obtuse*, have students find any and all lines of symmetry for the quadrilaterals.
- Have students construct a Newman Pinwheel by using the Triman® tools and by following the directions on pages 66 and 67 of *Explore Acute to Obtuse*. Have the students identify all lines of symmetry (there are 7).
- Next, have students construct an octagonal star flower by using the Triman® tools and by following the instructions on pages 74 and 75 of *Explore Acute to Obtuse*. When students have completed the octagonal star flower, have them color the flower to show line symmetry.

# Glossary

**acute angle** – an angle that measures less than 90 degrees

**acute triangle** – a triangle whose angles measure less than 90 degrees

**circle** – a set of all points that are equal distanced from a fixed point

**compass** – a tools used to draw circles

**diameter** – a line that passes through the center of a circle

**equilateral triangle** – a triangle with all sides the same length

**hexagon** – a polygon with six sides

**isosceles triangle** – a triangle with two sides the same length

**line segment** – a straight path between two points, or a part of a line with a definite beginning and ending

**obtuse angle** – an angle that measures more than 90 degrees

**obtuse triangle** – a triangle with one angle that measures more than 90 degrees

**octagon** – a polygon with eight sides

**parallel lines** – lines that are equally distanced and never intersect

**parallelogram** – a quadrilateral with opposite sides equal in length and parallel

**pentagon** – a polygon with five sides

**protractor** – a tool used to measure angles

**quadrilateral** – a polygon with four sides and four angles

**radius** – a line segment with one endpoint at the center of a circle and the other endpoint on the circle

**rectangle** – a quadrilateral with four 90 degree angles and the opposite sides are parallel and equal in length

**regular polygons** – polygons with equal sides and equal angles

**rhombus** – a quadrilateral with four equal sides and opposite sides are parallel

**right angle** – an angle that measures exactly 90 degrees

**right triangle** – a triangle with an angle that measures exactly 90 degrees

**ruler** – a tool used to measure lines

**scalene triangle** – a triangle with no sides the same length

**square** – a quadrilateral with four equal sides and four 90 degree angles

**straight angle** – an angle that measures 180 degrees

**trapezoid**– a quadrilateral with only one pair of parallel sides

**triangle** – a quadrilateral with three sides and three angles

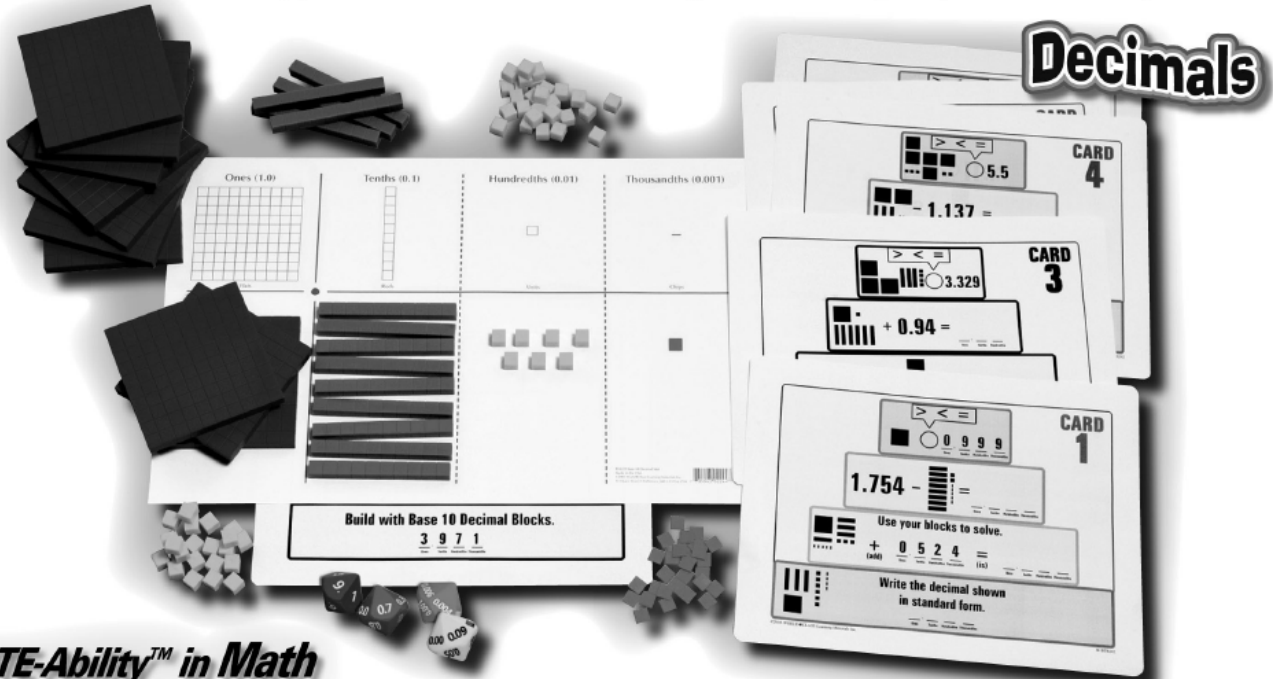


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