# ACTIVITY SET 9.1 CONNECTIONS & QUESTIONS
# FIGURES ON RECTANGULAR AND CIRCULAR GEOBOARDS

1. *School Classroom*: While working on an activity to divide geoboard squares into two congruent halves, several students could see that halves as in figures a and b were congruent but could not see that the parts of figures c and d were also congruent halves. Explain how you can help students determine when two plane figures are congruent so they can apply this knowledge to geoboard figures as well as other plane figures.
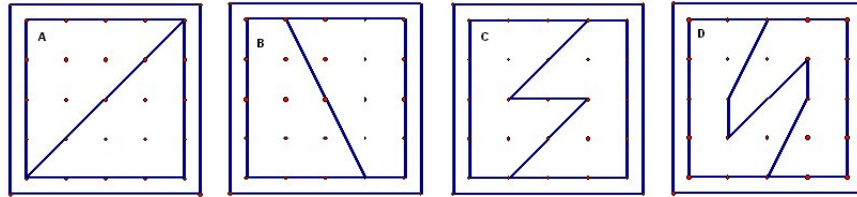
2. *School Classroom*: Several of your students insist that the following is a non-square rhombus because the sides are at a diagonal. How can you help your students resolve this issue?
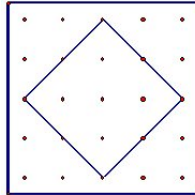
3. *Math Concepts:* Consider the following family of triangles formed on a circular geoboard, each triangle with base T_1T_{23}. Make lists that show each of the following (you may name triangles by the vertex angles T_2 through T_{22}). Which of these triangles are congruent? Which are acute triangles; obtuse triangles; scalene triangles; isosceles triangles; equilateral triangles; or right triangles? Illustrate your lists and explain your thinking. Circular geoboard recording paper is available for download at the Online Learning Center.
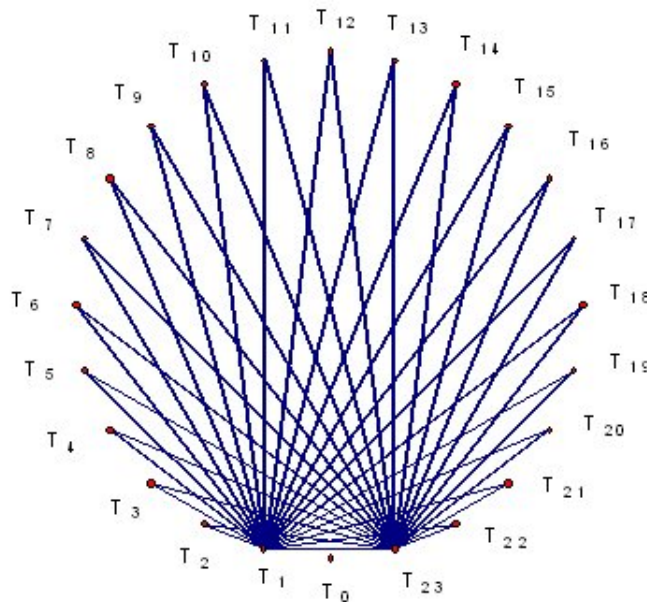
4. *Math Concepts:* Which regular polygons (all sides congruent and all angles congruent) can your form on a 24-peg circular geoboard? Illustrate each regular polygon on circular geoboard recording paper and explain how you know it is a regular polygon. Circular geoboard recording paper is available for download at the Online Learning Center.

5. *NCTM Standards*: Go to http://illuminations.nctm.org/ and under "Lessons" select grade levels 3 – 5 and the Geometry Standard. Choose a lesson that involves polygons.

   a. State the title of the lesson and briefly summarize the lesson.

   b. Referring to the **Standards Summary** in the back pages of this book as necessary, list the *Geometry Standard* Expectations that the lesson addresses and explain how the lesson addresses these *Expectations*.

ACTIVITY SET 9.2 CONNECTIONS & QUESTIONS
# REGULAR AND SEMI REGULAR TESSELLATIONS

1. *School Classroom*: Bees form tessellations when they create their honeycombs. How might you use this idea to design an activity for your classroom? Explain your activity ideas and your thinking.

2. *School Classroom*: One of your students claims that she has formed regular polygons of 3, 4 and 6 sides that she can use to tessellate the plane on her rectangular geoboard and shows you the following figures. Explain how you would help her determine which of these figures are regular and which are not.
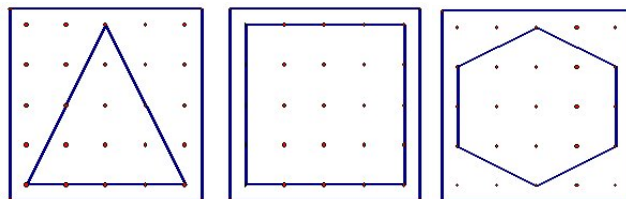
3. *School Classroom*: Do an Internet search and find a website that features a game or math applet focused on tessellations for kids. Print a one-page view of the game or applet, describe the game or applet and discuss how you would use such an activity in your own class. Give the URL of the game or math applet you found.

4. *Math Concepts*: On dot paper or grid paper draw a seven-sided polygon that tessellates and show the tessellation. Dot paper and grid paper are available for download at the Online Learning Center.

5. *Math Concepts*: Copy this concave quadrilateral in the center of a page of dot paper.
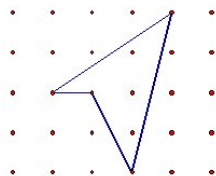
   a. Form a tessellation with this figure. Draw enough of the tessellation so it is obvious that the tessellation can be continued in all directions. Dot paper is available for download at the Online Learning Center.

   b. What observations can you make about the angles around the points where the vertices of the quadrilaterals meet?

6. *NCTM Standards*: Read over the **Standards** summary in the back pages of this book. Tessellations are not mentioned. What *Content Standards* and *Expectations* does the study of these topics address? List the *Standards* and *Expectations* and explain your thinking.

ACTIVITY SET 9.3 CONNECTIONS & QUESTIONS
MODELS FOR REGULAR AND SEMIREGULAR POLYHEDRA

1. *School Classroom*: Your students are using sticks and gumdrops to create models of the five Platonic Solids. How will you help them decide how many sticks and how many gumdrops they need and how to assemble their solids?

2. *School Classroom:* When asked to make a net for a cube, a drawing like Net A is the usual response. Design an activity for middle school students that will lead them to draw nets like Net B that are formed without using only squares. Describe you activity in such a way that another person could follow your directions. Submit a few designs for a net by sketching them on 2-centimeter grid paper. 2-centimeter grid paper is available for download at the Online Learning Center.
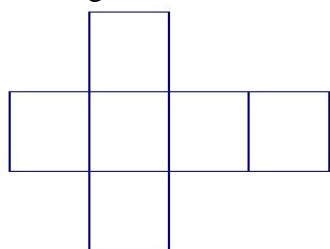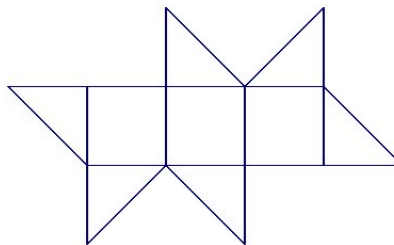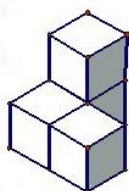


   Net A   Net B

3. *Math Concepts*: Design a two-dimensional net for the following figure that is composed of four cubes. Describe your procedure for constructing this net and submit a copy of the net with your response.

4. *Math Concepts*: Open the **Math Laboratory Investigation 9.3: Read Me - Pyramid Patterns Instructions** from the Online Learning Center and investigate the pyramid patterns described in question 1 of the *Starting Points for Investigations 9.3.* Show your procedures and explain your thinking.

5. *NCTM Standards*: Read over the **Geometry Standards** in the back pages of this book. Pick one *Expectation*, from each grade level which the activities in this section address. State the *Expectations* and the *Standards* they are under. Explain which activities address these *Expectations* and how they do so.

ACTIVITY SET 9.4 CONNECTIONS & QUESTIONS
CREATING SYMMETRIC FIGURES: PATTERN BLOCKS AND PAPER-FOLDING

1. *School Classroom*: One of your students claims that any line drawn through the center of a square is a line of symmetry for the square. Describe what you believe this student was thinking and how you would help her determine the lines of symmetry of a square without actually showing her these lines.

2. *School Classroom*: Rydell has found a wonderful pattern. Squares have four lines of symmetry and four rotational symmetries, non-square rectangles have two lines of symmetry and two rotational symmetries. He is sure this pattern holds for all quadrilaterals. Is he correct and if not, how can you help him resolve this issue?

3. *Math Concepts*: How many symmetrical shapes can be made by joining one more square to the shape below? Use color tiles from the Manipulative Kit to find the shapes and record your answers on centimeter grid paper. Describe the type of symmetry. Centimeter grid paper is available for download at the Online Learning Center.
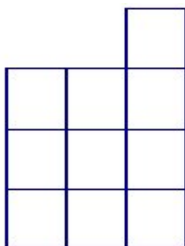
4. *Math Concepts*: Open the **Math Laboratory Investigation 9.4: Read Me – Mirror Cards Instructions** from the Online Learning Center and investigate the mirror patterns described in 1, 2 and 3 of the *Starting Points for Investigations 9.4.* Show your procedures and explain your thinking. A small handheld mirror will be helpful.

5. *NCTM Standards*: Go to http://illuminations.nctm.org/ and under "Lessons" select grade levels 3 – 5 and the **Geometry Standard**. Choose a lesson involving symmetry.

    a. State the title of the lesson and briefly summarize the lesson.

    b. Referring to the **Standards Summary** in the back pages of this book as necessary, list the *Geometry Standard Expectations* that the lesson addresses and explain how the lesson addresses these *Expectations*.