The following unit is a compilation of lessons from Investigations, the 4th grade Tiling and Fencing Unit, as well as others.

**Research on Area and Perimeter**

**Conceptualizing**
- According to Malloy (1999) students tend to be confused between all of the formulas dealing with area and perimeter because they have not “fully conceptualized the meanings of these words” (p. 87). Memorizing procedural skills without understanding the idea of perimeter or area conceptually sets students up for confusion.
- Kenney and Silver (1997) discuss the Sixth Assessment of the National Assessment of Educational Progress showed the following results with respect to 8th graders:
  - 19% were able to estimate the perimeter of a given geometric figure
  - 32% could match or identify the correct geometric shape when given a perimeter
Students' inability to estimate, match or draw in relation to perimeter and area show their lack of conceptual understanding. Knowing the formula for perimeter and area is far different than understanding what it means.

**Confusing Perimeter and Area:** Research states that students possess difficulty in explaining and illustrating ideas of perimeter and area. Students confuse perimeter and area because the topics are usually learned as a set of procedures and formulas instead of using rich contextualized problems....thus leading to misunderstanding the importance of the measurement behind them. Students don't know what the answer they found represents and thus don't understand when to use units and when to use square units.
GOAL 2: The learner will understand and use perimeter and area.
2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.
2.02 Solve problems involving perimeter of plane figures and areas of rectangles.

The students need to learn:
• To find the area of rectangles with and without using grids
• To find the area of larger rectangles using a calculator
• To solve problems involving the area of rectangles (This might include dividing an irregular figure into rectangles in order to determine the area.)
• To compare units of area within the same system
• To solve problems involving the perimeter of plane figures
• To recognize perimeter as a linear measurement and area as a square unit
• To develop strategies to determine area and perimeter such as using a ruler and covering with tiles
• That area and perimeter are not dependent on one another. The perimeter can remain constant while the area changes and the area can remain constant while the perimeter changes. This idea should be developed over time through hands-on lessons/activities.

Many times we use color tiles to teach area and perimeter. While color tiles are a GREAT representative of square inch units, they do not represent linear units well. Many times when counting to find the perimeter, students are still counting the actual tiles instead of the edge of the tile. Get your students in the habit of using a ruler, string, grid lines, or a measuring tape to measure the perimeter of objects.

As for area, it may help to post squares of various sizes (1cm², 1 in², 1 ft², 1 yd², etc.) on the wall. Your students will have a great reference when asked which “square” unit they should use]

GOAL 3: The learner will recognize and use geometric properties and relationships.
3.01 Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant.
3.02 Describe the relative position of lines using concepts of parallelism and perpendicularity.
3.03 Identify, predict, and describe the results of transformations of plane figures.
   a. Reflections. b. Translations. c. Rotations

Students need to learn:
• To use coordinate points to draw figures in the 1st quadrant. Figures might include plane figures, line segments, and lines. (Others might be on the EOGs. You are not limited to just these.)
• To identify intersecting, parallel, and perpendicular lines, line segments, and their midpoints; identify in the environment and in diagrams
• To describe the relative position of lines using parallelism and perpendicularity. This includes in diagrams (line AB is parallel to line ST), in shapes (a rectangle has 2 sets of parallel sides), and in the environment (Which 2 streets on the map run parallel?).
• To use the appropriate symbols and notations to describe lines and line segments (↔ – )
• To recognize congruent plane figures after transformations such as rotations (turns), reflections (flips), and translations (slides)
• To recognize 90 degree, 180 degree, and 270 degree rotations
# CMS 4th Grade Geometry/Measurement Unit – Week 1

Lessons #4 and #5 this week come from the 3rd grade *Investigations* Unit 4 “Perimeter, Angles, and Area”. If you have access to a 3rd grade unit, you may want to use it. If not, the lessons have been scanned and attached to this document. In addition, the SAB pages suggested in the unit have been modified and are included below.

<table>
<thead>
<tr>
<th>Objective(s):</th>
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</tr>
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<tbody>
<tr>
<td>3.01 Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant.</td>
<td>2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.</td>
</tr>
<tr>
<td>3.03 Identify, predict, and describe the results of transformations of plane figures. a. Reflections. b. Translations. c. Rotations</td>
<td>2.02 Solve problems involving perimeter of plane figures and areas of rectangles.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesson #1:</th>
<th>Lesson #2:</th>
<th>Lesson #3:</th>
<th>Lesson #4:</th>
<th>Lesson #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying and using coordinate points.</td>
<td>Making Tetrominoes</td>
<td>Tumbling Tetrominoes</td>
<td>3rd Grade Unit 4 Session 1.1 Using U.S. &amp; Metric Units to Measure Length</td>
<td>3rd Grade Unit 4 Session 1.2 Introducing Perimeter</td>
</tr>
</tbody>
</table>

**Lesson Summary:**

- Students play battleship. Students participate in workshop where they locate missing points of a polygon on a coordinate grid.
- Lesson Summary: Students build Tetrominoes, explore rotation, reflection and translation. They make a Tetrominoes flip-book.
- Lesson Summary: Students explore transformations using pattern blocks. They transform Tetrominoes to fill a grid.
- Lesson Summary: Students’ estimate and measure objects in the classroom using standards and metric measurements.
- Lesson Summary: Students are introduced to perimeter. They measure the perimeter of a variety of objects.

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<thead>
<tr>
<th>TMM:</th>
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<tbody>
<tr>
<td>Play/model coordinate grid battleship</td>
<td>Review Parallel and perpendicular, introduce Intersecting.</td>
<td>On your paper, draw a straight line. Label it AB. Draw a line parallel to it and label it CD. Trade papers with a partner, draw an intersecting line on your partner’s paper and label it EF. Introduce the word intersecting. Have students draw an intersecting line.</td>
<td>Using the figures below, draw each shape when it is 1) translated, 2) reflected across a horizontal line, 3) rotated 90 degrees, and 4) rotated 180 degrees</td>
</tr>
</tbody>
</table>

**Materials:**

- Overhead grid (graph paper)
- Geoboards and snap cubes and/or coordinate grids
- Rulers or other straight edge (for drawing lines)
- Snap cubes
- Rotation, Reflection, Translation H/W
- Graph paper and overhead graph paper for TMM
- Tetrominoes from yesterday
- Crayons/colored pencils
- Dice or number cube - Translation Chart
- Tumbling Tetrominoes Recording Sheet
- Ruler (in./cm.)
- Meter/Yardstick
- Measurement Tools & Benchmarks charts
- Adding machine tape
- SAB 1, (see attached)
- Ruler (in./cm.)
- Meter/Yardstick
- 8 ½ x 11” paper
- SAB 5-6 (see attached)

**Homework:**

- Teacher’s choice
- Rotation, Reflection, Translation worksheet
- Transformations with pattern blocks worksheet.
- SAB 3-4 Choosing Measurement Tools and Units (see attached)
- SAB 8: Perimeters at Home (see attached)
### CMS 4th Grade Geometry/Measurement Unit – Week 2

Lessons #6-8 this week come from the 3rd grade *Investigations* Unit 4 “Perimeter, Angles, and Area”. If you have access to a 3rd grade unit, you may want to use it. If not, the lessons have been scanned and attached to this document. In addition, the SAB pages suggested in the unit have been modified and are included below.

**Objective(s):**
- 2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.
- 2.02 Solve problems involving perimeter of plane figures and areas of rectangles.

### Lesson Summary:

<table>
<thead>
<tr>
<th>Lesson #6</th>
<th>Lesson #7</th>
<th>Lesson #8</th>
<th>Lesson #9</th>
<th>Lesson #10</th>
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</thead>
<tbody>
<tr>
<td>3rd Grade Unit 4</td>
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<td>4th Grade Unit 4</td>
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<tr>
<td>1.3 Assessment: Measuring Perimeter</td>
<td>1.4 Perimeter Problems</td>
<td>1.5 Ordering Shapes by Perimeter</td>
<td>Size, Shape, and Symmetry.</td>
<td>Size, Shape, and Symmetry.</td>
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<tr>
<td><strong>Objective:</strong></td>
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<tr>
<td>2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.</td>
<td>2.02 Solve problems involving perimeter of plane figures and areas of rectangles.</td>
<td>Students discuss Ordering Shapes activity from yesterday.</td>
<td>Students divide nonrectangular polygons in half. They use the LogoPaths software to measure turns in degrees.</td>
<td>Students use geo-boards to find the area of different shapes, including a focus on finding the area of a triangle.</td>
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<tr>
<td><strong>Lesson Summary:</strong></td>
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<tr>
<td>Students discuss common measurement errors and ways to avoid them.</td>
<td>Students discuss different shapes with the same perimeter.</td>
<td>Students discuss Ordering Shapes activity from yesterday.</td>
<td>Students divide nonrectangular polygons in half. They use the LogoPaths software to measure turns in degrees.</td>
<td>Students use geo-boards to find the area of different shapes, including a focus on finding the area of a triangle.</td>
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<tr>
<td>- Workshop:</td>
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<tr>
<td>- Ruler (in./cm.)</td>
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<td>- Ruler (in./cm.)</td>
<td>- Grid paper (for TMM)</td>
<td>- T51-52</td>
</tr>
<tr>
<td>- Meter/Yardstick</td>
<td>- Meter/Yardstick</td>
<td>- Meter/Yardstick</td>
<td>- SAB p.58-61</td>
<td>- Geo-boards</td>
</tr>
<tr>
<td>- Measurement Guidelines chart</td>
<td>- Computers with LogoPaths</td>
<td>- Computers with LogoPaths</td>
<td>- T 50</td>
<td>- SAB 58-64</td>
</tr>
<tr>
<td>- Masking tape</td>
<td>- SAB 13(see attached)</td>
<td>- SAB (see attached)</td>
<td><strong>Homework:</strong></td>
<td><strong>Homework:</strong></td>
</tr>
<tr>
<td>- Computers with LogoPaths</td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
<td>SAB 15: More Crazy Cakes</td>
<td>Teacher’s Choice</td>
</tr>
<tr>
<td>- SAB 9-10(see attached)</td>
<td>Released Question #8. Delia connected the points in the order they were given (3,6), (1,2), (5,2) and (3,6). What polygon did she create?</td>
<td>Perimeter of a Quadrilateral</td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
</tr>
<tr>
<td>- NEED M1-3</td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
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<tr>
<td><strong>Homework:</strong></td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
<td>Display the perpendicular, parallel, intersecting streets diagram and question (included in this packet).</td>
<td><strong>Homework:</strong></td>
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<tr>
<td>SAB 11: Making Shapes (see below)</td>
<td>Released Question #8. Delia connected the points in the order they were given (3,6), (1,2), (5,2) and (3,6). What polygon did she create?</td>
<td>SAB P.14 Missing Measures (4th grade book)</td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
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<td>Perimeter of a Quadrilateral</td>
<td><strong>TMM:</strong></td>
<td><strong>Homework:</strong></td>
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</table>

**TMM**
- a. look at a diagram of streets and respond to a question.
- b. Solve a coordinate grid shape problem.

**Homework:**
- SAB 11: Making Shapes (see below)
- SAB P.14 Missing Measures (4th grade book)
- Perimeter of a Quadrilateral
- SAB 61: More Crazy Cakes
- Teacher’s Choice

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*Objective(s):* Be sure to bring out different methods students are using to find the perimeter and area of figures. Ex: Rectangle; add all four sides together, or multiply the length x 2, then the width x 2, then add them together to find perimeter. To find the area, students may or may/not notice that they can multiply length x width. The idea is NOT to have students memorize formulas, but instead to have them connect mathematical expressions to the work they are doing.
### CMS 4th Grade Geometry/Measurement Unit – Week 3

#### 2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.

#### 2.02 Solve problems involving perimeter of plane figures and areas of rectangles.

<table>
<thead>
<tr>
<th>Lesson #11:</th>
<th>Lesson #12:</th>
<th>Lesson #13:</th>
<th>Lesson #14:</th>
<th>Lesson #15:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering Rectangles from Tiling and Fencing Unit</td>
<td>How is a Square Foot Made? From Tiling and Fencing Unit.</td>
<td>Area of Rectangles Exploration from Tiling and Fencing Unit</td>
<td>Area of Composite Shapes Exploration from Tiling and Fencing Unit</td>
<td>Area and Perimeter Puzzles</td>
</tr>
</tbody>
</table>

#### Lesson Summary:

- **Lesson #11: Ordering Rectangles from Tiling and Fencing Unit**
  - Students order rectangles according to size and find the area with tiles

- **Lesson #12: How is a Square Foot Made? From Tiling and Fencing Unit.**
  - Students create a square foot and a square yard then use them to measure objects in the room.

- **Lesson #13: Area of Rectangles Exploration from Tiling and Fencing Unit**
  - Students use square tiles to determine the area of rectangles, they also create regular and irregular shapes that have a given area.

- **Lesson #14: Area of Composite Shapes Exploration from Tiling and Fencing Unit**
  - Students use square tiles to determine the area and perimeter of composite figures given a picture and/or a grid.

- **Lesson #15: Area and Perimeter Puzzles**
  - Students work at 4 stations to find the area and perimeter using clues on the puzzle cards.

#### TMM:

- **Lesson #11:** A quadrilateral has a perimeter of 32 and its opposite sides are equal in length. What shapes could it be? What are the possible dimensions of the sides? Draw a picture of what you think it looks like.

- **Lesson #12:** Rotation, Reflection, Translation cards (see attached).

- **Lesson #13:** Area or Perimeter? See activity (included in lesson).

- **Lesson #14:** On your paper, draw a straight line. Label it AB. Draw a line parallel to it and label it CD. Trade papers with a partner, draw an intersecting line on your partner’s paper and label it EF.

- **Lesson #15:** None today- students work on Area and Perimeter Puzzles.

#### Materials:

- **Lesson #11:**
  - 1 set of rectangles per small group
  - Scissors and Glue
  - About 20 color tiles for each group
  - 1 pc. Of 12x18” construction paper per group.

- **Lesson #12:**
  - Grid paper
  - Construction paper
  - Scissors
  - Glue sticks
  - rulers

- **Lesson #13:**
  - Plastic square tiles
  - Copies of Station Puzzles

- **Lesson #14:**
  - Plastic square tiles
  - Big E
  - Composite Rectangles

- **Lesson #15:**
  - Grid paper
  - Area and Perimeter Puzzles

#### Homework:

- **Lesson #11:** Circles or Squares

- **Lesson #12:** Rabbit Pen w/s

- **Lesson #13:** Student Math Handbook p.114

- **Lesson #14:** Area of composite figures W/S

- **Lesson #15:** Teacher’s Choice
## Lesson #1: Coordinate Points

<table>
<thead>
<tr>
<th>Objective(s):</th>
<th>Students will:</th>
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</table>
| **3.01** Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant. | • Locate points on a coordinate grid  
• Solve problems involving coordinate grids |

<table>
<thead>
<tr>
<th>Materials:</th>
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</table>
| • Overhead grid (graph paper)  
• Geoboards and snap cubes and/or coordinate grids  
• Rulers or other straight edge (for drawing lines) | • Coordinate grid  
• x- and y- axis  
• vertices / vertex |

### Ten-Minute Math Activity (Students are familiar with this, plan to spend less than 10-15 minutes on it.)

- The teacher makes a trapezoid on a geoboards that the students cannot see.
- Give students geoboards or Coordinate Grids -see attached.
- Call on students to select coordinates. The teacher says MISS if the point is not a vertex of the figure and marks a red x on the overhead grid. If a student guesses correctly the teacher says HIT and places a dot in the appropriate spot on the grid.
- To keep track of the number of hits or misses: Draw a T-chart on the board. Record a tally mark in the “hit” or “miss” column each time a student guesses a coordinate pair.
- The students will record the hits and misses on their coordinate grids by circling the coordinates that have a HIT or by marking the MISSES with an X. If geoboards are being used, students can record the HITS by marking the coordinates with the same color snap cube. Have the students use a different color snap cube to mark all of the MISSES.
- **Object of the game:** To guess all four vertices of the trapezoid within 20 guesses (reduce the number of guesses to make play more difficult).
- Once the class has determined all of the point on the grid, ask, “what shape did we draw”. Have students brainstorm other shapes they could create when doing this activity (hexagon, pentagon, rhombus, etc.).
- During this modeling activity: Record the coordinate points so that students can see the proper notation, ex. (3, 5). Many students will remember how to move on the coordinate grid from 3rd grade lessons, but you will want to briefly revisit this.

### Before:
Have students play a few rounds of the game above with a partner. Ask them to use the list of shapes generated above.

As the students work, circulate around the room. Check to ensure students are plotting points correctly.

### During:
Post the following tasks around the room. Have students circulate around the room with a partner and solve the tasks below. If you do not have enough time for students to solve all 4, you may want to have them solve 2, then use the remaining 2 as ten-minute math activities.

**Station 1:** A square is on the coordinate plane. There are vertices at (2,1) and (6,1). What are the other two vertices of the square?

**Station 2:** Two congruent triangles are on the coordinate plane. The first one has points at (10,6), (10,8) and (8,6). The second triangle has a vertex at (2,10). What are the other points of the second triangle? Can you find 2 different triangles that contain the point (2,10)?

**Station 3:** A line segment goes from (3,1) to (8,4). The side of a quadrilateral is parallel to that line segment and includes the point (1,5). What would the other three vertices be?

**Station 4:** A ray passes through (11,10) and (1,10). Perpendicular to that ray is a line segment that is the side of a rectangle. What could the vertices of the rectangle be?

### After:
Bring students together as a whole group and discuss station 2 by asking, “were any of the words difficult/ confusing? How did you determine the missing points of the congruent triangle?” etc.

### Homework:
- teacher’s choice
**Lesson #2: Making Tetrominoes**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>(TMM) 3.01 Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant. 3.03 Identify, predict, and describe the results of transformations of plane figures. a. Reflections. b. Translations. c. Rotations</td>
<td>Create Tetrominoes and determine if they have all possible shapes by rotating, reflecting, and translating shapes.</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Materials:</th>
<th>Vocabulary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap cubes</td>
<td>Transformation - parallel</td>
</tr>
<tr>
<td>Graph paper and overhead graph paper for TMM</td>
<td>Rotation - perpendicular</td>
</tr>
<tr>
<td>Reflection</td>
<td>Translation</td>
</tr>
</tbody>
</table>

**Ten-Minute Math Activity:**
Ask students to draw a straight line from point (2, 1) to point (8, 1). Show students on the overhead what it would look like. Then ask them to draw a line that is parallel. Discuss with students what this word means and model on the overhead. Do the same with the word perpendicular. Be sure to make the connection between perpendicular lines and right angles.

**Before:**
Give students snap cubes and the following directions: *Today we are going to build Tetrominoes. Tetrominoes are shapes that include 4 cubes that are put together.* In pairs, students begin making arrangements: e.g., 4 in a row, a square, an L, a T, a Z. Do not explain what the arrangements should look like at this time.

**During:**
Observe students as they work. For pairs who find all 5 possible arrangements very quickly, prompt them to prove they have found all of the arrangements by asking, “Have you found all of the possible arrangements of 4 cubes? How do you know?” For those pairs who are making lots of different arrangements, help them focus their work by asking, “Are any of your arrangements the same?”

**After:**
Lead students in a discussion to determine if they have found all of the possible arrangements. Students discuss whether they have found all possible Tetrominoes.

As the class discusses this, introduce the terms translation (moving a figure horizontally and/or vertically), rotation (turning a figure about a point), and reflection (flipping a figure across an imaginary line). Guide students to see if some of their shapes are actually the same if they reflect, translate, or rotate them.

**Homework:** Rotation, Reflection, Translation worksheet
Remember: Transformations are when an object has been moved:
A Rotation shows when an object is turned
A reflection shows the mirror image
A translation shows the object being moved left, right, up, down, or diagonally.

Look at the figures below. Write rotation, reflection, or translation in the blank spaces below.

The quilt pattern contains rotations, reflections and translations of triangles.

Color 2 triangles that show a translation red.
Color two triangles that show a reflection blue.
Color two triangles that show a rotation green.
Lesson #3: Tumbling Tetrominoes

*From Navigating thru Geometry (Grades 3-5) and Investigations 1st Edition*

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<tr>
<td><strong>(TMM) 3.01</strong> Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant.</td>
<td>Perform transformations on Tetrominoes and record their movements.</td>
</tr>
<tr>
<td><strong>3.03</strong> Identify, predict, and describe the results of transformations of plane figures.</td>
<td></td>
</tr>
<tr>
<td>a. Reflections. b. Translations. c. Rotations</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Materials:</th>
<th>Vocabulary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Tetrominoes from yesterday</td>
<td>- Transformation</td>
</tr>
<tr>
<td>- Crayons/colored pencils</td>
<td>- Translation</td>
</tr>
<tr>
<td>- Dice or number cube and Translation Chart</td>
<td>- Rotation</td>
</tr>
<tr>
<td>- Tumbling Tetrominoes Recording Sheet</td>
<td>- Reflection</td>
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<tr>
<th>Ten-Minute Math Activity:</th>
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<tbody>
<tr>
<td>On your paper, draw a straight line. Label it AB. Draw a line parallel to it and label it CD. Trade papers with a partner, draw an intersecting line on your partner’s paper and label it EF. Introduce the word intersecting. Have students draw an intersecting line.</td>
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<tr>
<td>Review with students the transformations discussed yesterday.</td>
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<tbody>
<tr>
<td>Give each pair of students a 10x12 grid, 2 crayons/colored pencils, dice or number cube, Tumbling Tetrominoes Recording Sheet and Grid.</td>
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<tr>
<td>Follow the directions on the Tumbling Tetrominoes Recording Sheet as you model how to play the game for students.</td>
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<tr>
<td>The goal is to fill up the entire grid (e.g. like Tetris!!) with the fewest empty spaces.</td>
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<tr>
<td>The start point is always the middle of the grid. As students move (translate, rotate or reflect) their tetromino piece, they should verbalize their action and record what they do (translate, rotate, reflect).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you discuss this activity, make sure you have students examine the difference between rotations- 90 degrees (a quarter turn) vs 180 degrees (a half turn). Also, make sure you discuss reflections across various lines (horizontal and vertical lines).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow students time to play the game. All partners do not need to finish their grids. The idea is to have students practice using the terms rotation, reflection, and translation while they move their tetromino.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask students to discuss the shape they chose. Was this the best shape to fill all of the spaces? Why/not?</td>
</tr>
</tbody>
</table>

| Introduce the homework (see below). Allow students to begin working if time allows. |

<table>
<thead>
<tr>
<th>Homework:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformations with pattern blocks worksheet</td>
</tr>
</tbody>
</table>
Choose a tetromino. (You will use it for the entire game.)

Roll the dice.

Start at the top and center of the Tumbling Tetrominoes Board. Move your Tetromino according to the key to the right.

Color your movement on the Tumbling Tetrominoes Board.

Record your movement on the chart below.

<table>
<thead>
<tr>
<th>If you roll:</th>
<th>Transformation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reflect (up or down)</td>
</tr>
<tr>
<td>2</td>
<td>Rotate 90° right</td>
</tr>
<tr>
<td>3</td>
<td>Translation (left or right)</td>
</tr>
<tr>
<td>4</td>
<td>Rotate 180° left</td>
</tr>
<tr>
<td>5</td>
<td>Reflect (left or right)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shape</th>
<th>Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Look at the shapes below. Transform them according to the table below. Remember to always start with the shape from its **original** position.

<table>
<thead>
<tr>
<th>Shape</th>
<th>Translation</th>
<th>Reflection (horizontal line or flipping down)</th>
<th>Reflection (vertical line or flipping sideways)</th>
<th>90 degree Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
### Finding Lengths

Use a ruler, yardstick, and meter stick to find objects that are about the same length as these measurement units. Record the objects that you find for each unit.

<table>
<thead>
<tr>
<th>Centimeter</th>
<th>Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Foot</th>
<th>Yard/Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Choosing Measurement Tools and Units

What measurement tool (ruler, yardstick, or meter stick) would you use for each situation? What unit of measure (centimeter, inch, foot, yard, or meter) would you use?

1. I need to know the length of a fence that will go around the basketball court.
   Tool: __________________________
   Unit of Measure: __________________________

   I chose this because…

3. I need to know how long the strap is on my book bag.
   Tool: __________________________
   Unit of Measure: __________________________

   I chose this because…

5. I need to know the width of my foot at its widest point.
   Tool: __________________________
   Unit of Measure: __________________________

   I chose this because…

7. I want to guy materials for a bedspread. I need to know how long and how wide my bed is.
   Tool: __________________________
   Unit of Measure: __________________________

   I chose this because…
Finding and Measuring Perimeters:
Choose 5 objects in the classroom that have perimeters you can measure, such as a bulletin board, the top of a table, or the side of the teacher’s desk. Measure their perimeters and record your work below.

<table>
<thead>
<tr>
<th>Object</th>
<th>Drawing of What I am Measuring</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td><img src="example.png" alt="Diagram" /></td>
<td>96 inches</td>
</tr>
<tr>
<td>Top of my desk</td>
<td>30 in. 18 in. 18 in. 30 in.</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
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</tr>
</tbody>
</table>
Perimeters at Home
Measure the perimeters of at least two objects at home. Record your work below:

<table>
<thead>
<tr>
<th>Object</th>
<th>Drawing of What I am Measuring</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What is the perimeter of the hexagon below? ______

![Hexagon diagram]
Ten-Minute Math Activity: a. Look at the drawing of Trade and Tryon streets below:

- Trade Street
- Tryon Street

Which term describes the two streets?
A. parallel
B. perpendicular
C. acute
D. horizontal

b. On a coordinate grid there is a parallelogram that passes through the points (1,10) and (1,3). If the shape is not a rectangle what are the other two vertices? If the shape is a rectangle what are the other two vertices?
**Perimeter Problems**

1. Your teacher wants to put a tape around the edge of the longest table in the classroom. How much tape will she need? Explain how you got your answer.

2. Pilar’s backyard is shaped like a square and has a perimeter of 40 feet. Draw a picture of what her yard might look like, and label each side.

Nathan’s yard is shaped like a rectangle, and also has a perimeter of 40 feet. Draw a picture of what her yard might look like, and label each side.

3. Draw three different rectangles below that each have a perimeter of 20 cm.
LogoPaths: Missing Measures  (page 1 of 3)

Use the LogoPaths software to draw and finish each figure to create a rectangle. Record the procedure you used and the perimeter for each rectangle below.

1.  

   \[\begin{array}{c}
   40 \\
   140 \quad 140 \\
   40 \quad 80 \\
   \end{array}\]  

   ex.  \[\begin{array}{c}
   \text{fd} 40 \quad \text{rt} 90 \\
   \text{fd} 140 \quad \text{rt} 90 \\
   \end{array}\]  

   Perimeter: ________

2.  

   \[\begin{array}{c}
   160 \\
   40 \quad 40 \\
   80 \quad 160 \\
   \end{array}\]  

   Perimeter: ________

3.  

   \[\begin{array}{c}
   60 \\
   140 \quad 200 \\
   \end{array}\]  

   Perimeter: ________
Logophaths: Missing Measures (page 2 of 3)

4. 

\[ \begin{array}{c}
140 \\
60 \\
\end{array} \]

\[ \begin{array}{c}
100 \\
\end{array} \]

____  ____  ____  ____  

Perimeter: ____

5. 

\[ \begin{array}{c}
85 \\
135 \\
\end{array} \]

\[ \begin{array}{c}
135 \\
\end{array} \]

____  ____  ____  ____  

Perimeter: ____

6. 

\[ \begin{array}{c}
90 \\
130 \\
220 \\
\end{array} \]

____  ____  ____  ____  ____  ____  ____  ____

Perimeter: ____
LogoPaths: Missing Measures

7. 110
   70
   90
   180

8. 200
   90
   30

Perimeter: ________

Perimeter: ________
1. A large shape has appeared in your classroom! Draw a picture of the perimeter of the shape in the space below. Use the picture to record your measurements.

2. What is the total perimeter of the shape? Explain how you got your answer. Be sure to tell the measurement toll and units you used.
<table>
<thead>
<tr>
<th>Group:</th>
<th>Correctly identifies the perimeter of the shape.</th>
<th>Uses measurement tools correctly (keeps tool straight, no gaps or overlaps, begins each iteration at 0)</th>
<th>Keeps track of partial measurements</th>
<th>Accurately calculates the total perimeter (records in U.S. or metric units, does not mix units)</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>
**Making Shapes**

Draw a sketch of each given shape. Label the length of each side.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Square with a perimeter of 32 units.</td>
<td>2. Rectangle with a perimeter of 24 units.</td>
</tr>
<tr>
<td>3. Square with a perimeter of 16 units.</td>
<td>4. Rectangle with a perimeter of 18 units.</td>
</tr>
</tbody>
</table>
1. Look at the shapes below. Put them in order from the shortest to the longest perimeter without measuring:

   ______   ______   ______   ______

2. Choose a measurement tool and measure the perimeter of each shape. Put them in order from shortest to longest. Write the perimeter of each shape:

   Measurement Tool You Chose: ________________________________

   Perimeter:

   Rectangle ______________________

   Circle ______________________

   Star ______________________

   Square ______________________

3. Compare the lists you made before and after you measured. Did anything surprise you about the perimeter of these shapes? Explain what you found out.
Mark said, “Main St. intersects Peachtree Blvd. and Buford St.” Kameron disagreed, “Main St. is perpendicular to Peachtree Blvd. Which boy is correct? How do you know?”
Lesson #11: Ordering Rectangles *From CMS *Tiling and Fencing Unit

<table>
<thead>
<tr>
<th>Objective(s): 2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures. 2.02 Solve problems involving perimeter of plane figures and areas of rectangles.</th>
<th>Materials:</th>
</tr>
</thead>
</table>
| Students will be able to: develop the concept of area. They will recognize how big something is depends on the attribute being measured (area or perimeter) | - 1 set of rectangles per small group
- Scissors and Glue
- About 20 color tiles for each group
- 1 pc. Of 12”x18” construction paper per group |

**Vocabulary:**
- Area
- Comparison
- Cover
- Intersecting

**Ten-Minute Math:**
A quadrilateral has a perimeter of 32 and its opposite sides are equal in length. What shapes could it be? What are the possible dimensions of the sides? Draw a picture of what you think it looks like

**The Lesson**

**Before:**
Distribute the rectangles and scissors. Ask the students to order their rectangles from smallest to largest. Do not clarify the activity for them at this time and do not allow students to get manipulatives to help them measure. Every group may arrange the rectangles differently.

**During:**
Each group cuts apart the rectangles and discusses how to put them in order. Once all groups have decided on an order, have them share their results and justifications.

Pose the question, “If these were brownies, which one would you most like to have? Which one would be the smallest brownie?”

Look at rectangles B & E. Which is largest (think of them as brownies).

Model for students covering one of the rectangles with color tiles to determine how “big” it is. Introduce the word area.

**After:**
Have students redo the activity using color tiles to measure the area of the rectangles. Once they have determined the order from smallest to largest, have them glue their rectangles onto the large sheet of construction paper.

Make sure they write inside each rectangle how many squares fit inside the shape (10).

**Homework:** Circles or Squares
Cut out the rectangles. Which is the smallest? Which is the biggest? Put them in order
Cut out the circles and the squares at the bottom of this page. Use each to cover the area of the rectangle. Then answer the questions below.

Would you recommend that mathematicians use circles or squares as a unit to measure area? Explain why you think so:

Circles:
### Lesson #12: How is a Square Unit Made? (from Tiling and Fencing Unit)

**Objective(s):**  
2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.  
2.02 Solve problems involving perimeter of plane figures and areas of rectangles.

**Materials:**  
- Grid paper  
- Construction paper  
- Scissors  
- Glue sticks  
- Rulers

**Students will:**  
- Use square tiles to determine the area of rectangles  
- Create regular and irregular shapes that have a given area

**Vocabulary:**  
- Square unit  
- Square inch/sq.in  
- Square foot/sq.ft.  
- Square yard/sq.yd.  
- Square centimeter/sq.cm  
- Square meter/sq.m

**TMM:**  
Rotation, Reflection, Translation cards. Show students cards A, B, C, and D. Ask students to identify which how each shape was transformed using appropriate vocabulary. In addition, have students specify HOW the shape(s) were rotated either by degrees or fraction.

**Before:**  
On the overhead, review the previous night's homework. Discuss with the class whether circle units or square units are better for covering students. After students have agreed that square units are better, have the students brainstorm a list of various size squares they might be able to use.

Ask students to draw on a piece of scrap paper what they think a square inch would look like (you might want to show them about how long an inch is). Have someone share on the overhead.

Explain that today they’ll be making various square units to measure.

Distribute the 1” grid paper.

Have each student construct their own square foot. Have students measure their desk or other object in square feet. After students have had an opportunity to explore, have small groups work together to tape 9 square feet together to make a square yard. Continue measuring around the room using square yards. Record a class chart of your findings.

To close the lesson, ask students the following:  
1. Could we measure the classroom in square centimeters? Square inches? Square feet? Square yards? Which would be best?  
2. What if you were measuring a ball field?  
3. What if you were measuring the cover of your calculator?  
4. What if you were measuring the city of Charlotte.

**Homework:**
Lesson 12 Ten Minute Math
Darin bought 24 feet of fencing to make a rabbit’s pen. He knew he wanted to make a rectangular pen, but wasn’t sure how. Draw all of the possible rectangles Darin could create with 24 feet of fencing and label each side. Circle the one you think is the best design and explain why.
## Lesson #13: Area of Rectangles (From Tiling and Fencing Unit)

**Objective(s):**
- **2.01** Develop strategies to determine the area of rectangles and the perimeter of plane figures.
- **2.02** Solve problems involving perimeter of plane figures and areas of rectangles.

**Materials:**
- Plastic square tiles
- Copies of Station Puzzles

**Students will:**
- Use square tiles to determine the area of rectangles
- Create regular and irregular shapes that have a given area

**Vocabulary:**
- Dimensions
- Area
- Perimeter

### Area or Perimeter?
Would you need to find the area or the perimeter to buy the following:

a) Tiles for a bathroom floor  
b) Lace for the edge of a dress  
c) Trim for the bulletin board in your classroom.  
d) Paint for a wall  
e) Grass seed for the lawn  
f) M & M candies for the outside edge of a cake

What is the difference between area and perimeter?

---

**Before:**
- Post the warm-up puzzle for students to see.
- Set up stations around the room. Each station should have plastic square tiles and a different area puzzle.

Station 1: Figures A and C - students estimate area, then find area in tiles and perimeter in cm.  
Station 2: Composite Rectangle  
Station 3: Shape Puzzle I  
Station 4: Shape Puzzle II

**During:** Notice how students are solving the puzzles. Take note of how different partner groups solve the Composite Rectangle at Station 2. If students fill-in the shape with tiles, ask them if they could find the area another way. Notice how students solve Shape Puzzle I - have a few students in mind to share at the end of the lesson.

**After:** Bring the students back together. Display the Composite Rectangle. Ask students, “How did you find the area the shape?” Make sure to discuss the notation on the composite rectangle (e.g., 2”, 4”). Have several students share their strategies and drawings for Shape Puzzle I. Bring out that shapes with the same area can have different perimeters.

**Homework:** Student Math Handbook p.114
Record your estimate of the area,

Find the area of each figure in tiles.

Find the perimeter of each figure in cm.

Figure A
Area estimate: _____
Actual Area ______
Perimeter: _____cm.

Figure C
Area estimate: _____
Actual Area ______
Perimeter: _____cm.

Look at the figure below. What is the area?

2”
**Shape Puzzle I:** I am a rectangle that has an area of 12 square inches. What could my dimensions be? Draw 2 different rectangles with an area of 12 square inches. Label the perimeter of each rectangle.

---

**Shape Puzzle II:** I am a rectangle that has a perimeter of 20 inches. My area is between 10 and 20 square inches. What could my dimensions be? What is my perimeter? Draw a picture of the shape below.
Lesson #14: Area of Composite Shapes (from Tiling and Fencing Unit)

<table>
<thead>
<tr>
<th>Objective(s):</th>
<th>Materials:</th>
</tr>
</thead>
</table>
| 2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures. | - Plastic square tiles  
| 2.02 Solve problems involving perimeter of plane figures and areas of rectangles. | - Big E  
| | - Composite rectangles |

<table>
<thead>
<tr>
<th>Students will:</th>
<th>Vocabulary:</th>
</tr>
</thead>
</table>
| - Use square tiles to determine the area and perimeter of composite figures  
| - Determine the area of composite figures given a picture in a grid | - Dimensions  
| | - Area  
| | - Perimeter |

<table>
<thead>
<tr>
<th>TMM:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>On your paper, draw a straight line. Label it AB. Draw a line parallel to it and label it CD. Trade papers with a partner, draw an intersecting line on your partner’s paper and label it EF.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Before:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The local parks and recreation department is building a basketball court. They have decided the court will be 12 feet long. It will be twice as wide. Give a reason why they would need to find the area of the court.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore: Give students the Big E sheet and plastic square tiles. Ask them to estimate the area and the perimeter of the shape. Have students work in partners to determine the area and perimeter of the shape.</td>
<td></td>
</tr>
</tbody>
</table>

| Explain: Discuss students’ approaches to finding the perimeter and area of the composite figure. Make sure to allow students to think about how they would determine the area if they didn’t have square tiles. Give them the opportunity to discover how the Big E could be divided into smaller rectangles. | |

| Give students the remaining two puzzles and have them work on those tasks. Encourage students to split the larger figure into smaller rectangles. | |

<table>
<thead>
<tr>
<th>After:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow students to share their strategies for finding the area of the composite shapes.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Homework:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Composite Figures W/S</td>
<td></td>
</tr>
</tbody>
</table>
The Big E
Composite Rectangles: Lesson 13

8 units

2 units

4 units

6 units
What is the area of the figure below? _______________  Show how you found out.

2 ft.

Antoine was pushing tables together for a chess tournament. He used square card tables that were 2 ft. long and 2 ft. wide.

If Antoine pushed 4 tables together like this:

What would the perimeter of the long table be?

What would the area be?

Find the area and perimeter of the new table if Antoine pushed 12 tables together
## Lesson #15: Area and Perimeter Puzzle

<table>
<thead>
<tr>
<th>Objective:</th>
<th>Materials:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.</td>
<td>● Grid paper</td>
</tr>
<tr>
<td>2.02 Solve problems involving perimeter of plane figures and areas of rectangles.</td>
<td>● Area and Perimeter Puzzles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students will:</th>
<th>Vocabulary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solve problems using area and perimeter</td>
<td>● Dimensions</td>
</tr>
<tr>
<td></td>
<td>● Area</td>
</tr>
<tr>
<td></td>
<td>● perimeter</td>
</tr>
</tbody>
</table>

### Before:
Introduce the stations to students.

Station 1: The side of a square swimming pool in Newington Woods is 12 yards long. The side of a square swimming pool in Cantebury Woods is twice as long. Find the area and perimeter of each pool. Draw a picture of each and label.

Station 2: Steve is building a fence next to his house for his dog. He is using the side of the house for one of the sides of the dog pen. If he has 16 yards of fencing what dimensions of the dog pen make the largest area? Why?

Station 3: Two rooms are joined together in a house. The first room is 8 feet wide and 12 feet long. The second room has the same width but half the length of the first room. How much carpet would they need to cover the entire space? How much baseboard would they need to go around both rooms?

Station 4: A rectangle has a perimeter of 20 cm. The width is smaller than the length. What are the possible areas and perimeters of the rectangle?

### During:
Allow time for students work at each station. As they work, guide them with questions and let them explore. Note which two questions students struggle the most with (you will discuss these at the end of class).

### After:
Choose one or two of the problems and ask students to share their strategies through pictures and explanations.

### Homework:
Teacher’s Choice
Station 1: The side of a square swimming pool in Newington Woods is 12 yards long. The side of a square swimming pool in Canterbury Woods is twice as long. Find the area and perimeter of each pool. Draw a picture of each and label.

Station 2: Steve is building a fence next to his house for his dog. He is using the side of the house for one of the sides of the dog pen. If he has 16 yards of fencing what dimensions of the dog pen make the largest area? Why?
Station 3: Two rooms are joined together in a house. The first room is 8 feet wide and 12 feet long. The second room has the same width but half the length of the first room. How much carpet would they need to cover the entire space? How much baseboard would they need to go around both rooms?

Station 4: A rectangle has a perimeter of 20 cm. The width is smaller than the length. What are the possible areas and perimeters of the rectangle?
1. Draw a figure with an area of 12 square units. Shade your figure in.

2. Draw a figure with a perimeter of 12 units. Shade your figure in.

3. If all eight sides are the same length, what is the perimeter of the figure below?

4. This square measures 10 cm. on each side. What is the area of the square?

5. What is the perimeter of this figure?

6. What is the area of this figure?
7. Mark and his brother decided to put new carpet in their bedroom. Their bedroom has a rectangular shape. One side is 6 feet while the other side is 4 feet. Write a number sentence to show Mark and his brother how much carpet they will need to buy.

8. Jose is helping his brother put a fence around their fruit garden. The garden has a rectangular shape. One side is 5 meters while the other side is 8 meters. Write a number sentence to show Jose and his brother how to figure out how much fence to buy.

9. What is the perimeter of the shape below?

![Shape](image)

10. What is the area of the shape below?

![Shape](image)

11. The area of the rectangle is 16 square feet. The length is four times the width.

12. What is the width? ________
13. What is the length? ________

SHOW your WORK!

14. The area of the rectangle is 18 square feet. The length is twice as long as the width.

15. What is the width? ________
16. What is the length? ________

SHOW your WORK!

14. Harris is planting a rectangular garden with an area of 24 square feet. He is also putting a fence around his garden. How should he arrange his garden so he can buy the least amount of fence possible? Show your work below.
25. Mrs. Moore’s rectangular classroom is 30 feet long and 25 feet wide. When she moves to her new school, her classroom will be 45 feet long and 30 feet wide. How many more square feet will she have in her new classroom?

A 40 square feet  
B 75 square feet  
C 600 square feet  
D 1,350 square feet

23. Blake’s mother is ordering tile flooring for three rooms. The first room measures 10 feet by 12 feet. The second room measures 20 feet by 25 feet. The third room measures 14 feet by 16 feet. How much area must the tile flooring cover in all?

A 660 sq ft  
B 720 sq ft  
C 844 sq ft  
D 1,500 sq ft
27. Which of these points is closest to 
(0, 0) when graphed on the coordinate 
plane shown?

A  (1, 5)  
B  (3, 3)  
C  (4, 2)  
D  (3, 0)

24. Juan’s garden is rectangular with a 
length of 10 feet and a width of 6 feet. 
He is buying fencing to go around the 
entire garden. The fencing is sold in 
pieces that are each 2 feet long. How 
many pieces should he purchase?

A  8  
B  16  
C  26  
D  32

28. Ann rotates this triangle 90° clockwise.

Which choice shows Ann’s triangle after the 90° rotation?

A  
B  
C  
D  
26. The map below shows the streets near Jocelyn's home.

Which two streets are parallel?

A  Davis Street and Main Street
B  Davis Street and Everett Street
C  Main Street and Everett Street
D  Main Street and Broad Street

10. Which house shows only a translation of house X?

A  house A
B  house B
C  house C
D  house D
7. What is the perimeter of this figure?

A  23 units
B  27 units
C  30 units
D  54 units

6. Sally placed two sheets of paper side by side as shown below.

What is the total area of the two sheets of paper?

A  72 sq cm
B  92 sq cm
C  240 sq cm
D  264 sq cm
5. Adam needs to put a fence around his square garden to keep out rabbits. One side of the garden measures 3 m.

How many meters of fencing will be needed?

A 6 m
B 9 m
C 12 m
D 81 m