SD USD

San Diego Unified School District

Instructional Module to Enhance the Teaching of

HARCOURT

Math

California Edition

Grade 4

Module 4–Revised

Geometry

–Work in Progress–

San Diego City Schools
Instruction and Curriculum Division
MATHEMATICS CURRICULUM MAP – GRADE 4

MODULE 4 – GEOMETRY
Modules represent individual units of study that lead to the essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.

Students will:

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts and translate between different representations.
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- Students build their spatial sense through geometric experiences.
- Students transform shapes in a plane or in space and describe the changes as translations (slides), reflections (flips) and rotations (turns).
- Students model and explain the formulas for finding perimeter and area of rectangles and triangles and the volume of rectangular prisms.
- Students visualize, draw, cut and fold 2-dimensional nets into three-dimensional figures.
- Students find the areas of non-rectangular polygons by dividing them into rectangles and triangles.
- Students test figures for congruency and line and rotational symmetry. They use attributes of figures to solve problems.

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- How do I identify, describe and represent parallel, perpendicular and intersecting lines and use the relationship between lines to solve problems?
- How do I use flips, slides and turns to transform figures?
- How do I enlarge or reduce a figure to create a similar figure?
- How do I test a geometric figure for line and rotational symmetry and *congruency*?*
- **How do I use efficient strategies for finding the perimeter and area of a rectangle and show the relationship between them?*
- How do I find the area of a non-rectangular polygon by dividing it into separate parts?
- How do I use inverse operations and the formulas for area and perimeter to find unknown lengths when the area or perimeter is known?
- **How do I identify solid figures by the number of faces, edges and vertices?*
- How do I interpret and draw a two-dimensional net that can be cut and folded to model a geometric solid?
- **How do I develop and use strategies for finding and describing the volume of a rectangular prism?*
- How do I explain and model why the formulas for finding perimeter and area of rectangles and the volume of a rectangular prism work?
- How do I measure and name angles?
- How do I find the relationship between the parts of a circle and use these relationships to estimate the circumference?
- How do I explain pi and use it to find the circumference of a circle?
- **How do I describe and classify triangles and quadrilaterals?*

Presented in previous grade(s)

Resources: Van de Walle: Chapters 19 & 20 (pp 323-340 & 359-373); *Mathematics Sourcebook: Measurement* (pp. 27-36)

UNIT 8: GEOMETRY
5 – Weeks of Instruction

Key Mathematical Concepts:

- Understand and use concrete and representations of plane and solid geometric objects to show relationships between them and solve problems-
- Use, visualize and describe characteristics of geometric figures and geometric properties-
- Understand and find area and perimeter-
- Interpret and use formulas (e.g., area = length X width or A =lw) to calculate quantities and compare relationships between geometric figures-
- Understand how to use formulas and to make problem solving-decisions-
- Understand and use a variety of strategies: words, symbols/numbers; charts, graphs, tables, diagrams and models to explain and justify mathematical reasoning and solutions to problems.

Chapter 25: Plane Figures Lesson 1: Lines, Rays, and Angles Lesson 2: Line Relationships Lesson 3: Congruent Figures and Motion (2 Days) Lesson 4: Symmetric Figures Lesson 5: Problem Solving Strategy: Make a Model	**Chapter 26: Perimeter and Area of Plane Figures** Lesson 1: Perimeter of Polygons Lesson 2: Estimate and Find Perimeter Lesson 3: Estimate and Find Area (2 Days) Lesson 4: Relate Area and Perimeter Lesson 5: Relate Formulas and Rules (2 Days) Lesson 6: Problem Solving Strategy: Find a Pattern
Chapter 27: Solid Figures and Volume Lesson 1: Faces, Edges, and Vertices Lesson 2: Patterns for Solid Figures Lesson 3: Estimate and Find Volume of Prisms Lesson 4: Problem Solving Skill: Too Much/Too Little Information	**Chapter 28: Measure and Classify Plane Figures** Lesson 1: Turns and Degrees Lesson 2: Measure Angles Lesson 3: Circles Lesson 4: Circumference Lesson 5: Classify Triangles Lesson 6: Classify Quadrilaterals Lesson 7: Problem Solving Strategy: Draw a Diagram

Unit 8: Geometry

MODULE 4 NOTES

- Lessons with on overview with an " * "can be optional if additional instructional time is needed for particular unit concepts/topics.

  Several of the "* lessons" provide important experiences with problem-solving strategies and can be built into other lessons if they are not taught.

  ** Indicate lessons that definitely can be omitted if additional instructional time is needed for other lessons.

- The focused "Problem Solving" lessons often provide a strong foundation for the concepts of the chapter **and can be taught** as the first in the chapter's sequence.

- Lessons include many suggested "Routines" – choose those that meet the students instructional needs. It is not necessary to teach every Routine included with the module, they are provided as suggestions.
  Note: It is important to include instructional experiences focused on "time" as part of Routines. Chapter 7 – Time is not included in the Grade 4 year plan.

- This module does not have lesson plans for:
  Day 26: California Connections
  Day 27: Assessment

Day 1 **Chapter 25: Plane Figures** **Lesson 25.1** Lines, Rays and Angles	Day 2 **Lesson 25.2** Line Relationships	Day 3 **Lesson 25.3 (Day 1)** Congruent Figures and Motion	Day 4 **Lesson 25.3 (Day 2)** Congruent Figures and Motion	Day 5 **Lesson 25.4** Symmetric Figures
Day 6 ****Lesson 25.5** Problem Solving Strategy: Make a Model	Day 7 **Chapter 26: Perimeter and Area of Plane Figures** **Lesson 26.1** Perimeter of Polygons	Day 8 **Lesson 26.2** Estimate and Find Perimeter	Day 9 **Lesson 26.3 (Day 1)** Estimate and Find Area	Day 10 **Lesson 26.3 (Day 2)** Estimate and Find Area
Day 11 **Lesson 26.4** Relate Area and Perimeter	Day 12 **Lesson 26.5 (Day 1)** Relate Formulas and Rules	Day 13 **Lesson 26.5 (Day 2)** Relate Formulas and Rules	Day 14 ***Lesson 26.6** Problem Solving Strategy; Find a Pattern	Day 15 **Chapter 27: Solid Figures and Volume** **Lesson 27.1** Faces, Edges and Vertices
Day 16 **Lesson 27.2** Patterns for Solid Figures	Day 17 ****Lesson 27.3** Estimate and Find Volume of Rectangular Prisms	Day 18 ***Lesson 27.4** Problem Solving: Too Much/Too Little Information	Day 19 **Chapter 28: Measure and Classify Plane Figures** **Lesson 28.1** Turns and Degrees	Day 20 **Lesson 28.2** Hands On: Measure Angles
Day 21 **Lesson 28.3** Circles	Day 22 **Lesson 28.4** Hands On: Circumference	Day 23 **Lesson 28.5** Classify Triangles	Day 24 **Lesson 28.6** Classify Quadrilaterals	Day 25 **Lesson 28.7** **Problem** Solving Strategy: Draw a Diagram
Day 26 California Connection	Day 27 Assessment	** **Indicates lessons to omit** if additional instructional time is needed for other lessons. * Indicates **optional lessons** **Lesson 25.3** can be a 1 day rather than 2 day lesson.		

DAY 1
Unit 8: GEOMETRY
Chapter 25: PLANE FIGURES
LESSON 25.1, pp. 478-481

MATERIALS:	Transparency 25.1; **Routines**: 2" X 11" strips of unlined paper – at least 1 per student.
LESSON FOCUS:	**Identify Lines, Rays, and Angles**
CALIFORNIA STANDARDS:	**Measurement and Geometry:** **3.0:** Students demonstrate an understanding of plane and solid geometric objects and use this knowledge to show relationships and solve problems. **3.5:** Students know the definitions of a right angle, an acute angle, and an obtuse angle. Understand that 90°, 180°, 270°, and 360° are associated, respectively, with _, _, _, and full turns. **Mathematical Reasoning: 2.4**
PURPOSE OF LESSON:	• Knowing the characteristics of **points, lines and planes** is fundamental to understanding geometry. • Understand that the size of an angle is not dependent on the length of the ray and know/use the conventions for naming rays; understand that the 3 points used to name a plane are not on the same line.
LAUNCH: Transparency 25.1	**TE Pg. 478A: Number of the Day** **Learn, p. 478.** Geometry Everywhere. **Teach, TE p. 478**, Guided Instruction questions to guide student discussion of chart of definitions. Noting that: a straight **line**, goes on infinitely in both directions, a **line segment** has 2 endpoints, and a **ray** has only 1 endpoint. Also, highlight proper labeling. **Discuss**: • *Does a line segment or a ray have any depth? Height? Can you measure the length of a line or a ray?* **Alternative Teaching Strategy, TE p. 480.** • Guide students to seeing the application/connection. • Discuss and summarize with students referring to the chart of the terms. **Note: See Common Error Alert, TE p. 480**
EXPLORE:	**Types of Angles, Pg. 479**: • Use: Special Needs Strategy, TE Pg. 478 B, to introduce different types of angles. • See question bullets, top margin TE p. 479. **Activity** and **Examples, p. 479** with students. **Practice & Problem Solving, p. 480 #5 – 10.** Do with students; discuss.
PRACTICE:	**Practice & Problem Solving, Pg. 480 #20 – 22.** Students work with partners/individually; monitor and confer with students. Continue with #27 – 33. Discuss student responses.
SUMMARIZE	**TE Assess, Pg. 481: WRITE.** Share responses.
HOMEWORK:	**Link Up To Art, p. 481** **Mixed Review and Test Prep**, p. 481

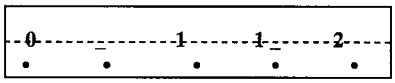
ROUTINES:

Making Folding Fraction Number Lines

Materials: 11" unlined paper strips about 2" wide.

Note: These number lines can be saved and used routinely.

- Place strip lengthwise and fold in half vertically (hot dog fold).
- Open strip and lay flat.
- Make point at top left end and label it "0". Make point at top right end and label it "2".
- Make a point on crease at top and label it "1".



Question

What do you think you are going to make?

Discuss the number lines.

- Fold strip into halves and then fold it again into fourths.
- Open strip. Make points at new creases.

Question

Where is the first new crease? What points is it between? (0 and 1) Is it halfway between them?

What fraction should you write to label this point? (_)

Continue with the point between 1 and 2 and label it "1 _ ".

- Fold into fourths, and then into half again, making eighths.
- Open strip. Make points at new creases. Discuss how they should be labeled (_, _, 1 _ , 1 _).

Review using a number line to compare numbers. Discuss how to use a number line to do simple addition and subtraction of fractions; e.g., _ + _ = 1; _ + _ = _; 1 + _ = 1 _, etc. (Students do simple adding and subtracting fractions as they did in Grade 3. Students work with a partner. First, student asks a problem; e.g., Which is greater, _ or _ ?)

DAY: 2
Unit 8: GEOMETRY
Chapter 25: PLANE FIGURES
LESSON 25.2, pp. 482-483

MATERIALS:	*Transparency 25.2; 1 copy of Geoboard dot paper for each student (TR53); ***Optional**: Pg. 482 B: Special Needs Strategy: 4 small sheets of paper per student; *Challenge 25.2 – 1 copy per 2 students
LESSON FOCUS:	**Identify Line Relationships**
CALIFORNIA STANDARDS:	**Measurement and Geometry:** **3.0:** Students demonstrate an understanding of plane and solid geometric objects and use this knowledge to show relationships and solve problems. **3.1:** Identify lines that are parallel and perpendicular. **3.5:** Students know the definitions of a right angle, an acute angle, and an obtuse angle. Understand that 90°, 180°, 270°, and 360° are associated, respectively, with _, _, _, and full turns. **Mathematical Reasoning: 2.4**
PURPOSE OF LESSON:	• Understand characteristics of and identify parallel, perpendicular and intersecting lines. • Understand that intersecting lines form angles; parallel line never intersect and how to use relationships between lines to solve problems. Example: Maps show line relationships.
LAUNCH: *Transparency 25.2	**Hw: Pg. 481: Discuss Link up to Art** **Problem of the Day, TE p. 482A** **Questions:** • *What do we call a corner where two streets cross each other?* • Write: **intersection** on board/overhead. Discuss. • *Can you use your arms to show an intersection?* • *Draw two intersecting lines.* • *What word can describe lines that will not ever intersect?* • Write: **parallel** on the board/overhead. Discuss. • *Can you use your arms (or two index fingers) to show parallel lines?* • *How can you describe these lines?* Draw two perpendicular lines on the board/overhead. Discuss/Emphasize: Lines that intersect to form **right angles** are called perpendicular lines. • Draw several examples and ask students to identify the line relationships. Optional game; play **Simon Says**. Use your arms to model the lines I name." Alternate saying, "Simon Says perpendicular; intersecting; and parallel," until students can identify each.
EXPLORE: *Special Needs Strategy: 4 Small pieces of paper **OR:** * 1 copy of Challenge 25.2 per pairs	**Learn, p. 482:** Follow the Lines. • Study the map and chart of definitions. **Teach, p. 482,** TE Guided Instruction questions to further the discussion. • Emphasize the labels and symbols used in naming and comparing lines. • **Challenge 25.2**

PRACTICE:	**Check, Pg. 482 - 483 #1-4**. Do with students. Discuss. **Practice & Problem Solving, p. 483.** Discuss diagram for #11-20 with students; Again, emphasize proper labeling. • Confer with groups as students they do #11-22, individually/partners. • Discuss #21 & 22.
SUMMARIZE:	**ASSESS, TE p. 483: DISCUSS:** "How to draw different types of lines...." • Show diagram for **ASSESS:** Write: Students identify 3 different angles. • List and describe the line relationships.
HOMEWORK:	**Mixed Review, p. 483**

ROUTINES:

Team Products

Divide class into two or more teams with a scorekeeper for each team. First student on each team says and writes the first part of a basic multiplication fact; second student gives product. The third students says first part of new fact; fourth student gives product, etc.

First student: 7 x 8 = ? Second student: 56
Third student: 9 x 4 = ? Fourth student: 36, etc.

Note: Students must give correct product. Student asking fact must give same student a different fact if an incorrect answer is given.

DAY: 3
Unit 8: GEOMETRY
Chapter 25: PLANE FIGURES
LESSON 25.3 (Day 1 of 2-days), pp. 484-87

MATERIALS:	**Problem of the Day:** Transparency 25.3; 2 copies of dot paper per student (Pg. TR53) and scissors; *Transparency: Pg. TR 53
LESSON FOCUS:	**Congruent Figures and Motion**
CALIFORNIA STANDARDS:	**Measurement and Geometry** **3.0:** Students demonstrate an understanding of plane and solid geometric objects and use this knowledge to show relationships and solve problems. **3.1:** Identify lines that are parallel and perpendicular. **3.3:** Identify congruent figures.
PURPOSE OF LESSON:	• Understand how figures are congruent and similar and predict the results of flips, slides and turns. • Understand that enlarging or reducing a figure produces a similar figure. • Recognize that flips, turns and slides transform or move figures and help determine if figures are congruent.
LAUNCH: *Transparency 25.3 Geoboard Dot Paper: 1 page per student *Geoboard Dot Paper transparency for modeling	**Problem of the Day, TE** Pg. 484A • Use geoboard dot paper. Task: Give dimensions for the sides of two rectangles. Draw each rectangle. (Model an example.) Rectangle #1 7 by 5 units (7 units, 5 units, 7 units, 5 units) Rectangle #2 5 by 7 units (5 units, 7 units, 5 units, 7 units) • Look at your rectangles. Describe them. • Ask students: How are they alike? How are they different? Explain/justify your responses. **Discuss:** *What do we call shapes that have the same shape and size?* (congruent) • To show that the shapes are **congruent,** students cut out shapes and place one on top of the other to check for an exact fit. Note: the shape may need to be rotated or flipped to fit exactly.
EXPLORE: Geoboard Dot Paper	**Learn activity, Pg. 484.** Use dot paper. Do with students. **Teach, p. 484,** Guided Instruction questions to guide discussion. **Examples, bottom Pg. 484** with students. • Discuss definitions of terms: slide, flip, and turn using the shapes. • Use pattern blocks or tiles to sketch figures on dot/grid paper and create flips, rotations (turns), and slides as in the examples. **Similar Figures, Pg. 485**: Monitor while students do the **Activity** using bullets top margin, TE p. 485. Discuss **similar** and how the three squares alike? How are they different? **Alternative Teaching Strategy, TE p. 486.** Discuss. **Check, Pg. 485:** # 1 with students. Use dot paper.
PRACTICE:	**Check, Pg. 485:** #2 – 4. Students explain the motion. **Practice & Problem Solving, Pg. 486** #8-11 Students work individually/with partners. Discuss with solutions with students.
SUMMARIZE:	**ASSESS, TE Pg. 487**: **DISCUSS:** "How can you tell if 2 figures are similar? Congruent?

HOMEWORK:	**Practice & Problem Solving, p. 486 #12 - 14** • Find examples of shapes that have been slid, flipped, or turned. List or draw at least 1 example of each. **Mixed Review, p. 487 #28 – 30**

ROUTINES:

Missing Factors/Division

Divide class into two or more equal teams; each team with a leader and scorekeeper. Team leaders say and write a problem with a missing factor; e.g., 7 x ? = 63, or 9 x ? = 90. Leader gives team a problem. Students give correct missing factor.

Two or more rounds are played. Since leaders are writing their problems it is easier to discuss the "difficult" problems. Continue as needed.

Sample problems are:

6 x ? = 48	7 x ? = 56	8 x ? = 40	3 x ? = 24
5 x ? = 500	3 x ? = 90	4 x ? = 80	2 x ? = 400
8 x ? = 64	5 x ? = 100	4 x ? = 44	6 x ? = 60

Discuss strategies for solving these problems.

DAY: 4
Unit 8: GEOMETRY
Chapter 25: PLANE FIGURES
LESSON 25.3 (DAY 2of 2), pp. 484-87

MATERIALS:	Two sheets of geoboard dot paper (TR53); Transparency of Geoboard Dot paper; 1 copy of Tangram Pieces for each student. (Included with module.) **Note**: the top shape shows the pieces put together into a square tile. **Do not** give this to students at this time. Give them the bottom part of the page with the separate pieces.
PURPOSE OF LESSON:	• Understand how figures are congruent and similar and predict the results of flips, slides and turns. • Understand that enlarging or reducing a figure produces a similar figure. • Recognize that flips, turns and slides transform or move figures and help determine if figures are congruent
LAUNCH:	**Thinker's Corner, p. 487**. • Use tangram pieces. Discuss shapes & attributes of the shapes. (large, medium, small triangles are equilateral & similar.) • Chart descriptions.
EXPLORE: Geoboard Dot paper & *Transparency	**Practice & Problem Solving, Pg. 486 #18-21:** • Do with students. • Share and discuss solutions.
PRACTICE:	**Practice and Problem Solving, Pg. 486.** Use geoboard dot paper and do # 15 and 16 with students. • Confer as students complete: Pg. 487: #24 - 27 individually/with partners. Discuss strategies.
SUMMARIZE:	**ASSESS, TE Pg. 487: WRITE** and discuss. Students show: slides, flips and turns with alphabet letters.
HOMEWORK:	**Mixed Review and Test Prep, Pg. 487 #28 – 30, 33 – 36.**

ROUTINES:

Is Your Writing Right?
Read the following to students who record the numerals for the number words. Check when done.

one thousand ninety-three
twenty thousand five hundred one
thirty-two thousand six
ninety-nine hundred
etc.

fifteen hundred
seven million
ninety-nine thousand
twenty-nine million

After checking these, have students take turns selecting and dictating numbers for other students to record.

Note: Students write the number first before dictating.