Course Title: Mathematics	Full Year	Required

Course Description:
The big ideas in grade 2 include: extending understanding of the base-ten number system, building fluency with addition and subtraction, using standard units of measure, and describing and analyzing shapes.
The mathematical work for grade 2 is partitioned into 9 units:

1. Adding, Subtracting, and Working with Data
2. Adding and Subtracting within 100
3. Measuring Length
4. Addition and Subtraction on the Number Line
5. Numbers to 1,000
6. Geometry, Time, and Money
7. Adding and Subtracting within 1,000
8. Equal Groups
9. Putting it All Together

In these materials, particularly in units that focus on addition and subtraction, teachers will find terms that refer to problem types, such as Add To, Take From, Put Together or Take Apart, Compare, Result Unknown, and so on. These problem types are based on common addition and subtraction situations, as outlined in Table 1 of the Mathematics Glossary section of the Common Core State Standards.

Additional Course Information:

The big ideas in Grade 2 include:

- Representing and solving problems involving addition and subtraction
- Adding and subtracting within 20
- Understanding place value
- Using place value understanding and properties of operations to add and subtract
- Measuring and estimating lengths in standard units
- Relating addition and subtraction to length

Required fluency in grade 2 includes:

- Single-digit sums and differences (sums from memory by end of Grade 2)
- Add/subtract within 100

Core Resources:
Illustrative Mathematics

Instructional Routines and Math Language Routines

Glossary - Student-friendly

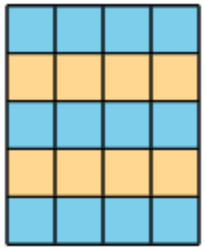
Required Materials

IM en Español:

Developing a Mathematical Community

Are there any attachments at the course level that teachers will need?
Scope and Sequence This document should be reviewed at the start of the year and each unit for information on language routines, expectations, and possible misconceptions.

Pacing Guide and Dependency Diagrams K-5

Unit 8: Equal Groups	Duration: 14-15 days
Unit Overview - FOCUS: Unit Learning Goals Students work with equal groups of objects to gain foundations for multiplication. In this unit, students develop an understanding of equal groups, building on their experiences with skip-counting and with finding the sums of equal addends. The work here serves as the foundation for multiplication and division in grade 3 and beyond. Students begin by analyzing even and odd numbers of objects. They learn that any even number can be split into 2 equal groups or into groups of 2, with no objects left over. Students use visual patterns to identify whether numbers of objects are even or odd. Next, students learn about rectangular arrays. They describe arrays using mathematical terms (rows and columns). Students see the total number of objects as a sum of the objects in each row and as a sum of the objects in each column, which they express by writing equations with equal addends. They also recognize that there are many ways of seeing the equal groups in an array.   Later, students transition from working with arrays containing discrete objects to equal-size squares within a rectangle. They build rectangular arrays using inch tiles and partition rectangles into rows and columns of equal-size squares. The work here sets the stage for the concept of area in grade 3.	**Topic Titles:** ● **Section A: Odd and Even** ○ Determine whether a group of objects (up to 20) has an odd or even number of members. ○ Write an equation to express an even number as a sum of two equal addends. ○ ● **Section B: Rectangular Arrays** ○ Find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns using addition. ○ Partition rectangles into rows and columns of equal-size squares, and count to find the total number of squares. ○ Represent the total number of objects in an array as a sum of equal addends.

Coherence: How does this unit build on and connect to prior knowledge and learning?
Students build on their experiences with skip counting in previous units and grades. Throughout second grade students have developed their fluency with addition and subtraction within 20. Students build on their real-world experiences with equal sharing to understand odd and even. Lessons focus on relating sums with equal addends to the structure of the rows and columns in an array to build foundations for using arrays to represent multiplication in grade 3. When students write equations to represent the total number of objects in a rectangular array using the same addend it helps build conceptual foundations for multiplication and the properties of operations that will be explored in future grades. In an earlier unit, students composed larger shapes from composite shapes and partitioned rectangles to make halves, thirds, or fourths. The learning in this unit sets the foundation for multiplication, division and area, which students will learn in grade 3.

Essential Questions:	**Enduring Understanding:**
1. How can you determine whether a number is even or odd? 2. How do arrays and partitioning rectangles relate to repeated addition?	● **We can determine if a number is even or odd by making two equal groups, pairing objects, skip-counting by 2 or using equations with two equal addends to represent an even number of objects.** Some groups of objects can be made into two equal groups without a "leftover" (even) and other groups can be made into two equal groups with "1 leftover." (odd) Repeated addition of the same addend involves joining equal groups. ● **An array involves joining equal groups and is one way to think about repeated addition. We can partition rectangles into rows and columns of equal-size squares to find the total number of squares.** We can use our understanding of the structure of an array to find the total number of objects with repeated addition. The total number of objects in an array can be shown as a sum of equal addends.

What Students Will Know:	What students will do:	Unit Specific Vocabulary: Academic vocabulary
● Some numbers of objects can be split into two equal groups, without any objects left over, and other numbers cannot. ● When the number of objects can be split into two equal groups or made into pairs without any objects left over, we say the number is even. ● When we try to make two equal groups of objects but there's one left over, there is an odd number of objects. ● Objects arranged in rows or columns can show equal groups or pairs. ● An array is an arrangement of objects into rows with an equal number of objects in each row. ● The total number of objects in an array can be determined by finding the sum of the number of objects in each row. ● In an array objects in a row are equally spaced from each other. When arranged this way, the objects also line up into columns. ● A rectangle partitioned into equal-size squares is composed of squares that are arranged in rows and columns.	● Use the terms even and odd to describe groups of objects. ● Determine whether representations of groups of objects show an even or odd number of objects. ● Justify why a number is even or odd using methods based on making two equal groups, pairing objects, skip-counting by 2 or using equations with two equal addends to represent an even number of objects. ● Represent an even number as the sum of two equal addends by writing an equation. ● Determine if a number within 20 is even or odd. ● Describe the structure of an array and use appropriate language to describe an array of up to 5 rows and 5 columns. ● Use the structure of the array and addition to find the total number of objects arranged in rectangular arrays. ● Partition rectangles into rows and columns. ● Represent the number of objects in an array as a sum of equal addends with a visual and an equation. ● Create arrays using square tiles and partially-partitioned rectangles.	Equal groups Leftover Pair Odd Even Equal Addends Pattern Array Rows Organize Column Estimation Expression Equation Analyze Compare Partition Equal-size

Entry Level Assessment and Connection to Unit: Section A Pre-Unit Practice Problems Section B Practice Problems	**Unit Materials, Resources and Technology:** ● **Illustrative Mathematics** ● **Instructional Routines and Math Language Routines** ● **Glossary - Student-friendly** ● **Required Materials** ● **IM en Español** ● **Pacing Guide and Dependency Diagrams K-5**
Opportunities for Interdisciplinary Connections:	
Any links, attachments and resources: Instructional Routines Document Family Support Materials	**Planning Ideas:** Components of a Typical IM Lesson What To Know About IM When Planning Where to Find the Mathematical Practices in the Units Assessing the Mathematical Practices

Topic # 1 (Section A)	Topic Name: Section A - Odd and Even	Duration: Recommended: 6 lessons (6 days)

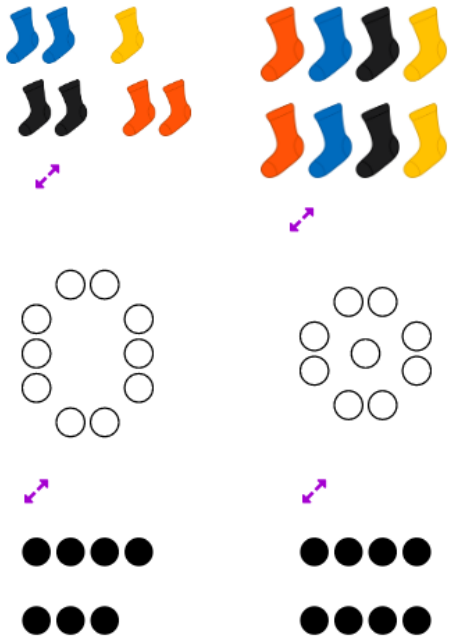
Topic Description:
In this section, students learn about odd and even numbers, building on their experience with sharing objects with another person or with making pairs out of a set of objects. They begin by noticing that some groups of objects can be made into two equal groups without a "leftover" and other groups can be made into two equal groups with "1 leftover." The same pattern can be seen when pairing objects.

After learning the terms, students focus on explaining why a group has an even number or an odd number of members. They do so by showing whether the objects can be made into two equal groups or be paired without a leftover, or whether they can skip-count by 2 to count the entire collection.

The representations used here support students as they progress from explaining even and odd numbers informally to doing so more formally. They also pave the way for students to make sense of representations of multiplication in grade 3.

Early lessons encourage the teacher to record student thinking using diagrams of equal groups or by arranging objects in rows and columns. Both recording strategies help students see and count pairs of objects.

Students begin to see how objects arranged in rows and columns can show equal groups or pairs. They will learn more about this arrangement and the term "array" in the next section.



To focus the work on building a foundation for multiplication and division, counters or connecting cubes should be available to students throughout the section, including during cool-downs.

Section Learning Goals

- Determine whether a group of objects (up to 20) has an odd or even number of members.
- Write an equation to express an even number as a sum of two equal addends.

<table>
<tr>
<td>Competencies Addressed:

Understanding and Applying Number Systems
2.NS.2 I can count, read, and write whole numbers. (2.NBT.A.2-3)
2.NS.4 I can use my understanding of place value and properties of operations to add. (2.NBT.B.5-9)
2.NS.5 I can use my understanding of place value to subtract. (2.NBT.B.5, 7-9)

Operations and Algebraic Thinking
2.OA.1 I can add within 20. (2.OA.B.2)
2.OA.2 I can subtract within 20. (2.OA.B.2)
2.OA.4 I can build on my understanding of addition to gain concepts of multiplication. (2.OA.C.3-4)</td>
<td>Essential Question and Enduring Understanding Addressed in this Topic:

Essential Question
1. How can you determine whether a number is even or odd?

Enduring Understanding
● We can determine if a number is even or odd by making two equal groups, pairing objects, skip-counting by 2 or using equations with two equal addends to represent an even number of objects. Some groups of objects can be made into two equal groups without a “leftover” (even) and other groups can be made into two equal groups with “1 leftover.” (odd) Repeated addition of the same addend involves joining equal groups.</td>
</tr>
<tr>
<td>In this Topic, students will know:

● Some numbers of objects can be split into two equal groups, without any objects left over, and other numbers cannot.
● When the number of objects can be split into two equal groups or made into pairs without any objects left over, we say the number is even.
● When we try to make two equal groups of objects but there’s one left over, there is an odd number of objects.
● Objects arranged in rows or columns can show equal groups or pairs.</td>
<td>Topic Vocabulary:

Academic vocabulary
Equal groups
Leftover
Pair
Odd
Even
Equal Addends
Pattern</td>
</tr>
</table>

In this Topic, students will be able to:

- Use the terms even and odd to describe groups of objects.
- Determine whether representations of groups of objects show an even or odd number of objects.
- Justify why a number is even or odd using methods based on making two equal groups, pairing objects, skip-counting by 2 or using equations with two equal addends to represent an even number of objects.
- Represent an even number as the sum of two equal addends by writing an equation.
- Determine if a number within 20 is even or odd.

Plan for Student Reflection:

Student Journal Prompts and Reflection Practices

Plan for Teacher Reflection:

Lesson 1: What ideas did students already have about the number of objects that can be made into equal groups? How did you elicit and use these ideas during the lesson?

Lesson 2: What was the best question you asked students today? Why would you consider it the best one based on what students said or did?

Lesson 3: Reflect on whose thinking was heard today. Reflect on whose thinking was not heard but could have enriched the conversations. What prompts or structures might better enable the latter to share their voices and reasoning?

Lesson 4: Throughout the year, students have practiced adding and subtracting within 20 to develop fluency. How did students leverage their fluency to decompose numbers into 2 equal addends?

Lesson 5: How did students use what they have learned about even and odd numbers to explain the effect of adding 1 or 2? How did students show what they understand about numbers that can be decomposed into 2 equal groups or can be made into pairs? How can you build on that understanding as students consider other equal groups in the next

	section? **Lesson 6:** How did you use questioning to assess what students understand about mathematics during their work in centers? **Utilize additional strategies for Teacher Reflection:** ● Reviewing formative assessments ● Developing scaffolds ● Collaborative scoring ● PLCs ● Planning for small groups

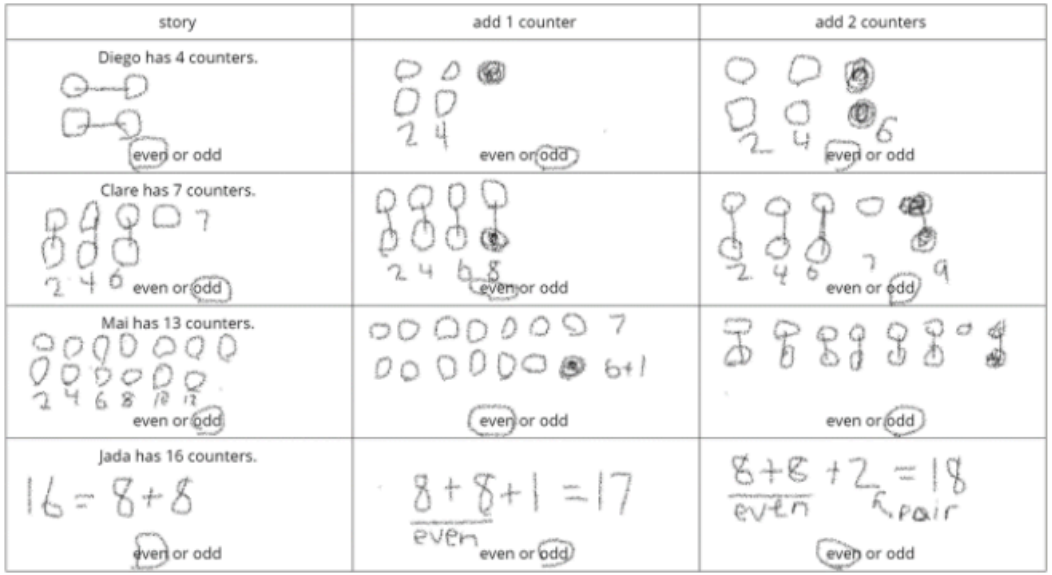
Topic 1 Task Development

Each Topic has its own Task that serves as a roadmap for instruction during the unit. The task follows the Learning Cycle Model that drives teaching and learning in Naugatuck Public Schools.

<table>
<tr><td>Task Title: Topic 1 - Odd and Even</td><td>Grade Level and Unit: Grade 2, Unit 8</td></tr>
<tr><td>Description of Task:

In this task students look for patterns with even and odd numbers. Students will explore their conjectures and create a visual representation to display their findings. This task goes beyond the depth of understanding required to address the standards.

Sample:

 
</td><td>Purpose of Task:
The purpose of this task is for students to notice and describe patterns in sums within 20 using what they know about even and odd numbers.</td></tr>
<tr><td>Background of Students/Learning Progression:
In previous lessons, students worked with physical objects and images to determine if groups of objects were even or odd. They represented even numbers as an equation with two equal addends.

In this task, students continue to practice identifying and justifying even and odd</td><td>Ensure all competencies are addressed in the task:

▢ Yes, all competencies are addressed
▢ No - Task needs modification</td></tr>
</table>

numbers and deepen their number sense with numbers within 20. They notice patterns in even and odd numbers when counting and use what they know about 2 equal groups and pairs to generalize why adding 1 changes whether a group is even or odd, but adding 2 does not.	

Getting Started: In the lessons that make up Topic 1 - Section A of Unit 8, students will:

- Determine whether a group of objects (up to 20) has an odd or even number of members.
- Write an equation to express an even number as a sum of two equal addends.

Lesson 1 (Warm Up) The purpose of this warm-up is to elicit students' personal experiences with equal sharing, which will be useful when students create equal groups of objects in the lesson activities. Although students may notice and wonder many things about the image, comments and questions about the number of children, number of objects, and ways to resolve the problem with equal shares are the important discussion points.

"If these children are fighting over the toy, how could they resolve their problem?" (One could play with the other toy, so they both have one to play with. They could take turns playing with the dinosaur.)
"Today we are going to look at ways to share groups of objects equally."

Section A

IM Lesson	Lesson 1: Can You Share?	Lesson 2: Partners Make Pairs	Lesson 3: Is It Odd or Even?	Lesson 4: Decompose Even and Odd	Lesson 5: Patterns with Even and Odd Numbers (Optional)	Lesson 6: Center Day 1 (Optional)
Learning Cycle Model	**Making Meaning**	**Making Meaning**	**Investigation**	**Investigation**	**Create / Produce**	**Additional Learning**

Naugatuck Math Competency	2.OA.4	2.OA.4	2.OA.C.4	2.OA.1	2.OA.1 2.OA.4	2.NS.2, 2.NS.4, 2.NS.5 2.OA.1, 2.OA.2
Math Practice Standards	MP7	MP7, MP8	MP2, MP7	MP8	MP3, MP7, MP8	
Lesson Purpose	The purpose of this lesson is for students to arrange a number of objects into 2 equal groups and learn that some numbers of objects can be put into two equal groups without any objects left over.	The purpose of this lesson is for students to pair all of the objects in a group and understand that some numbers of objects can be paired without any objects left over.	The purpose of this lesson is for students to determine whether representations of groups of objects show an even or odd number of objects.	The purpose of this lesson is for students to represent even numbers as the sum of two equal addends.	The purpose of this optional lesson is for students to notice and describe patterns in sums within 20 using what they know about even and odd numbers.	The purpose of this lesson is for students to skip-count by 2, 5, and 10 and to add and subtract within 1,000.
Vocabulary Focus	Equal groups, Left over	Pair	Odd, Even	Equal Addends	Patterns	
Lesson Materials/ Resources	Lesson 1 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each group of 2 a container of counters with 4 to 15 counters in each container. *These containers will be used again in	Lesson 2 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each group of 2 a container of 4 to 15 counters. ● Create a t-chart on a large piece of chart paper to display in the activity	Lesson 3 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students access to counters and yellow and blue crayons or colored pencils. **Activity 2:** ● Give each group	Lesson 4 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students access to counters **Activity 2:** ● Give students access to counters	Lesson 5 Slides Teacher Presentation Materials Student Pages **Activity 2:** ● Give each student a Presto Chango Recording Sheet and access to counters.	Lesson 6 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each group a Write the Number Stage 4 Gameboard. ● Give students access to dry erase markers and plastic sleeves.

	the next lesson. ● Create a t-chart on a large piece of chart paper to display in the activity synthesis. **Activity 2:** ● Give students access to connecting cubes or counters. Cool-down: Share with Your Partner	synthesis. **Activity 2:** ● Give students access to connecting cubes or counters. Cool-down: Everybody Find a Partner	a set of Even and Odd Card Sort cards. Cool-down: Even or Odd?	Cool-down: Two Equal Addends	Cool-down: Odd One Out	**Activity 2:** ● Centers - see below
Assessment	**Formative Assessment Strategies: observation, questioning, student discourse : Monitoring Sheet** **See Section A Checkpoint Assessment, Section A Checkpoint Teacher's Guide**					
						Section A Practice Problems
Centers Materials	Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting) Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)	Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting) Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)	Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting) Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)	Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting) Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)	Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting) Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)	Write Numbers, Stage 4 Target Numbers (1-5), Stages 6 and 7 Five in a Row: Addition and Subtraction (1–2),, Stages 7 and 8 How Close? (1–5), Stage 4

	How Close? (1–5), Stage 4: Add to 1,000 (Supporting)	How Close? (1–5), Stage 4: Add to 1,000 (Supporting)	How Close? (1–5), Stage 4: Add to 1,000 (Supporting)	How Close? (1–5), Stage 4: Add to 1,000 (Supporting)	How Close? (1–5), Stage 4: Add to 1,000 (Supporting)	

Making Meaning:

In Lesson 1, students learn that some numbers of objects can be split into two equal groups, without any objects left over, and other numbers cannot. The work of this lesson builds on students' real-world experiences with equal sharing and prepares them to understand and use the terms even and odd to describe groups of objects in future lessons (MP6). In the first activity, students separate objects into 2 equal groups and begin to create a list of numbers that can be split into 2 equal groups. In the second activity, they are given access to objects, but are also encouraged to consider other representations of numbers, including equations, that may show a number of objects as 2 equal groups or 2 equal groups and 1 leftover.

In Lesson 2, students learn that some numbers of objects can be split into multiple groups of 2 (pairs) without any incomplete pairs. In the lesson synthesis, students compare the charts from this lesson and the previous lesson that show no leftovers or one leftover. They notice that the lists of numbers are the same. The terms even and odd are introduced and added to the charts. Students should have access to connecting cubes or counters throughout the lesson, including the cool-down.

Lesson 1: Can You Share?

- The purpose of this lesson is for students to arrange a number of objects into 2 equal groups and learn that some numbers of objects can be put into two equal groups without any objects left over.
- Lesson 1 Slides
- Teacher Presentation Materials

Lesson 2: Partners Make Pairs

- The purpose of this lesson is for students to pair all of the objects in a group and understand that some numbers of objects can be paired without any objects left over.
- Lesson 2 Slides
- Teacher Presentation Materials

Investigation:

In Lesson 3, students justify why a number is even or odd using methods based on making two equal groups, pairing objects, or skip-counting by 2. Some students may begin to justify why a group of objects has an even or odd number of members by using equations with two equal addends to represent even numbers of objects. In the second activity, they interpret addition equations in this way and connect the equations to representations of 2 equal groups (MP2).

In Lesson 4, students explore patterns in the ways they can represent even and odd numbers as sums of two addends. In the first activity, they decompose even and odd numbers in different ways and notice that only the even numbers of objects could be decomposed into two equal addends. In the second activity, students practice decomposing numbers into two equal addends and verify that even numbers can be represented as a sum of two equal addends. They will continue to use expressions with equal addends to represent arrays in upcoming lessons and will relate multiplication expressions to addition expressions with equal addends in grade 3. Throughout the lesson, it is important to emphasize that even numbers can be represented as a sum of two equal addends. Avoid communicating a misconception that odd numbers can not be represented as a sum of two equal addends. Students will learn that odd numbers cannot be represented as a sum of two equal whole numbers as they learn more about whole numbers and fractions in later grades.

Lesson 3: Is It Odd or Even?

- The purpose of this lesson is for students to determine whether representations of groups of objects show an even or odd number of objects.
- Lesson 3 Slides
- Teacher Presentation Materials

Lesson 4: Decompose Even and Odd

- The purpose of this lesson is for students to represent even numbers as the sum of two equal addends.
- Lesson 4 Slides
- Teacher Presentation Materials

Create and Produce:

In Lesson 5, students continue to practice identifying and justifying even and odd numbers and deepen their number sense with numbers within 20. They notice patterns in even and odd numbers when counting and use what they know about 2 equal groups and pairs to generalize why adding 1 changes whether a group is even or odd, but adding 2 does not (MP8). Students add even and odd numbers and connect the mental

strategies they use to add within 20 to patterns in the value of the sums of even and odd addends. This lesson is optional because it goes beyond the depth of understanding required to address the standards.
In Lesson 5, Activity 2, students make and test conjectures about the effect of adding 1 and adding 2 on the parity of a group of objects. They use what they know about equal groups, pairs, and skip-counting to explain why adding 1 may change whether a group of objects is even or odd and why adding 2 will have no effect (MP3, MP8).

"If we add 1 more circle to this group, will it change if the group has an even or odd number?" (Yes. It's odd, so if you add 1 circle you'd make another pair and it'd be even.)
Students will share their conjectures.
"Does adding 1 always change whether a number of objects is even or odd?"

Lesson 5: Patterns with Even and Odd Numbers (Optional)

- The purpose of this optional lesson is for students to notice and describe patterns in sums within 20 using what they know about even and odd numbers.
- Lesson 5 Slides
- Teacher Presentation Materials

Communicate and Present: "Let's test our ideas. Complete the first two columns of the table. You can test other numbers if you have time." "If we add 2 more to a group, will it change if the group has an even or odd number?" Students test and share their conjectures. "Let's test our thinking. Complete the table for the "add 2 counters" column. You can test other numbers if you have time."	**Reflection:** "Let's use Jada's counters to show which of our ideas are true." "How do these equations show that adding 1 changes whether a number is even or odd, but adding 2 does not?" "Han has an odd number of objects." "Lin has 2 more than Han." "Does Lin have an odd or even number of objects? Explain."

Additional Learning:

In Lesson 6, Activity 1, students learn stage 4 of the Write Numbers center, which was first introduced in grade 1. In this new stage, called Skip Count by 2, 5, and 10, students write numbers as they skip-count by 2, 5, or 10. In Activity 2, students choose to continue working on Write Numbers, or choose between three previously introduced centers focused on addition and subtraction within 1,000.

Lesson 6: **Center Day 1 (Optional)**

- The purpose of this lesson is for students to skip-count by 2, 5, and 10 and to add and subtract within 1,000.
- Lesson 6 Slides
- Teacher Presentation Materials

Notes: Follow IM lessons in numerical order.	**Complete File with Resources and Task:**

Topic # 2 (Section B)	Topic Name: Section B - Rectangular Arrays	**Duration:** Recommended 8 days (7 lessons) 1 extra day for end of unit assessment

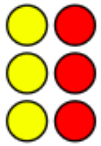
Topic Description:
In this section, students learn that a rectangular array contains objects arranged into rows and columns, with the same number of objects in each row and the same number in each column.

Using this structure, students can skip-count by the number in each row or in each column to find the total number of objects. They can also write equations with equal addends representing the number of objects in a row or a column.

Later in the section, students relate their work with arrays to the partitioning of shapes into equal parts.

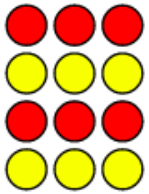
True or false?

$2 + 2 + 2 = 3 + 3$



True or false?

$3 + 3 + 3 + 3 = 4 + 4$



Students build rectangles by arranging square tiles into rows and columns, and then partition rectangles into rows and columns.

Use 8 tiles to build a rectangle. Arrange them in 2 rows.

Partition this rectangle to match the rectangle you made.

Rectangles in this section have up to 5 rows and 5 columns. Students are not expected to name the fractional units created by partitioning shapes. The focus is on using the structure of the rows and columns created by the partitions to count the total number of equal-size squares. This work serves as a foundation for students' future study of multiplication and area measurement.

Section Learning Goals:

- Find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns using addition.
- Partition rectangles into rows and columns of equal-size squares, and count to find the total number of squares.
- Represent the total number of objects in an array as a sum of equal addends.

Competencies Addressed:

Understanding and Applying Number Systems
2.NS.2 I can count, read, and write whole numbers. (2.NBT.A.2-3)
2.NS.4 I can use my understanding of place value and properties of operations to add. (2.NBT.B.5-9)
2.NS.5 I can use my understanding of place value to subtract. (2.NBT.B.5, 7-9)

Operations and Algebraic Thinking
2.OA.1 I can add within 20. (2.OA.B.2)
2.OA.4 I can build on my understanding of addition to gain concepts of multiplication. (2.OA.C.3-4)

Reasoning With Geometry
2.G.2 I can use my understanding of equal shares to partition shapes. (2.G.A.2-3)

Essential Question and Enduring Understanding Addressed in this Topic:

1. How do arrays and partitioning rectangles relate to repeated addition?

- **An array involves joining equal groups and is one way to think about repeated addition. We can partition rectangles into rows and columns of equal-size squares to find the total number of squares.** We can use our understanding of the structure of an array to find the total number of objects with repeated addition. The total number of objects in an array can be shown as a sum of equal addends.

In this Topic, students will know:

- An array is an arrangement of objects into rows with an equal number of objects in each row.
- The total number of objects in an array can be determined by finding the sum of the number of objects in each row.
- In an array objects in a row are equally spaced from each other. When arranged this way, the objects also line up into columns.
- A rectangle partitioned into equal-size squares is composed of squares that are arranged in rows and columns.

Topic Vocabulary:

Academic vocabulary
Array
Rows
Odd
Even
Organize
Column
Estimation
Expression
Equation

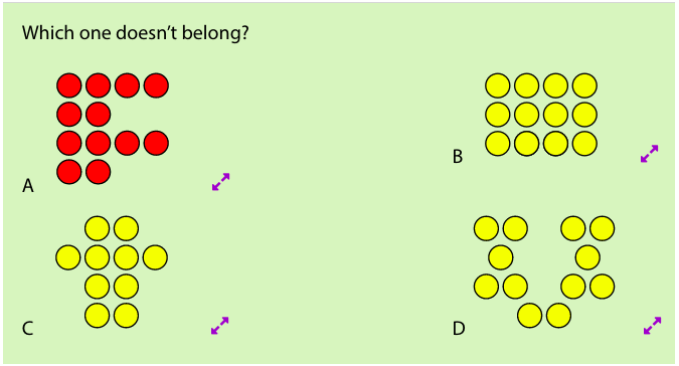
	Analyze Compare Partition Equal-size
In this Topic, students will be able to: ● Describe the structure of an array and use appropriate language to describe an array of up to 5 rows and 5 columns. ● Use the structure of the array and addition to find the total number of objects arranged in rectangular arrays. ● Partition rectangles into rows and columns. ● Represent the number of objects in an array as a sum of equal addends with a visual and an equation. ● Create arrays using square tiles and partially-partitioned rectangles.	**Plan for Student Reflection:** Student Journal Prompts and Reflection Practices **Plan for Teacher Reflection:** **Lesson 7:** In previous lessons, students explained why a number of objects was even or odd using diagrams and by skip-counting by 2. In this lesson, how did students use the structure of arrays to make sense of skip counting and finding total amounts without counting by 1? **Lesson 8:** Outside of class, how can you reinforce the array work done today? Are there opportunities at other times during the day to ask students to represent or count objects using an array? **Lesson 9:** As students worked in their small groups today, whose ideas were heard, valued, and accepted? How can you adjust the group structure tomorrow to ensure each student's ideas are a part of the collective learning? **Lesson 10:** What connections did students make between the structure of an array and the structure of the addition expressions they wrote? What

	questions did you ask to help make the connections more visible? **Lesson 11:** How can you support students as they partition rectangles to get as close to equal-size squares as possible and developmentally appropriate? What tools can you offer to help guide them? **Lesson 12:** How did the work of arranging objects to make arrays support the understanding of partitioning rectangles into equal-size squares? What additional support is needed as students build this understanding? **Lesson 13:** Identify something you thought was going to go well in math class recently, but did not. What can you do to make it a success the next time? **Utilize additional strategies for Teacher Reflection:** ● Reviewing formative assessments ● Developing scaffolds ● Collaborative scoring ● PLCs ● Planning for small groups

Topic 2 Task Development

Each Topic has its own Task that serves as a roadmap for instruction during the unit. The task follows the Learning Cycle Model that drives teaching and learning in Naugatuck Public Schools.

Task Title: Topic 2 - Rectangular Arrays	**Grade Level and Unit: Grade 2, Unit 8**
Description of Task: In this task, students partition rectangles into equal-size squares with and without guiding marks and represent the total number of squares within the rectangles with equations that show the sum of the number of squares in each row or the number of squares in each column. They will write equations to match the rectangles that they partitioned on their visual display. Monitor for the ways students use what they know about the structure of arrays to plan and partition their rectangles.	**Purpose of Task:** The purpose of this task is for students to partition rectangles to create rows and columns of equal-size squares. Then they will find the total number of squares that make up the rectangle.
Background of Students/Learning Progression: Partitioning rectangles into equal-size squares and determining the total helps build the foundation necessary to grasp finding the area of a rectangle in third grade. In the previous section students arranged objects into rows and columns to determine if a number was even or odd. When students write equations to represent the total number of objects in a rectangular array using the same addend it helps build conceptual foundations for multiplication and the properties of operations that will be explored in future grades. In an earlier unit, students composed larger shapes from composite shapes and partitioned rectangles to make halves, thirds, or fourths.	**Ensure all competencies are addressed in the task:** ▢ Yes, all competencies are addressed ▢ No - Task needs modification
Getting Started In the lessons that make up Topic 2 - Section B of Unit 8, students will: ● Find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns using addition. ● Partition rectangles into rows and columns of equal-size squares, and count to find the total number of squares. ● Represent the total number of objects in an array as a sum of equal addends. Lesson 7 (Warm Up) This warm-up prompts students to carefully analyze and compare different arrangements of circles, including an array. Listen for the ways students describe how they see equal groups in each arrangement and use the language they developed in previous lessons to determine if a group of objects was even or odd.	



"How are the circles in B arranged differently than in the other groups?"
"We call objects arranged in equal rows an **array.** The rows go from side to side. We are going to explore arrays today."

Section B

IM Lesson	Lesson 7: What is an Array?	Lesson 8: Count Columns and Objects in Columns	Lesson 9: A Sum of Equal Addends	Lesson 10: Write Expressions and Equations to Represent Arrays	Lesson 11: Arrays and Rectangles	Lesson 12: Partition Rectangles into Squares	Lesson 13: Center Day 2 (optional)
Learning Cycle Model	**Making Meaning**	**Making Meaning**	**Investigation**	**Investigation**	**Investigation**	**Create / Produce**	**Additional Learning**
Naugatuck Math Competency	2.OA.1 2.OA.4	2.OA.1 2.OA.4	2.OA.1 2.OA.4	2.NS.2 2.OA.1 2.OA.4	2.G.2 2.OA.4	2.G.2 2.OA4	2.NS.2 2.NS.4, 2.NS.5
Math Practice Standards	MP6	MP6	MP2, MP7	MP2	MP6, MP8	MP7	
Lesson Purpose	The purpose of this lesson is for students to learn that an array is an arrangement of objects into rows with an equal number of	The purpose of this lesson is for students to see that in an array of objects, the objects are arranged into columns with an equal number of	The purpose of this lesson is for students to make connections between the structure of an array and expressions that represent the	The purpose of this lesson is for students to write equations to show the sum of the rows or columns of an array.	The purpose of this lesson is for students to see that a rectangle partitioned into equal-size squares is composed of squares that are	The purpose of this lesson is for students to partition rectangles into equal-size squares.	The purpose of this lesson is for students to skip-count by 2, 5, and 10 and to add and subtract within 1,000.

	objects in each row.	objects in each column.	sum of the number of objects in each row or column in an array.		arranged in rows and columns.		
Vocabulary Focus	Array, rows, odd, even	Organize, column	Estimation, expression	Equation	Analyze, compare, partition	Equal-size	
Lesson Materials/ Resources	Lesson 7 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each group 3 sets of counters with 6, 7, and 9. **Activity 2:** ● Give students access to counters. Cool-down: Count the Counters	Lesson 8 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students counters. **Activity 2:** ● Give students 25 counters. Cool-down: Make Rows and Columns	Lesson 9 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students access to counters. **Activity 2:** ● Give each group a set of Match Arrays to Expressions Card Sort. Cool-down: Match Expressions with Arrays	Lesson 10 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students access to counters. **Activity 2:** ● Give students access to counters. Cool-down: 1 Array, 2 Equations	Lesson 11 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students inch tiles and colored pencils **Activity 2:** ● Give each student at least 2 different colors of colored pencils or crayons and a ruler. Cool-down: Partition Rectangles into Squares	Lesson 12 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give students rulers and inch tiles. **Activity 2:** ● Give students rulers and inch tiles. Cool-down: How Many Squares?	Lesson 13 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Centers - see below

Assessment	Formative Assessment Strategies: observation, questioning, student discourse : Monitoring Sheet See Section B Checkpoint Assessment, Section B Checkpoint Teacher's Guide End of Unit 8 Assessment, End of Unit 8 Assessment Teacher's Guide						
							Section B Practice Problems
Centers Materials	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)	Write Numbers (1–2), Stage 4: Skip Count by 2, 5, and 10 (Addressing) Target Numbers (1-5), Stages 6 and 7 Five in a Row: Addition and Subtraction (1-2), Stages 7 and 8 How Close, Stage 4

Making Meaning

In Lesson 7, students describe the structure of an array. They describe the number of objects in each row of an array and learn that the total number of objects in an array can be determined by finding the sum of the number of objects in each row. Although students may describe many features of the arrays in the lesson, the focus is on describing the rows of the array. They attend to the number of rows, the number in each row, and the total number of objects. In the next lesson, students will be encouraged to describe the columns of an array and will use this term in future lessons.

In Lesson 8, students refine their understanding of an array to include the fact that the objects in a row are equally spaced from each other. When arranged this way, the objects also line up into columns. Students use mathematical language to describe arrays and recognize that rows go side to side and columns go up and down (MP6). They use the structure of the array to find the total number of objects in an array (MP7).

Lesson 7: What is an Array?

- The purpose of this lesson is for students to learn that an array is an arrangement of objects into rows with an equal number of objects in each row.
- Lesson 7 Slides
- Teacher Presentation Materials

Lesson 8: Count Columns and Objects in Columns

- The purpose of this lesson is for students to see that in an array of objects, the objects are arranged into columns with an equal number of objects in each column.
- Lesson 8 Slides
- Teacher Presentation Materials

Investigation:

In Lesson 9, students match expressions with equal addends to arrays and find the total number of objects in an array by finding the value of these sums. The primary focus of the lesson is on relating sums with equal addends to the structure of the rows and columns in an array to build foundations for using arrays to represent multiplication in grade 3. The arrays in the lesson also invite students to decompose the array in ways that make sense to them and it is important to recognize other ways students may use expressions to represent arrays. For example, students might find the total number in the array by adding 6+6. Although this expression does not directly match the structure of the rows and columns, it would be important to invite students to share why they chose this expression and how they may have used the rows or columns. When students compare this expression to the sum of the number of counters in each column (3+3+3+3) or the sum of the counters in each row (4+4+4), it helps build conceptual foundations for multiplication and the properties of operations that will be explored in future grades. For arrays that don't have the same number of rows as columns, there are 2 expressions that can represent the number of objects in the array.

In Lesson 10, students write equations with equal addends to represent an array as the sum of the number of objects in each row or the sum of the number of objects in each column.

In Lesson 11, students partition rectangles into equal-size squares with support. They make the connection between an array of individual objects that don't touch each other and a partitioned rectangle with individual squares that do touch each other. Students begin by arranging tiles to make an array, then push them together to make a rectangle. They recognize that the squares within the rectangle are arranged in rows and columns, and that the total number of squares within the rectangle can be represented by writing equations to show the sum of the number of squares in the rows or the number of squares in the columns (MP7). This work prepares students to learn about area in grade 3.

Lesson 9: A Sum of Equal Addends

- The purpose of this lesson is for students to make connections between the structure of an array and expressions that represent the sum of the number of objects in each row or column in an array.

- Lesson 9 Slides
- Teacher Presentation Materials

Lesson 10: Write Expressions and Equations to Represent Arrays

- The purpose of this lesson is for students to write equations to show the sum of the rows or columns of an array.
- Lesson 10 Slides
- Teacher Presentation Materials

In Lesson 11: Arrays and Rectangles

- The purpose of this lesson is for students to see that a rectangle partitioned into equal-size squares is composed of squares that are arranged in rows and columns.
- Lesson 11 Slides
- Teacher Presentation Materials

Create and Produce:

In Lesson 12, students partition rectangles into equal-size squares with and without guiding marks and represent the total number of squares within the rectangles with equations that show the sum of the number of squares in each row or the number of squares in each column. Monitor for the ways students use what they know about the structure of arrays to plan and partition their rectangles. It is not important that students partition the rectangles into exactly equal-size squares.

In Activity 1, students partition rectangles to create rows and columns of equal-size squares. In the launch, students build an array with tiles and then represent it on a rectangle with tick marks as guidance. They will partition rectangles without tick marks in the next activity.

In Activity 2, students partition rectangles into rows and columns of equal-size squares. They use tiles to help them see how to draw lines to partition the rectangles. Although it is important for students to use what they know about the structure of arrays and composing rectangles from squares to partition the rectangles (MP7), it is not necessary that students' drawings are perfect. As long as it is clear that the student intended for the squares to be equal in size and they can articulate their reasoning. If their squares are significantly different or result in more squares in one column or row than another, offer a ruler and consider having students trace tiles for practice or guidance.

In Lesson 12: Partition Rectangles into Squares

- The purpose of this lesson is for students to partition rectangles into equal-size squares.
- Lesson 12 Slides
- Teacher Presentation Materials

Communicate and Present:	**Reflection:**

Activity 1:

Students will share the rectangles they created.

"How does your equation match the array?"

"Can you write an equation with equal addends that shows the sum of each row or column?"

Activity 2:

Students will share how they partitioned their rectangles.

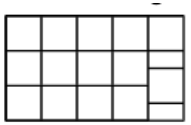
"How did you decide which drawn rectangle to use to represent your tile rectangle?"

"Could you have used the other rectangle?"

"For the next 2 rectangles, work on your own to partition them. Remember that all the squares should be the same size. After you are done, compare with your partner."

Activity 1:

Draw a rectangle and partition to show:



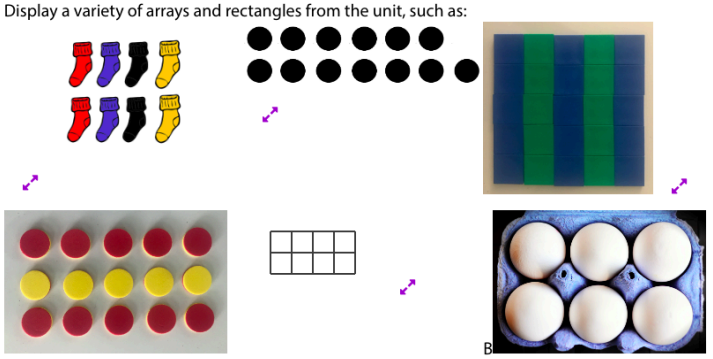
"How is this partition different from what we did in this activity?"

Activity 2:

"What strategies did you use for making your squares all the same size?" (I knew I wanted _____ squares, so I did _____ lines across and down. I started by making my rows, then made the lines for the columns, and then saw how many squares it made.)

"In this unit you learned about even and odd numbers and different types of arrays. Looking at these images, think about 1 thing you could say about each one. What are some things that are the same or different?"

Display a variety of arrays and rectangles from the unit, such as:



Share and record responses.

Additional Learning:

In Lesson 13, students have another chance to practice skip-counting by 2, 5, and 10 and addition and subtraction within 1,000.

In Lesson 13: Center Day 2 (optional) ● The purpose of this lesson is for students to skip-count by 2, 5, and 10 and to add and subtract within 1,000. ● Lesson 13 Slides ● Teacher Presentation Materials	
Notes: Follow the lessons in numerical order.	**Complete File with Resources and Task:**