

Course Title: Mathematics	Full Year	Required
<p>Course Description:</p> <p>The mathematical work for grade 3 is partitioned into 8 units:</p> <ol style="list-style-type: none"> 1. Introducing Multiplication 2. Area and Multiplication 3. Wrapping Up Addition and Subtraction within 1,000 4. Relating Multiplication to Division 5. Fractions as Numbers 6. Measuring Length, Time, Liquid Volume, and Weight 7. Two-dimensional Shapes and Perimeter 8. Putting it All Together 		
<p>Additional Course Information:</p> <p>The big ideas in grade 3 include:</p> <ul style="list-style-type: none"> ● developing understanding of multiplication and division and strategies for multiplication and division within 100 ● developing understanding of fractions, especially unit fractions (fractions with numerator 1) ● developing understanding of the structure of rectangular arrays and of area ● describing and analyzing two-dimensional shapes 	<p>Core Resources:</p> <p>Illustrative Mathematics</p> <p>Instructional Routines and Math Language Routines</p> <p>Glossary - Student-friendly</p> <p>Required Materials</p> <p>IM en Español</p> <p>Developing a Mathematical Community</p>	<p>Are there any attachments <u>at the course level</u> that teachers will need?</p> <p>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.</p> <p>Pacing Guide and Dependency Diagrams K-5</p>

Unit 1: Introducing Multiplication

Duration: 22 - 23 days

Unit Overview - FOCUS:

In this unit, students interpret and represent data on scaled picture graphs and scaled bar graphs. Then, they learn the concept of multiplication.

This is the first of four units that focus on multiplication. In this unit, students explore scaled picture graphs and bar graphs as an entry point for learning about equal-size groups and multiplication.

In grade 2, students analyzed picture graphs in which one picture represented one object and bar graphs that were scaled by single units. Here, students encounter picture graphs in which each picture represents more than one object and bar graphs that were scaled by 2 or 5 units. The idea that one picture can represent multiple objects helps to introduce the idea of equal-size groups.

Students learn that multiplication can mean finding the total number of objects in a groups of b objects each, and can be represented by $a \times b$. They then relate the idea of equal groups and the expression $a \times b$ to the rows and columns of an array. In working with arrays, students begin to notice the commutative property of multiplication.

In all cases, students make sense of the meaning of multiplication expressions before finding their value, and before writing equations that relate two factors and a product.

Later in the unit, students see situations in which the total number of objects is known but either the number of groups or the size of each group is not known. Problems with a missing factor offer students a preview to division.

Throughout the unit, provide access to connecting cubes or counters, as students may choose to use them to represent and solve problems.

Topic Titles:

- Section A: Interpret and Represent Data on Scaled Graphs
 - Interpret scaled picture and bar graphs.
 - Represent data using scaled picture and bar graphs.
 - Solve one- and two-step story problems using addition and subtraction.
- Section B: From Graphs to Multiplication
 - Represent and solve multiplication problems involving equal groups.
 - Understand multiplication in terms of equal groups.
- Section C: Represent Multiplication with Arrays and the Commutative Property
 - Represent and solve multiplication problems involving arrays.

Coherence: How does this unit build on and connect to prior knowledge and learning?

In Grade 2 (Unit 1), students were introduced to picture graphs and bar graphs as a way to represent categorical data. They asked and answered questions about situations described by the data.

In Grade 2 (Unit 8), students developed an understanding of equal groups, building on their experiences with skip-counting and with finding the sums of equal addends. Students began by analyzing even and odd numbers of objects. They learned that any even number can be split into 2 equal groups or into groups of

2, with no objects left over. Students used visual patterns to identify whether numbers of objects are even or odd.

Next, students learned about rectangular arrays. They described arrays using mathematical terms (rows and columns). Students saw 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 expressed by writing equations with equal addends. They also recognized that there are many ways of seeing the equal groups in an array.

Lastly, students transitioned from working with arrays containing discrete objects to equal-size squares within a rectangle. They built rectangular arrays using inch tiles and partitioned rectangles into rows and columns of equal-size squares.

Essential Questions:

1. How can data be represented, analyzed, and interpreted?
2. How can we find the product of two or more numbers?

Enduring Understanding:

Scaled pictures and bar graphs help us to represent, analyze and interpret data. We use the information from scaled pictures and bar graphs to answer questions about the data and to understand the relationship between the information and the graph or picture

Multiplication is one way to find the product of two or more numbers. By building arrays and finding equal groups, we can find out the answer to multiplication problems. Scaled picture graphs and bar graphs can act as an entry point for learning about equal-size groups and multiplication.

What Students Will Know:

- How to represent, interpret, and display data
- How to use a variety of visual models
- generate, analyze, and explain patterns and relationships of numbers
- How to interpret multiplication and division numerical and algebraic expressions
- How to write and evaluate numerical and algebraic expressions
- How to apply the properties of operations to multiply and divide
- Multiply and divide within 100 using

What students will do:

- Interpret picture graphs and bar graphs to generate questions (orally and in writing) about the data.
- Represent data using bar graphs and picture graphs.
- Solve one- and two-step problems using addition and subtraction within 20.
- Interpret scaled picture graphs to generate questions (orally and in writing) about the data.
- Represent data using scaled picture graphs.
- Represent data using scaled bar graphs.
- Choose an appropriate scale for a bar graph that represents a given data set.

Unit Specific Vocabulary:

Academic vocabulary
bar graph (Lesson 1)
key (Lesson 1)
picture graph (lesson 1)
scaled bar graph (lesson 5)
scaled picture graph (Lesson 5)
multiplication (Lesson 9)
equation (Lesson 13)
expression (Lesson 13)
product (Lesson 13 & 15)
array (Lesson 16)

strategies

- Solve one- and two-step “how many more” and “how many fewer” problems within 100, based on the data presented in scaled bar graphs.
- Build an understanding of multiplication as equal groups.
- Represent a situation involving equal groups in a way that makes sense to students.
- Interpret a situation involving equal groups and represent it with a diagram.
- Make sense of tape diagrams that represent multiplication.
- Write multiplication expressions to represent situations involving equal groups and diagrams.
- Represent and solve multiplication problems.
- Relate equations to multiplication situations and diagrams.
- Write equations for multiplication situations and diagrams using a symbol for the unknown number.
- Relate equations to multiplication situations and diagrams using a symbol for the unknown number.
- Write equations for multiplication situations and diagrams using a symbol for the unknown number.
- Solve multiplication problems.
- Build arrays with physical objects and describe them in terms of multiplication.
- Describe an array as an arrangement of objects into rows with an equal number of objects in each row and into columns with an equal number in each column.
- Relate arrays to drawings of equal groups and describe them in terms of multiplication.

	<ul style="list-style-type: none"> ● Represent multiplication situations with arrays and multiplication expressions. ● Represent an array situation with an equation with a symbol for the unknown number. ● Solve multiplication problems involving arrays. ● Describe the commutative property of multiplication using arrays. ● Make choices and assumptions. ● Represent data using scaled bar graphs to communicate results. ● Solve real-world problems involving equal groups. 	
<p>Entry Level Assessment and Connection to Unit:</p> <p>Section A: Pre-Unit Practice Problems</p> <p>Section B: Pre-Unit Practice Problems</p> <p>Section C: Pre-Unit Practice Problems</p>	<p>Unit Materials, Resources and Technology:</p> <ul style="list-style-type: none"> ● Illustrative Mathematics ● Instructional Routines and Math Language Routines ● Glossary - Student-friendly ● Required Materials ● IM en Español ● Pacing Guide and Dependency Diagrams K-5 	
<p>Opportunities for Interdisciplinary Connections: Using bar graphs to analyze data connects to the work students do in science.</p>		
<p>Any links, attachments and resources:</p> <p>Instructional Routines Document</p> <p>Family Support Materials</p>	<p>Planning Ideas:</p> <p>Components of a Typical IM Lesson</p> <p>What To Know About IM When Planning</p> <p>Where to Find the Mathematical Practices in the Units</p> <p>Assessing the Mathematical Practices</p>	

Topic # 1 (Section A)	Topic Name: Section A - Interpret and Represent Data on Scaled Graphs	Duration: Recommended: 8 days
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Topic Description:
 In this section, students interpret and draw picture graphs and bar graphs to represent data, building on their experience with data representation and with skip-counting by 2, 5, and 10 in grade 2.

Students see that each picture in a picture graph and each line or increment in a bar graph can represent more than one object. They work with familiar number scales of 2, 5, and 10.

ways to get home	number of students
bike	12
walk	4
bus or van	6
car	3

ways to get home	number of students
bike	12
walk	4
bus or van	6
car	3

Students use the information in scaled bar graphs to solve one- and two-step “how many more” and “how many fewer” problems within 100. This work allows teachers to formatively assess students’ fluency with addition and subtraction within 100, a grade 2 expectation.

Section Learning Goals

- Interpret scaled picture and bar graphs.
- Represent data using scaled pictures and bar graphs.
- Solve one- and two-step story problems using addition and subtraction.

<p>Competencies Addressed:</p> <p>Measurement and Data Investigations</p> <p>3.MD.3 - I can represent, interpret and display data using a variety of visual models.</p>	<p>Essential Question and Enduring Understanding Addressed in this Topic:</p> <p>Essential Question How can data be represented, analyzed, and</p>
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	<p>interpreted?</p> <p>Scaled pictures and bar graphs help us to represent, analyze and interpret data. We use the information from scaled pictures and bar graphs to answer questions about the data and to understand the relationship between the information and the graph or picture</p>
<p>In this Topic, students will know:</p> <ul style="list-style-type: none"> ● represent, interpret, and display data ● use a variety of visual models 	<p>Topic Vocabulary:</p> <p>Academic vocabulary bar graph (Lesson 1) key (Lesson 1) picture graph (lesson 1) scaled bar graph (lesson 5) scaled picture graph (Lesson 5)</p>
<p>In this Topic, students will be able to:</p> <ul style="list-style-type: none"> ● Interpret picture graphs and bar graphs to generate questions (orally and in writing) about the data. ● Represent data using bar graphs and picture graphs. ● Solve one- and two-step problems using addition and subtraction within 20. ● Interpret scaled picture graphs to generate questions (orally and in writing) about the data. ● Represent data using scaled picture graphs. ● Represent data using scaled bar graphs. ● Choose an appropriate scale for a bar graph that represents a given data set. ● Solve one- and two-step “how many more” and “how many fewer” problems within 100, based on the data presented in scaled bar graphs. 	<p>Plan for Student Reflection:</p> <p>Student Journal Prompts and Reflection Practices</p> <hr/> <p>Plan for Teacher Reflection:</p> <ul style="list-style-type: none"> ● Reviewing formative assessments ● Developing scaffolds ● Collaborative scoring ● PLCs ● Planning for small groups ● Teacher Reflection Prompts in Teacher Guides

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.

<p>Task Title: Topic 1 - Interpret and Represent Data on Scaled Graphs</p>	<p>Grade Level and Unit: Grade 3, Unit 1</p>
<p>Description of Task: In this activity, the categorical data is presented in a table. Students choose a scale and make a scaled bar graph of the categorical data. Students have prior experience with scales of 2, 5, and 10, and are not directed to a specific scale in this activity. However, due to the larger numbers, it is likely that students choose a scale of 5 or 10. If students struggle to get started, you could suggest a scale of 5 or 10. In the whole-class discussion, students share how their choice of scale affected their graph.</p>	<p>Purpose of Task: The purpose of this activity is for students to represent data in a scaled bar graph.</p>
<p>Background of Students/Learning Progression: In grade 2, students learned how to draw and label single-unit scale bar graphs and picture graphs and used categorical data presented in graphs to solve simple problems.</p>	<p>Ensure all competencies are addressed in the task:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Yes, all competencies are addressed <input type="checkbox"/> No - Task needs modification
<p>Getting Started:</p> <p>Lesson 1: Make Sense of Data: Warm-Up ONLY: Notice and Wonder: Graphs</p> <ul style="list-style-type: none"> ● The purpose of this lesson is to elicit students’ prior understandings of single-unit scale picture graphs and bar graphs in preparation for upcoming work with scaled bar graphs. ● Teacher presentation materials ● Slides <p>The purpose of this warm-up is to elicit students’ prior understandings about categorical data representations, which will be useful when students engage with single-unit scale picture and bar graphs in later activities. While students may notice and wonder many things about this graph, it is important to pay attention to the ways in which students make sense of a picture graph, the questions they have about the categorical data, and the contexts that make sense for the categorical data shown.</p> <p>For all warm-up routines, consider establishing a small, discreet hand signal that students can display to indicate they have an answer they can support with reasoning. This signal could be a thumbs-up, a certain number of fingers that tells the number of responses they have, or another subtle signal. This is a quick</p>	

way to see if students have had enough time to think about the problem. It also keeps students from being distracted or rushed by hands being raised around the class. Since this is the first warm-up of the year, we allocated 15 minutes, instead of 10, to establish the structure of a routine.

Section A

IM Lesson	L1: Make Sense of Data	L2: Represent Data and Solve Problems	L3: Scaled Picture Graphs	L4: Create Scaled Picture Graphs	L5: Represent Data in Scaled Bar Graphs	L6: Choose a Scale	L7: Answer Questions about Scaled Bar Graphs	L8: More Questions about Scaled Bar Graphs
Learning Cycle Model	Getting Started & Making Meaning	Making Meaning	Making Meaning	Making Meaning	Making Meaning	Investigate & Create and Produce	*Additional Learning	*Additional Learning
Naugatuck Math Competency	3.G.3	3.G.3	3.G.3	3.G.3	3.G.3	3.G.3	3.G.3	3.G.3
Math Practice Standards	MP 2	MP 6				MP 3		MP 1
Lesson Purpose	The purpose of this lesson is to elicit students' prior understandings of single-unit scale picture graphs and bar graphs in preparation for upcoming work with scaled bar graphs.	The purpose of this lesson is for students to solve one- and two-step problems about data represented in bar graphs.	The purpose of this lesson is for students to read and answer questions about scaled picture graphs.	The purpose of this lesson is for students to create a scaled picture graph to represent categorical data.	The purpose of this lesson is for students to create a scaled bar graph.	The purpose of this lesson is for students to consider the advantages and disadvantages of various bar graph scales.	The purpose of this lesson is for students to solve one-step "how many more" and "how many fewer" problems based on data presented in a scaled bar graph.	The purpose of this lesson is for students to solve one- and two-step "how many more" and "how many fewer" problems, based on data presented in a scaled bar graph.
Teacher Facing Learning Goal	Interpret picture graphs and bar graphs to generate questions (orally and in writing) about the data.	<ul style="list-style-type: none"> Represent data using bar graphs and picture graphs. Solve one- and two-step 	Interpret scaled picture graphs to generate questions (orally and in writing) about the data.	Represent data using scaled picture graphs.	Represent data using scaled bar graphs.	Choose an appropriate scale for a bar graph that represents a given data set.	Solve one-step "how many more" and "how many fewer" problems within 100, based on the data	Solve one- and two-step "how many more" and "how many fewer" problems within 100, based on

		problems using addition and subtraction within 20.					presented in scaled bar graphs.	the data presented in scaled bar graphs.
Vocabulary Focus	bar graph, key, picture graph				Scaled bar graph, scaled picture graph			
Lesson Materials/Resources	Lesson 1 Slides Teacher Materials Student Pages Cooldown: Describe and Ask	Lesson 2 Slides Teacher Materials Student Pages Activity 1: Create a visual display with a blank bar graph that will be large enough to fit a column of sticky notes in each category. Materials to Gather Sticky notes Cooldown: Questions About a Bar Graph	Lesson 3 Slides Teacher Materials Student Pages Cooldown: Birds in the Park	Lesson 4 Slides Teacher Materials Student Pages Cooldown: Complete the Picture Graph	Lesson 5 Slides Teacher Materials Student Pages Activity 2: Each student needs the picture graph they created in the previous lesson. Materials to Gather Materials from a previous lesson Cooldown: Complete a Scaled Bar Graph	Lesson 6 Slides Teacher Materials Student Pages Cooldown: Reflection on Bar Graphs and Scale	Lesson 7 Slides Teacher Materials Student Pages Activity 1: Students will need their Favorite Time of the Year graphs from the previous lesson. Materials to Gather Materials from a previous lesson Cooldown: Favorite Sports	Lesson 8 Slides Teacher Materials Student Pages Cooldown: Reading Time
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	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 2: Picture or Bar Graphs (Supporting) • Capture Squares (1–3), Stage 3: Add within 20 (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 2: Picture or Bar Graphs (Supporting) • Capture Squares (1–3), Stage 3: Add within 20 (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 2: Picture or Bar Graphs (Supporting) • Capture Squares (1–3), Stage 3: Add within 20 (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 2: Picture or Bar Graphs (Supporting) • Capture Squares (1–3), Stage 3: Add within 20 (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 3: Scaled Graphs (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 3: Scaled Graphs (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 3: Scaled Graphs (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting) 	<ul style="list-style-type: none"> • Sort and Display (1–3), Stage 3: Scaled Graphs (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)

Making Meaning:

[Lesson 1: Make Sense of Data: Activities 1 & 2 and the Lesson Synthesis](#)

- The purpose of this lesson is to elicit students' prior understandings of single-unit scale picture graphs and bar graphs in preparation for upcoming work with scaled bar graphs.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 2: Represent Data and Solve Problems](#)

- The purpose of this lesson is for students to solve one- and two-step problems about data represented in bar graphs.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 3: Scaled Picture Graphs](#)

- The purpose of this lesson is for students to read and answer questions about scaled picture graphs.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 4 Create Scaled Picture Graphs](#)

- The purpose of this lesson is for students to create a scaled picture graph to represent categorical data.

- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 5: Represent Data in Scaled Bar Graphs](#)

- The purpose of this lesson is for students to create a scaled bar graph.
- [Teacher presentation materials](#)
- [Slides](#)

Checkpoints: These documents for the above lessons provide teachers with a template for collecting data and information on student understanding of skills and concepts.

[Checkpoint A: Assessment](#)

[Checkpoint A: Teacher Guide](#)

Investigate:

[Lesson 6: Choose a Scale: Warm-Up and Activity 1 ONLY](#)

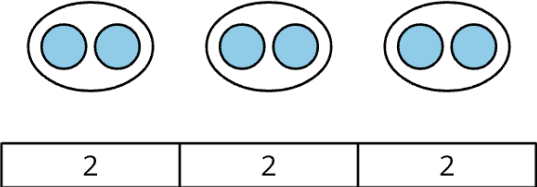
- The purpose of this warm-up is to elicit the idea that adjusting the scale changes the size of the bars in a bar graph and can make it easier or more difficult to interpret. While students may notice and wonder many things about these graphs, the different scales in the bar graphs are the most important discussion points.
- The purpose of activity 1 is for students to analyze a scale and create a scaled bar graph. Students consider a large collection of pattern blocks and decide which scale will work best to represent the categorical data. They consider three students' ideas, choose a scale of 2, 5, or 10, and create a scaled bar graph to represent the categorical data. Students must justify why they agree that a particular scale would be best. During the activity and whole-class discussion, students share their thinking and have opportunities to listen to and critique the reasoning of their peers (MP3). Providing a variety of scales for students to choose from allows for discussion about the benefits of using larger scales for larger groups of objects and the effect of a scale on how easy it may be to read and interpret data in a graph.
- [Teacher presentation materials](#)
- [Slides](#)

Create and Produce:

[Lesson 6: Choose a Scale: Activity 2: Represent More Data in a Scaled Bar Graph](#)

- The purpose of this activity is for students to represent data in a scaled bar graph. In this activity, the categorical data is presented in a table. Students choose a scale and make a scaled bar graph of the categorical data. Students have prior experience with scales of 2, 5, and 10, and are not directed to a specific scale in this activity. However, due to the larger numbers, it is likely that students choose a scale of 5 or 10. If students struggle to get started, you could suggest a scale of 5 or 10.
- [Teacher presentation materials](#)
- [Slides](#)

<p>Communicate and Present: Lesson 6, Activity 2</p> <p>In the whole-class discussion, students share how their choice of scale affected their graph. “How did the scale you chose for your graph affect how your graph looked in the end?”</p>	<p>Reflection: Lesson 6, Activity 2: Synthesis</p> <p>Display the bar graphs from today’s lesson. “What did you learn today that will help you make decisions about how to create scaled graphs in the future?” (You can pick scales that match the data. If there's mostly larger numbers, you might pick a scale like 5 or 10. The scale can help make the graph easier to read.)</p>
<p>Additional Learning:</p> <p>Lesson 7: Answer Questions about Scaled Bar Graphs</p> <ul style="list-style-type: none"> • The purpose of this lesson is for students to solve one-step “how many more” and “how many fewer” problems based on data presented in a scaled bar graph. • Teacher presentation materials • Slides <p>Lesson 8: More Questions about Scaled Bar Graphs</p> <ul style="list-style-type: none"> • The purpose of this lesson is for students to solve one- and two-step “how many more” and “how many fewer” problems, based on data presented in a scaled bar graph. • Teacher presentation materials • Slides 	
<p>Notes: Teach all lessons in numerical order.</p>	<p>Complete File with Resources and Task:</p> <p>Task-Based Learning Plan Format for Topic 1</p>

Topic # 2 (Section B)	Topic Name: Section B - From Graphs to Multiplication	Duration: Recommended: 7 days
<p>Topic Description: In this section, students make sense of multiplication in terms of equal groups of objects. They use discrete drawings and tape diagrams that show equal groups to represent multiplication, and then relate these representations to expressions such as 3×2, interpreting them to mean “3 groups of 2.”</p> <div style="text-align: center;">  </div> <p>Note that expressions of the form $a \times b$ could be interpreted to mean a groups of b or b groups of a. We tend to say “___ groups of ___” when referring to equal groups, however, in these materials we write multiplication expressions in that order:</p> <p style="text-align: center;"><i>number of groups \times size of each group</i></p> <p>It is not necessary for students to use this convention as long as they can explain what each number in their expression represents.</p> <p>Later, students write equations to represent multiplication situations and find unknown products or factors. In reasoning about the latter, they begin to make sense of the relationship between multiplication and division, without formally using the language of division.</p> <p>Section Learning Goals</p> <ul style="list-style-type: none"> • Represent and solve multiplication problems involving equal groups. • Understand multiplication in terms of equal groups. 		
<p>Competencies Addressed:</p> <p>Operations and Algebraic Thinking</p> <p>3.OA.1 - I can analyze and explain patterns</p> <p>3.OA.2 - I can represent and interpret multiplication and division expressions.</p> <p>3.OA.3 - I can apply the properties of operations to multiply and divide.</p>		<p>Essential Question and Enduring Understanding Addressed in this Topic:</p> <p>How can we find the product of two or more numbers?</p> <p>Multiplication is one way to find the product of</p>

<p>Measurement and Data Investigations 3.MD.3 - I can represent, interpret and display data using a variety of visual models.</p>	<p>two or more numbers. By building arrays and finding equal groups, we can find out the answer to multiplication problems. Scaled picture graphs and bar graphs can act as an entry point for learning about equal-size groups and multiplication.</p>
<p>In this Topic, students will know:</p> <ul style="list-style-type: none"> ● How to generate, analyze, and explain patterns and relationships of numbers ● How to interpret multiplication and division numerical and algebraic expressions ● How to write and evaluate numerical and algebraic expressions ● How to apply the properties of operations to multiply and divide ● How to represent, interpret, and display data ● How to use a variety of visual models 	<p>Topic Vocabulary:</p> <p>Academic vocabulary multiplication (Lesson 9) equation (Lesson 13) expression (Lesson 13) product (Lesson 13 & 15)</p>
<p>In this Topic, students will be able to:</p> <ul style="list-style-type: none"> ● Build an understanding of multiplication as equal groups. ● Represent a situation involving equal groups in a way that makes sense to students. ● Interpret a situation involving equal groups and represent it with a diagram. ● Make sense of tape diagrams that represent multiplication. ● Write multiplication expressions to represent situations involving equal groups and diagrams. ● Represent and solve multiplication problems. ● Relate equations to multiplication situations and diagrams. ● Write equations for multiplication situations and diagrams using a symbol for the unknown number. ● Relate equations to multiplication situations and diagrams using a symbol for the unknown number. ● Write equations for multiplication situations and diagrams using a symbol for the unknown number. ● Solve multiplication problems. 	<p>Plan for Student Reflection:</p> <p>Student Journal Prompts and Reflection Practices</p> <hr/> <p>Plan for Teacher Reflection:</p> <ul style="list-style-type: none"> ● Reviewing formative assessments ● Developing scaffolds ● Collaborative scoring ● PLCs ● Planning for small groups ● Teacher Reflection Prompts in Teacher Guides

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 - From Graphs to Multiplication	Grade Level and Unit: Grade 3, Unit 1
Description of Task: Students solve problems about equal groups that they may see when they are making or eating a meal. They will write an equation with a symbol for the unknown to represent the situation and find the number that makes the equation true.	Purpose of Task: The purpose of this task is for students to represent a situation with a multiplication equation including a symbol for the unknown, and find the number that makes the equation true.
Background of Students/Learning Progression: Students have worked with addition and subtraction equations with a symbol to represent the unknown number in grades 1 and 2. Students build on that work and the work with multiplication equations in the previous lesson as they encounter multiplication equations that have a symbol for the unknown number for the first time.	Ensure all competencies are addressed in the task: <input type="checkbox"/> Yes, all competencies are addressed <input type="checkbox"/> No - Task needs modification
Getting Started: Lesson 9: Multiplication as Equal Groups : Warm-Up and Activity 1 ONLY <ul style="list-style-type: none"> • The purpose of this lesson is for students to use scaled picture graphs as an introduction to multiplication as equal groups. • Teacher presentation materials • Slides <p>The purpose of Activity 1: From Scaled Graphs to Equal Groups, is for students to connect scaled picture graphs to situations involving equal groups. The scale of the picture graph will be used to help students think about a category of the graph as a situation involving equal groups.</p> <p>The launch of the activity is an opportunity for students to share their experiences and ask questions about the graph to ensure each student has access to the context. If it is helpful, display a few images of different types of signs students may see in their community.</p>	

Section B

IM Lesson	L9: Multiplication as Equal Groups	L10: Drawings, Situations, and Diagrams, Oh My!	L11: Multiplication Expressions	L12: Represent and Solve Multiplication Problems	L13: Multiplication Equations	L14: Write and Solve Equations with Unknowns	L15: More Factors, More Problems
Learning Cycle Model	Getting Started & Making Meaning	Making Meaning	Making Meaning	Making Meaning	Making Meaning	Investigate	Create and Produce
Naugatuck Math Competency	3.OA.2	3.OA.2	3.OA.2	3.OA.2, 3.OA.5	3.OA.2, 3.OA.5	3.OA.1, 3.OA.2, 3.OA.3, 3.OA.5	3.OA.1, 3.OA.3, 3.OA.5
Math Practice Standards		MP 2, 6, 7	MP 2, 7, 8		MP 2	MP 2, 6, 7, 8	MP 8
Lesson Purpose	The purpose of this lesson is for students to use scaled picture graphs as an introduction to multiplication as equal groups.	The purpose of this lesson is for students to connect situations involving equal groups to tape diagrams.	The purpose of this lesson is for students to use multiplication expressions to represent equal groups.	The purpose of this lesson is for students to represent and solve multiplication problems.	The purpose of this lesson is for students to relate multiplication equations to situations and diagrams and write equations.	The purpose of this lesson is for students to relate equations to and write equations for multiplication situations and diagrams using a symbol for the unknown number.	The purpose of this lesson is for students to solve multiplication problems.
Teacher Facing Learning Goal	<ul style="list-style-type: none"> Build an understanding of multiplication as equal groups. Represent a situation involving equal groups in a way that makes sense to students. 	<ul style="list-style-type: none"> Interpret a situation involving equal groups and represent it with a diagram. Make sense of tape diagrams that represent multiplication. 	Write multiplication expressions to represent situations involving equal groups and diagrams.	Represent and solve multiplication problems.	<ul style="list-style-type: none"> Relate equations to multiplication situations and diagrams. Write equations for multiplication situations and diagrams using a symbol for the unknown number. 	<ul style="list-style-type: none"> Relate equations to multiplication situations and diagrams using a symbol for the unknown number. Write equations for multiplication situations and diagrams using a 	Solve multiplication problems.

						symbol for the unknown number.	
Vocabulary Focus	multiplication				equation, expression, product		product
Lesson Materials/ Resources	Lesson 9 Slides Teacher Materials Student Pages Materials to Gather Connecting cubes or counters Activity 1: Each student needs 20 connecting cubes or counters. Activity 2: Each student needs 20 connecting cubes or counters. Cooldown: Represent Equal Groups	Lesson 10 Slides Teacher Materials Student Pages Materials to Copy Card Sort Equal Groups Activity 2: Create a set of cards from the blackline master for each group of 2. Cooldown: Boxes of Shirts	Lesson 11 Slides Teacher Materials Student Pages Materials to Gather Materials from a previous lesson Activity 1: <ul style="list-style-type: none"> Each group of 2 needs 1 card from the card sort in the previous lesson. Post these expressions around the room: <ul style="list-style-type: none"> 3 x 5 4 x 3 3 x 2 2 x 10 3 x 10 Cooldown: Write and Expression	Lesson 12 Slides Teacher Materials Student Pages Cooldown: Ducks in a Pond	Lesson 13 Slides Teacher Materials Student Pages Cooldown: Match the Expression	Lesson 14 Slides Teacher Materials Student Pages Materials to Copy Card Sort Unknown Numbers Activity 1: Create a set of cards from the blackline master for each group of 2. Cooldown: Unknown and a number	Lesson 15 Slides Teacher Materials Student Pages Cooldown: Solve the Problem
Assessment	Formative Assessment Strategies: observation, questioning, student discourse: Monitoring Sheet See Section B Checkpoint Assessment , Section B Checkpoint Teacher's Guide						
							Section B Practice Problems

Centers Materials	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting) • Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting) • Five in a Row: Addition and Subtraction (1–2), Stage 7: Add within 1,000 without Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting) • Five in a Row: Addition and Subtraction (1–2), Stage 7: Add within 1,000 without Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 7: Add within 1,000 without Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 7: Add within 1,000 without Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Addition and Subtraction (1–2), Stage 8: Add within 1,000 with Composing (Supporting)
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Making Meaning:

[Lesson 9: Multiplication as Equal Groups](#): Activity 2 ONLY

- The purpose of this lesson is for students to use scaled picture graphs as an introduction to multiplication as equal groups.
- The purpose of this activity is for students to represent situations involving equal groups in a way that makes sense to them.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 10: Drawings, Situations, and Diagrams, Oh My!](#)

- The purpose of this lesson is for students to connect situations involving equal groups to tape diagrams.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 11: Multiplication Expressions](#)

- The purpose of this lesson is for students to use multiplication expressions to represent equal groups.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 12: Represent and Solve Multiplication Problems](#)

- The purpose of this lesson is for students to represent and solve multiplication problems.
- [Teacher presentation materials](#)
- [Slides](#)

[Lesson 13: Multiplication Equations](#)

- The purpose of this lesson is for students to relate multiplication equations to situations and diagrams and write equations.
- [Teacher presentation materials](#)
- [Slides](#)

Checkpoints: These documents for the above lessons provide teachers with a template for collecting data and information on student understanding of skills and concepts.

[Checkpoint B: Assessment](#)

[Checkpoint B: Teacher Guide](#)

Investigate:

[Lesson 14: Write and Solve Equations with Unknowns](#)

- The purpose of this lesson is for students to relate equations to and write equations for multiplication situations and diagrams using a symbol for the unknown number.
- [Teacher presentation materials](#)
- [Slides](#)

Create and Produce:

[Lesson 15: More Factors, More Problems](#)

- The purpose of this lesson is for students to solve multiplication problems.
- [Teacher presentation materials](#)
- [Slides](#)

In activity 2, students solve problems about equal groups that they may see when they are making or eating a meal. They will write an equation with a symbol for the unknown to represent the situation and find the number that makes the equation true. Next, students will work in groups of 4 to make a poster for one of the problems.

Communicate and Present:

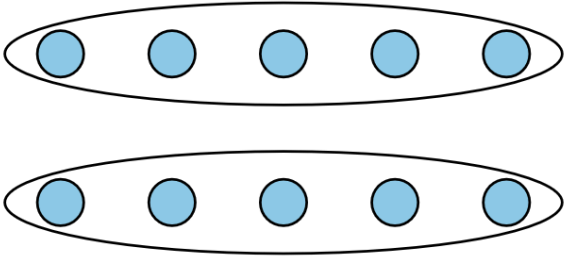
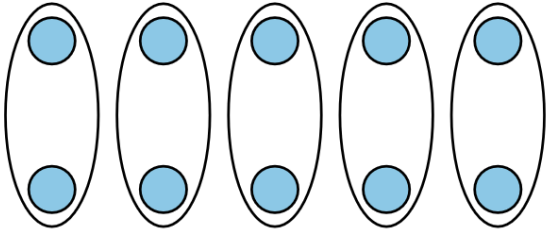
After each group is done completing their poster, the students can do a gallery walk to look for things that are the same or different in the posters.

Reflection: Lesson 15, Activity 1: Synthesis

Display samples of student work for each problem next to each other, including a sample of a drawing of equal groups and a sample of a tape diagram.

- “Where do we see the parts of the problem in the drawing and the diagram?” (The number of objects in each group are the dots in the drawing, but the number is written in

	<p>each part of the diagram.)</p> <ul style="list-style-type: none"> ● “How did you use the factors in each equation to find the product?” (The factors told me how many groups there were and how many were in each group.) ● “How are drawings and diagrams useful for finding the solution to the problem?” (You can count the dots in the drawing. The diagram can be used to count by 10.)
<p>Notes: Complete all lessons in numerical order.</p>	<p>Complete File with Resources and Task:</p> <p>Task-Based Learning Plan Format for Topic 2</p>

Topic # 3 (Section C)	Topic Name: Section C - Represent Multiplication with Arrays and the Commutative Property	Duration: Recommended: 6 days
<p>Topic Description: In this section, students relate the idea of equal groups to the structure of an array, a representation introduced in grade 2.</p> <p>Students see that the rows and columns of an array represent equal groups. The number of rows (or columns), the number of items in each row (or column), and the total number of objects in an array can therefore be represented with a multiplication equation. The equations may involve an unknown value, be it one of the factors or the product. As students reason about arrays, they also notice that multiplication is commutative.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p>Section Learning Goals</p> <ul style="list-style-type: none"> • Represent and solve multiplication problems involving arrays. 		
<p>Competencies Addressed:</p> <p>Operations and Algebraic Thinking</p> <p>3.OA.1 - I can analyze and explain patterns</p> <p>3.OA.2 - I can represent and interpret multiplication and division expressions.</p> <p>3.OA.3 - I can apply the properties of operations to multiply and divide.</p> <p>3.OA.4 - I can multiply and divide within 100.</p>		<p>Essential Question and Enduring Understanding Addressed in this Topic:</p> <p>Essential Question How can we find the product of two or more numbers?</p> <p>Enduring Understanding Multiplication is one way to find the product of two or more numbers. By building arrays and finding equal groups, we can find out the answer to multiplication problems. Scaled</p>

	<p>picture graphs and bar graphs can act as an entry point for learning about equal-size groups and multiplication.</p>
<p>In this Topic, students will know:</p> <ul style="list-style-type: none"> ● How to generate, analyze, and explain patterns and relationships of numbers ● How to interpret multiplication and division numerical and algebraic expressions ● How to write and evaluate numerical and algebraic expressions ● How to apply the properties of operations to multiply and divide ● How to multiply and divide within 100 using strategies 	<p>Topic Vocabulary:</p> <p>Academic vocabulary array (Lesson 16)</p>
<p>In this Topic, students will be able to:</p> <ul style="list-style-type: none"> ● Build arrays with physical objects and describe them in terms of multiplication. ● Describe an array as an arrangement of objects into rows with an equal number of objects in each row and into columns with an equal number in each column. ● Relate arrays to drawings of equal groups and describe them in terms of multiplication. ● Represent multiplication situations with arrays and multiplication expressions. ● Represent an array situation with an equation with a symbol for the unknown number. ● Solve multiplication problems involving arrays. ● Describe the commutative property of multiplication using arrays. ● Make choices and assumptions. ● Represent data using scaled bar graphs to communicate results. ● Solve real-world problems involving equal groups. 	<p>Plan for Student Reflection:</p> <p>Student Journal Prompts and Reflection Practices</p> <hr/> <p>Plan for Teacher Reflection:</p> <ul style="list-style-type: none"> ● Reviewing formative assessments ● Developing scaffolds ● Collaborative scoring ● PLCs ● Planning for small groups ● Teacher Reflection Prompts in Teacher Guides

Topic 3 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 3 - Represent Multiplication with Arrays and the Commutative Property	Grade Level and Unit: Grade 3, Unit 1
Description of Task: Students make a scaled bar graph that shows how many people can play each game with their room arrangement. Students can work with their group but each student will make their own graph and can choose different scales.	Purpose of Task: The purpose of this task is for students to represent their game night plans on a scaled bar graph.
Background of Students/Learning Progression: In previous lessons, students created scaled bar graphs and solved problems involving equal groups. In this lesson, they use these ideas as they make a seating arrangement.	Ensure all competencies are addressed in the task: <input type="checkbox"/> Yes, all competencies are addressed <input type="checkbox"/> No - Task needs modification
Getting Started: Lesson 16: Arrange Objects Into Arrays: Warm-Up ONLY: Notice and Wonder - Eggs <ul style="list-style-type: none">• The purpose of this lesson is for students to describe arrays and arrange objects into arrays.• Teacher presentation materials• Slides <p>The purpose of this warm-up is to elicit ideas students have about objects arranged in an array, which will be useful when students arrange equal groups into arrays in a later activity. While students may notice and wonder many things about this image, ideas around arrangement and equal groups are the important discussion points. When students notice the arrangement of the eggs they look for and make use of structure (MP7).</p> <p>Activity Synthesis:</p> <ul style="list-style-type: none">• “How does having the eggs in a carton help you see equal groups?” (I can see how they could be split into equal groups. I can see 6 eggs in each row. I can see 6 groups of 2.)• “The eggs are arranged in an array. An array is an arrangement of objects in rows and columns. Each column must contain the same number of objects as the other columns, and each row must have the same number of objects as the other rows.”	

Section C

IM Lesson	L16: Arrange Objects Into Arrays	L17: Match and Draw Arrays	L18: Represent Arrays with Expressions	L19: Solve Problems Involving Arrays	L20: The Commutative Property	L21: Game Night Seating Plan
Learning Cycle Model	Getting Started & Making Meaning	Making Meaning	Making Meaning	Making Meaning	Making Meaning	Investigate & Create and Produce
Naugatuck Math Competency	3.OA.2	3.OA.2	3.OA.2	3.OA.1, 3.OA.2, 3.OA.4, 3.OA.5	3.OA.3	3.MD.3, 3.OA.5
Math Practice Standards	MP 3, 7	MP 3, 6		MP 8	MP 3, 6, 7	
Lesson Purpose	The purpose of this lesson is for students to describe arrays and arrange objects into arrays.	The purpose of this lesson is for students to relate arrays to drawings of equal groups and describe arrays in terms of multiplication.	The purpose of this lesson is for students to represent multiplication situations with arrays and multiplication expressions.	The purpose of this lesson is for students to represent an array situation using an equation with a symbol for the unknown number and solve.	The purpose of this lesson is for students to describe the commutative property of multiplication using arrays.	The purpose of this lesson is for students to use their understanding of equal groups to solve a design problem.
Teacher Facing Learning Goals	Build arrays with physical objects and describe them in terms of multiplication. Describe an array as an arrangement of objects into rows with an equal number of objects in each row and into columns with an equal number in each column.	Relate arrays to drawings of equal groups and describe them in terms of multiplication.	Represent multiplication situations with arrays and multiplication expressions.	<ul style="list-style-type: none"> Represent an array situation with an equation with a symbol for the unknown number. Solve multiplication problems involving arrays. 	Describe the commutative property of multiplication using arrays.	<ul style="list-style-type: none"> Make choices and assumptions. Represent data using scaled bar graphs to communicate results. Solve real-world problems involving equal groups.
Vocabulary Focus	array					
Lesson Materials/Resources	Lesson 16 Slides Teacher Materials Student Pages	Lesson 17 Slides Teacher Materials Student Pages	Lesson 18 Slides Teacher Materials Student Pages	Lesson 19 Slides Teacher Materials Student Pages	Lesson 20 Slides Teacher Materials Student Pages	Lesson 21 Slides Teacher Materials Student Pages

	<p>Activity 2: Each group of 2 needs 60 cubes.</p> <p>Materials to Gather Connecting cubes</p> <p>Cooldown: Array Arrangement</p>	<p>Activity 1: Create a set of cards from the blackline master for each group of 2 or 4 students.</p> <p>Materials to Gather Connecting cubes or counters</p> <p>Materials to Copy Card sort arrays</p> <p>Cooldown: Draw and Describe</p>	<p>Activity 1: Each group of 2 will need 20 connecting cubes or counters.</p> <p>Materials to Gather Connecting cubes or counters</p> <p>Cooldown: Array Situation</p>	<p>Cooldown: Clare's Cards</p>	<p>Cooldown: Multiplication Reflection</p>	<p>Activity 2: Each student needs a sheet of grid paper.</p> <p>Materials to Gather</p> <ul style="list-style-type: none"> • Connecting cubes or counters • Inch tiles • Tools for creating a visual display <p>Materials to Copy Centimeter Grid Paper - Standard</p>
Assessment	<p>Formative Assessment Strategies: observation, questioning, student discourse: Monitoring Sheet See Section C Checkpoint Assessment, Section C Checkpoint Teacher's Guide Unit 1 Assessment, End of Unit 1 Assessment Teacher Guide</p>					
						Section C Practice Problems
Centers Materials	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing) 	<ul style="list-style-type: none"> • Capture Squares (1–3), Stage 5: Multiply with 2, 5, and 10 (Addressing) • Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Addressing)

Making Meaning:

[Lesson 16: Arrange Objects Into Arrays: Activity 1, 2, and Lesson Synthesis](#)

- The purpose of this lesson is for students to describe arrays and arrange objects into arrays.
- [Teacher presentation materials](#)

- [Slides](#)

Lesson 17: Match and Draw Arrays

- The purpose of this lesson is for students to relate arrays to drawings of equal groups and describe arrays in terms of multiplication.
- [Teacher presentation materials](#)
- [Slides](#)

Lesson 18: Represent Arrays with Expressions

- The purpose of this lesson is for students to represent multiplication situations with arrays and multiplication expressions.
- [Teacher presentation materials](#)
- [Slides](#)

Lesson 19: Solve Problems Involving Arrays

- The purpose of this lesson is for students to represent an array situation using an equation with a symbol for the unknown number and solve.
- [Teacher presentation materials](#)
- [Slides](#)

Lesson 20: The Commutative Property

- The purpose of this lesson is for students to describe the commutative property of multiplication using arrays.
- [Teacher presentation materials](#)
- [Slides](#)

Checkpoints: These documents for the above lessons provide teachers with a template for collecting data and information on student understanding of skills and concepts.

[Checkpoint C: Assessment](#)

[Checkpoint C: Teacher Guide](#)

Investigate:

Lesson 21: Game Night Seating Plan: Warm-Up and Activity 1 ONLY

- The purpose of this lesson is for students to use their understanding of equal groups to solve a design problem.
- [Teacher presentation materials](#)
- [Slides](#)

Create and Produce:

Lesson 21: Game Night Seating Plan: Activity 2

- The purpose of this lesson is for students to use their understanding of equal groups to solve a design problem.
- [Teacher presentation materials](#)
- [Slides](#)

The purpose of this activity is for students to represent their game night plans by making a scaled bar graph. Students can work with groups but each student will make their own graph. In the synthesis, students consider how their graph communicates information about their game night plan.

Communicate and Present: Activity 2: Synthesis

Display graphs that used different scales.

- “How did choosing different scales affect the graphs?” (Some of the graphs have shorter bars because each jump on the graph is worth more. Some of the graphs are easier to read than others.)
- “What information does this bar graph give us about the situation?” (The number of people at each game, the types of games. We can find the total number of people if we add them all up.)

Reflection: Lesson 21: Synthesis

“Today, we made seating arrangements based on some given information and other things we decided.”

“Which decisions affected your arrangement? Were there any decisions that did not affect your arrangement?” (We decided that there would be 2 of games A, B, and C played at the same time. This affected the number of people who could play game D.)

Notes: Complete all lessons in numerical order.

Complete File with Resources and Task:

Task-Based Learning Plan Format for Topic 1