2nd Grade Objective Analysis

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Number & Operations (N)	
2.N.1 Compare and represent whole numbers up to 1,000 with an emphasis on place value and equality.	**2.N.1.1** Read, write, discuss, and represent whole numbers up to 1,000. Representations may include numerals, words, pictures, tally marks, number lines and manipulatives.
	2.N.1.2 Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 100.
	2.N.1.3 Use place value to describe whole numbers between 10 and 1,000 in terms of hundreds, tens and ones. Know that 100 is 10 tens, and 1,000 is 10 hundreds.
	2.N.1.4 Find 10 more or 10 less than a given three-digit number. Find 100 more or 100 less than a given three-digit number.
	2.N.1.5 Recognize when to round numbers to the nearest 10 and 100.
	2.N.1.6 Use place value to compare and order whole numbers up to 1,000 using comparative language, numbers, and symbols (e.g., 425 > 276, 73 < 107, page 351 comes after page 350, 753 is between 700 and 800).
2.N.2 Add and subtract one- and two- digit numbers in real-world and mathematical problems.	**2.N.2.1** Use the relationship between addition and subtraction to generate basic facts up to 20.
	2.N.2.2 Demonstrate fluency with basic addition facts and related subtraction facts up to 20..
	2.N.2.3 Estimate sums and differences up to 100.
	2.N.2.4 Use strategies and algorithms based on knowledge of place value and equality to add and subtract two-digit numbers.
	2.N.2.5 Solve real-world and mathematical addition and subtraction problems involving whole numbers up to 2 digits.
	2.N.2.6 Use concrete models and structured arrangements, such as repeated addition, arrays and ten frames to develop understanding of multiplication.
2.N.3 Explore the foundational ideas of fractions.	**2.N.3.1** Identify the parts of a set and area that represent fractions for halves, thirds, and fourths.
	2.N.3.2 Construct equal-sized portions through fair sharing including length, set, and area models for halves, thirds, and fourths.
2.N.4 Determine the value of a set of coins.	**2.N.4.1** Determine the value of a collection(s) of coins up to one dollar using the cent symbol.
	2.N.4.2 Use a combination of coins to represent a given amount of money up to one dollar.
Algebraic Reasoning & Algebra (A)	
2.A.1 Describe the relationship found in patterns to solve real-world and mathematical problems.	**2.A.1.1** Represent, create, describe, complete, and extend growing and shrinking patterns with quantity and numbers in a variety of real-world and mathematical contexts.
	2.A.1.2 Represent and describe repeating patterns involving shapes in a variety of contexts.
2.A.2 Use number sentences involving unknowns to represent and solve real- world and mathematical problems.	**2.A.2.1** Use objects and number lines to represent number sentences.
	2.A.2.2 Generate real-world situations to represent number sentences and vice versa.
	2.A.2.3 Apply commutative and identity properties and number sense to find values for unknowns that make number sentences involving addition and subtraction true or false
Geometry & Measurement (GM)	
2.GM.1 Analyze attributes of two-dimensional figures and develop generalizations about their properties.	**2.GM.1.1** Recognize trapezoids and hexagons.
	2.GM.1.2 Describe, compare, and classify two-dimensional figures according to their geometric attributes.
	2.GM.1.3 Compose two-dimensional shapes using triangles, squares, hexagons, trapezoids, and rhombi.
	2.GM.1.4 Recognize right angles and classify angles as smaller or larger than a right angle.

2.GM.2 Understand length as a measurable attribute and explore capacity.	**2.GM.2.1** Explain the relationship between the size of the unit of measurement and the number of units needed to measure the length of an object.
	2.GM.2.2 Explain the relationship between length and the numbers on a ruler by using a ruler to measure lengths to the nearest whole unit.
	2.GM.2.3 Explore how varying shapes and styles of containers can have the same capacity.

2.GM.3 Tell time to the quarter hour.	**2.GM.3.1** Read and write time to the quarter-hour on an analog and digital clock. Distinguish between a.m. and p.m.
Data & Probability (D)	
2.D.1 Collect, organize, and interpret data.	**2.D.1.1** Explain that the length of a bar in a bar graph or the number of objects in a picture graph represents the number of data points for a given category.
	2.D.1.2 Organize a collection of data with up to four categories using pictographs and bar graphs with intervals of 1s, 2s, 5s or 10s.
	2.D.1.3 Write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one.
	2.D.1.4 Draw conclusions and make predictions from information in a graph.

Introduction to the OKMath Framework
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2-N-1-1

2.N.1.1 Read, write, discuss, and represent whole numbers up to 1,000. Representations may include numerals, words, pictures, tally marks, number lines and manipulatives.

In a Nutshell

This objective covers developing understanding of place value, the base ten number system, and the relationships among the different representations which lays the foundation of mathematics. Students enter second grade with a basic understanding of place value up 100. They will expand their understanding of numbers up to 1,000 and express those numbers in various ways. In future grades, they will continue to apply these strategies up to the millions.

Student Actions	Teacher Actions
• **Develop the ability to make conjectures, model, and generalize** base ten number system understanding up to 1,000. • **Develop mathematical reasoning** on the relationships among various representations. • **Develop a deep and flexible conceptual understanding** of the base ten number system.	• **Pose purposeful questions** to help students justify their thinking about a variety of ways of representing whole numbers up to 1000 (e.g., Can you represent 512 in a different way?). • **Implement mathematical tasks** where students explore the connections between a number and its representation up to 1,000. (The digit '8' represents eight objects.) • **Facilitate meaningful discourse** around a variety of representations of numbers using manipulatives, such as base-ten blocks up to 1,000. • **Use and connect a variety of number representations** to deepen understanding of place value. • **Elicit and use evidence of student thinking** about the base ten system such as when students explain place value and digit relationships (e.g., Why is the number 12 represented by the digits 1 and 2?).
Key Understandings	**Misconceptions**
• Ten digits are used to symbolically represent numbers (0-9). • "10" represents one bundle or group of ten. • "100" represents ten bundles or groups of ten, called a "hundred". • "1000" represents ten bundles or groups of one hundred, called a "thousand". • There are multiple ways to represent numbers.	• Numbers can only be represented only one way (e.g., the number 502 could be represented by 5 hundreds and two ones, 50 tens and two ones, etc.).

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2-N-1-2

2.N.1.2 Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 100.

In a Nutshell

Students enter second grade with the ability to find any given number up to 20 on an open number line. They will expand their understandings of number relationships and the base ten number system to locate numbers up to 100 on an open number line. In future grades, they will continue using their understandings of number relationships and the base ten number system to compare and order numbers, including fractions.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of the base ten number system, place value, and the relationship between numbers to locate numbers up to 100 on a number line. • **Communicate mathematically** their reasons for placing numbers on an open number line. • **Develop mathematical reasoning** of the patterns of the base ten number system to locate numbers on a number line (i.e. 73 would be between the benchmarks of 70 and 80).	• **Elicit and use evidence of student thinking** of using number relationships to locate numbers up to 100 on an open number line. • **Facilitate meaningful discussions** on strategies for finding numbers on an open number line by analyzing and comparing strategies. • **Implement tasks that promote reasoning and problem solving** such as using number relationships to locate the position of a given whole number on an open number line up to 100.
Key Understandings	**Misconceptions**
• Understand number relationships (e.g. 7 comes after 6 but before 10 and 7 has a greater value than 6) • Number line as a representational numeration system involving spacing and sequence	• There is only one correct way to draw a number line.

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2-N-1-3

2.N.1.3 Use place value to describe whole numbers between 10 and 1,000 in terms of hundreds, tens and ones. Know that 100 is 10 tens, and 1,000 is 10 hundreds.

In a Nutshell

Students enter second grade with the ability to describe whole numbers between 10 and 100 in terms of tens and ones. They will expand their understandings of number relationships and the base ten number system to describe and represent whole numbers between 10 and 1,000, using hundreds, tens, and ones. In third grade, students will continue developing understanding of the base ten number system to represent whole numbers up to 100,000 including in expanded form.

Student Actions	Teacher Actions
• **Develop procedural fluency** with composing and decomposing numbers between 10 and 1000. • **Make conjectures and generalize** patterns of the places in multi-digit numbers (hundreds, tens, and ones). • **Develop mathematical reasoning** about the values of each digit based on their place. • **Develop a deep and conceptual understanding** of the base ten number system by connecting number words and numerals to the quantities using a variety of representations (e.g., concrete materials, pictures and symbols).	• **Pose purposeful questions** to advance students' reasoning on the composing of numbers between 10 and 1000. • **Facilitate discussions** that encourage students to build shared understandings of patterns in the base-ten number system. • **Implement tasks that promote reasoning** on the base ten number system to describe and represent whole numbers between 10 and 1,000.
Key Understandings	**Misconceptions**
• A digit will have different values, according to its place in a given number. (A digit of "1" in the hundreds place has a different value than a "1" in the tens place or the ones place.)	• Numbers can only be represented only one way (e.g., the number 502 could be represented by 5 hundreds and two ones, 50 tens and two ones, etc.).

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2-N-1-4

2.N.1.4 Find 10 more or 10 less than a given three-digit number. Find 100 more or 100 less than a given three-digit number.

In a Nutshell

Students enter second grade with the knowledge to find a number that is 10 more or 10 less than a given number to 100. They will expand their knowledge to find 10 more or 10 less than a three-digit number and to find 100 more or 100 less than a given three-digit number. In future grades, they will apply these strategies to larger numbers.

Student Actions	Teacher Actions
• **Develop procedural fluency** by adding and subtracting 10 and 100. • **Develop a deep and flexible conceptual understanding** of numbers by finding a number 10 more or 10 less and 100 more or 100 less using a variety of representations (e.g., hundred charts or number lines).	• **Pose purposeful questions** to help students develop and explain strategies for finding 10 more or 10 less and 100 more or 100 less. • **Implement tasks** where students explore the connections (relationships) from 1-1,000 to find 10 more or 10 less and 100 more or 100 less. • **Facilitate meaningful mathematical discourse** to build shared understanding of finding 10 more or 10 less and 100 more or 100 less.
Key Understandings	**Misconceptions**
• Counting by 10's and 100's only changes the value • When 10 more or 10 less and 100 more or 100 less, the digit in the tens or hundreds place respectively will increase or decrease by one until a student gets to a transitional number (e.g., from 9 to 0 or from 0 to 9).	• Transition numbers (e.g., counting by 10's and transitioning from 190 to 200) may be difficult from students who count rotely without a conceptual understanding of the base ten number system.

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2-N-1-5

2.N.1.5 Recognize when to round numbers to the nearest 10 and 100.

In a Nutshell

Students enter second grade with a basic understanding of place value up to 100. As students expand their knowledge of place value to include whole numbers up to 1,000, they will learn when to round numbers up or down to the nearest 10 and 100. This concept will continue in third grade as students recognize when to round to the nearest thousand and ten thousand, using compatible numbers to estimate sums and differences.

Student Actions	Teacher Actions
• **Develop the ability to generalize** patterns for rounding to the nearest 10 and 100. • **Develop conceptual understanding** of rounding by making real-world connections (e.g., A can of green beans priced at 79 cents is about 80 cents) • **Develop mathematical reasoning** with a variety of strategies to round to the nearest 10 and 100. • **Develop a deep and flexible conceptual understanding** of the base ten number system related to proximity and value (e.g., 130 is closer to 100 than 200 because it is 3 tens away from 100 and 7 tens away from 200).	• **Pose purposeful questions** to advance students' reasoning and sense-making about rounding. • **Implement tasks** where students grapple with real-world problems in which they must round to the nearest 10 or 100. • **Elicit and use evidence of student thinking** on rounding problems to assess progress toward understanding.
Key Understandings	**Misconceptions**
• Relationship between numbers in terms of proximity to the next group of ten/hundred or the previous group of ten/hundred. • Recognize when to round in real world situations. For example, if gum is sold in packs of 10 sticks and there are 24 students in second grade, the teacher will need to buy 30 sticks of gum (3 packs) in order for each student to have gum.	• Rounding a number means to the next number up or down rather than to a benchmark number. For example, 37 rounds to 36 or 38.

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2-N-1-6

2.N.1.6 Use place value to compare and order whole numbers up to 1,000 using comparative language, numbers, and symbols (e.g. 425 >276, 73<107, page 351 comes after page 350, 753 is between 700 and 800).

In a Nutshell

Students enter second grade with an understanding of place value, comparing and ordering whole numbers up to 100. Second graders will continue this skill by developing the ability to compare and order whole numbers up to 1,000 and begin to use comparative language, numbers and symbols. In future grades, they will expand their knowledge of numbers up to 100,000 and compare and order those numbers.

Student Actions	Teacher Actions
• **Develop an accurate and appropriate procedural fluency** when comparing and ordering numbers, using vocabulary and symbols (e.g. less than, greater than, equal to, <, >, =, after, before, between). • **Make conjectures and generalize** base ten understandings when comparing and ordering numbers up to 1,000. • **Communicate** an understanding of numbers by comparing and ordering numbers up to 1,000.	• **Pose purposeful questions** to assess and advance students' reasoning and sense making about ordering and comparing numbers. • **Build procedural fluency** of comparing and ordering numbers from conceptual understanding of the base ten number system. • **Facilitate meaningful discourse** to build shared understandings of comparing and ordering whole numbers up to 1,000.
Key Understandings	**Misconceptions**
Students would have this objective mostly covered from 2.N.1.1 • How the base ten number system works (i.e., grouping and place value). • The significance of "0" in situations where one group is complete. • 10 is ten ones - called a "ten" • 100 is ten tens - called a "hundred" • 1000 is ten hundreds - called a "thousand" • The significance of the symbols < and >	• Students only look at the first or the last digit in a multi-digit number when comparing and ordering numbers. • Students order numbers based on the value of their digits instead of their place value. For example, 96>312 because 9 and 6 are bigger than 3, 1, and 2.

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2-N-2-1

2.N.2.1 Use the relationship between addition and subtraction to generate basic facts up to 20.

In a Nutshell

Second graders build on their understandings of addition and subtraction of numbers up to 10 from first grade. Adding and subtracting fluently to 20 will be developed through the students' reasoning and strategies.

Student Actions	Teacher Actions
• **Develop a deep and flexible** conceptual understanding of adding, subtracting, and their relationship to one another. Communicate effectively the various addition and subtraction strategies they are using. • **Develop the ability to model and generalize** what it means to "take apart", "put together', and "compare solutions". • **Develop a variety of strategies** for solving addition and subtraction problems.	• **Implement tasks that promote reasoning and problem solving** of addition, subtraction, and their relationship to one another. • **Support engagement in productive struggle** as students grapple with the relationship between addition and subtraction. • **Facilitate meaningful mathematics discourse** to build shared understanding of the variety of strategies used for adding and subtracting by comparing different approaches.
Key Understandings	**Misconceptions**
• There are a variety of strategies for addition and subtraction (e.g., counting on/back, making tens (9 + 7 = 10 + 6), decomposing a number leading to a ten (14 – 6 = 14 – 4 – 2 = 10 – 2 = 8), doubles, and doubles plus one (7 + 8 = 7 + 7 + 1)) • Some of the strategies used for addition can be used for subtraction. For example, counting on is similar to counting back; making tens to count up could also be helpful in counting back. • Why the commutative property of addition works (in real world contexts). • Why the commutative property of subtraction doesn't work (in real world contexts). • The relationship between addition and subtraction.	• Addition and subtraction are unrelated

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2-N-2-2

2.N.2.2 Demonstrate fluency with basic addition facts and related subtraction facts up to 20.

In a Nutshell

Students enter second grade demonstrating a fluency with basic addition facts and related subtraction facts up to 10. They will expand their fluency to include facts up to 20. In future grades, students will build upon this knowledge to begin fluency in both multiplication and division.

Student Actions	Teacher Actions
• **Developing computational fluency** which extends beyond memorization of facts. • **Demonstrating flexible use of strategies** and thinking. • **Actively engaging** in a variety of activities such as dominoes, dice, and card games related to adding and subtracting. • **Developing** a variety of strategies for problem solving. • **Making reasonable arguments and critiquing the thinking of others** when describing a strategy used for adding or subtracting.	• **Determining clear goals** for student learning. • **Posing purposeful questions** to help students develop and explain strategies for adding and subtracting. • Modeling a variety of strategies for adding and subtracting. • Using appropriate vocabulary. • Using assessments to **uncover student thinking** in order to guide instruction and assess understanding.
Key Understandings	**Misconceptions**
• Addition and subtraction facts are not simple facts to be memorized but can be applied to real-world problems.	• Counting is a strategy for fluency. • Subtraction is commutative. For example, 5 - 3 = 3 - 5.

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2-N-2-3

2.N.2.3 Estimate sums and differences up to 100.

In a Nutshell

Students enter second grade with a basic understanding of place value up to 100 and with the ability to fluently add and subtract up to 10. As students expand this knowledge with larger whole numbers, they will learn to round numbers in order to estimate sums and differences to 100. In future grades, students will continue rounding numbers, estimating 4- and 5-digit numbers.

Student Actions	Teacher Actions
• **Develop procedural fluency** for estimating sums and differences up to 100 based on a strong sense of the base ten system while making real-world connections. • **Develop mathematical reasoning** as students explain and justify estimates.	• **Pose purposeful questions** to assess and advance students' reasoning and sense-making on strategies for estimating sums and differences. • **Elicit and use evidence of student thinking** to support and extend learning for estimating sums and differences.
Key Understandings	**Misconceptions**
• When adding and subtracting, students typically use strategies that first account the numbers in the tens place followed by the ones place. In turn, students and teachers should build on these strategies to estimate sums and differences up to 100. • The importance of estimating in daily life.	• Estimates require exactness.

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2-N-2-4

2.N.2.4 Use strategies and algorithms based on knowledge of place value and equality to add and subtract two-digit numbers.

In a Nutshell

Students will continue developing a deep understanding of the base ten number system and place value in adding and subtracting two-digit numbers using a variety of strategies. In third grade, students will use this knowledge to add and subtract multi-digit numbers.

Student Actions	Teacher Actions
• **Develop strategies** for solving addition and subtraction of two digit numbers using multiple representations (e.g., verbal, physical, symbolic, pictures, number line). • **Develop a deep and flexible conceptual understanding** of adding and subtracting two digit numbers through learning a variety of strategies (e.g., counting on, making tens, decomposing numbers, using base-ten blocks). • **Develop mathematical reasoning** by exploring, comparing, and communicating a variety of addition and subtraction strategies(e.g., in small groups and during whole class discussion)	• **Use and connect among various representations and strategies** of adding and subtracting two digit numbers. • **Elicit and use evidence of student thinking** of adding and subtracting to assess progress toward understanding and to support and extend learning. • **Facilitate meaningful mathematical discourse** among students to build shared understanding of adding and subtracting two digit numbers by analyzing and comparing approaches and arguments.
Key Understandings	**Misconceptions**
• There are a variety of strategies to solve two-digit addition and subtraction problems (e.g., counting on/counting back, counting all, drawing pictures, using base ten blocks, rounding, chunking, making tens, adding tens first then adding ones second, etc.).	• The Standard Computational Algorithm (SCA, i.e., the method of putting one number on top of the other then adding or subtracting) is the most efficient for adding and subtracting. (Introducing the SCA too early could be detrimental to a student's math development.) • When using the SCA, it's okay to "subtract up" when the digit in the minuend is smaller than the digit in the subtrahend. For example, 56 - 37, the student may subtract 6 from 7 and get 1. Then subtract 3 from 5 and get 2, for an answer of 21.

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2-N-2-5

2.N.2.5 Solve real-world and mathematical addition and subtraction problems involving whole numbers up to 2 digits.

In a Nutshell

Students will develop understanding of solving addition and subtraction problems in real-world situations, using whole numbers up to 2 digits. In third grade, students will use a variety of strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of their answers.

Student Actions	Teacher Actions
• **Develop strategies** for solving real-world addition and subtraction of two digit numbers using multiple representations (e.g., verbal, physical, symbolic, pictures, number line). • **Develop a deep and flexible conceptual understanding** of real-world problems involving adding and subtracting two digit numbers through learning a variety of strategies (e.g., counting on, making tens, decomposing numbers, using base-ten blocks). • **Develop mathematical reasoning** by exploring, comparing, and communicating a variety of addition and subtraction strategies of solving real world problems.	• **Use and connect among various representations** and strategies of adding and subtracting two digit number real-world problems. • **Elicit and use evidence of student thinking** of adding and subtracting real world problems to assess progress toward understanding and to support and extend learning. • **Facilitate meaningful mathematical discourse** among students to build shared understanding of adding and subtracting two digit numbers real world problems by analyzing and comparing approaches and arguments.
Key Understandings	**Misconceptions**
• There are two types of real-world subtraction problems: (1) take-away (e.g., I have 28 cookies and my sister ate 12) and (2) comparison (e.g., how much taller is Maria compared to Sally).	• The Standard Computational Algorithm (SCA, i.e., the method of putting one number on top of the other then adding or subtracting) is the most efficient for adding and subtracting. (Introducing the SCA too early could be detrimental to a student's math development.) • When using the SCA, the sum of all digits become the answer. For example, 35+27=512.

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2-N-2-6

2.N.2.6 Use concrete models and structured arrangements, such as repeated addition, arrays and ten frames to develop understanding of multiplication.

In a Nutshell

As students enter second grade, they can partition sets of objects into equal groupings. Second graders will now use those equal groupings (number of groups and number in groups) to lay a foundation for multiplication. They will practice this repeated addition with tools and real-world situations so that they may begin to multiply in third grade.

Student Actions	Teacher Actions
• **Develop strategies for solving problems** involving equal groupings (e.g., counting by 2's, making tens, using arrays, etc.). • **Develop a deep and flexible conceptual understanding** by making groups, arrays, etc. of numbers in order to lay foundation for multiplication.	• **Implement tasks that promote reasoning and problem solving** by allowing multiple entry points and varying solution strategies (e.g., "I have eight bags of candy. In each bag there are 6 pieces of candy. How many candies are there in all?) . • **Facilitate meaningful mathematical discourse** by encouraging students to discuss their strategies for counting or adding. • **Use and connect mathematical representations** by providing mathematical tools (e.g. ten frames, arrays, and geoboards) to aid in the development of the foundation for multiplication.
Key Understandings	**Misconceptions**
• Two components are involved in multiplication: (1) the number of groups and (2) the number in groups • There are a variety of strategies to solve multiplication problems (e.g., drawing pictures, using base ten blocks, coordinating two counts, compensation, making tens, doubling, informal version of the distributive property,, etc.). • Why the commutative property works. In other words, why is the solution to the problem involving 8 groups of 6 the same as 6 groups of 8?	• Multiplication is just repeated addition.

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2-A-1-1

2.A.1.1 Represent, create, describe, complete, and extend growing and shrinking patterns with quantity and numbers in a variety of real-world and mathematical contexts.

In a Nutshell

Second graders expand their work with patterns from first grade where they used objects and shapes to identify, create, complete, and extend number patterns. They connected numbers to patterns made with objects and examined the relationship between the numbers to predict what will come next. Second graders identify, create, complete, and extend number patterns involving addition, subtraction, skip-counting, and arrays of objects. In addition, they describe the rule for a number pattern. In third grade, students will begin to use multiplication to create, describe, and extend patterns and solve problems in a variety of contexts.

Student Actions	Teacher Actions
• **Develop models and make conjectures** while working in groups to explore problems based on growing and shrinking patterns. • **Develop a deep and flexible conceptual understanding** of number patterns by solving real-world problems, not just practicing a collection of isolated skills. • **Communicate mathematical ideas** about patterns to one another through examples, demonstrations, models, drawing, symbols, and logical arguments. • **Develop mathematical reasoning** while justifying their thinking and explaining different strategies for problem solving.	• **Pose purposeful questions,** keeping the focus on students' understanding of number patterns, asking "Why? How do you know? Will that always be true? Explain your brain." • **Implement tasks that promote reasoning and problem solving** with patterns and allow multiple entry points and varied solution strategies. • **Build procedural fluency** by modeling descriptions of patterns. • **Elicit and use evidence of student thinking** by monitoring student descriptions for accuracy and mathematical validity. • **Facilitate mathematical discourse** about the generalization of patterns, such as "What is the pattern? Is it growing, shrinking, or repeating? What will come next?"
Key Understandings	**Misconceptions**
• There are patterns in numbers and students will apply the pattern to predict what comes next in a number pattern. • Students need to describe the rule for a given number pattern. • Students can use a given rule to extend or complete a number pattern. • Students can use patterns to solve problems.	• All patterns are repeating patterns. • Patterns involve only pictures, objects, or movements. • There is no relationship between numbers in a number pattern. • Growth patterns only get bigger, not realizing patterns can shrink.

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2-A-1-2

2.A.1.2 Represent and describe repeating patterns involving shapes in a variety of contexts.

In a Nutshell

In first grade, students discovered how to identify, create, complete, and extend repeating patterns using objects, pictures, and numbers. Second grade students use their knowledge of shapes and their attributes to represent and describe repeating patterns. In third grade, students will begin to use multiplication to create, describe, and extend patterns and solve problems in a variety of contexts.

Student Actions	Teacher Actions
• **Develop models and make conjectures** by working in groups to explore problems based on repeating patterns. • **Develop a deep and flexible conceptual understanding** of number patterns by solving real-world problems, not just practicing a collection of isolated skills. • **Communicate mathematical ideas** to one another through examples, demonstrations, models, drawing, symbols, and logical arguments. • **Develop mathematical reasoning** by justifying their thinking and explaining different ways to represent a pattern using the same shapes.	• **Pose purposeful questions,** keeping the focus on students' understanding of number patterns, asking "Why? How do you know? Will that always be true? Explain your brain." • **Build procedural fluency** by modeling descriptions of patterns. • **Elicit and use evidence of student thinking** by monitoring student descriptions for accuracy and mathematical validity. • **Facilitate mathematical discourse** about the generalization of patterns, such as "What is the pattern? Is it growing, shrinking, or repeating? What will come next?"
Key Understandings	**Misconceptions**
• Shapes have many attributes, such as size, shape, number of sides/corners, and color which can be used to describe and represent patterns.	• Only repeating patterns are patterns. • A pattern only involves two elements.

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2-A-2-1

2.A.2.1 Use objects and number lines to represent number sentences.

In a Nutshell

Second graders expand their work with patterns from first grade where they used objects and now include number patterns. They connect numbers to patterns made with objects and examine the relationship between the numbers to predict what will come next. Second graders identify, create, complete, and extend number patterns involving addition, subtraction, skip counting, and arrays of objects. In addition, they describe the rule for a number pattern.

Student Actions	Teacher Actions
• **Develop a productive mathematical disposition,** describing connections between addition and subtraction in a variety of contexts, such as number grids, number lines, counters, ten frames, numerals, connecting cubes, etc. • **Communicate mathematical ideas** to one another through examples, demonstrations, models, drawing, symbols, and logical arguments. Students know how and when to use tools such as blocks, number lines, and objects. • **Develop mathematical reasoning** by justifying their thinking and explaining different strategies for problem-solving.	• **Use and connect mathematical representations** by highlighting the connections between addition and subtraction. • **Implement tasks that promote reasoning and problem solving** by inviting exploration of addition and subtraction with objects and number lines. • **Pose purposeful questions** that help students construct conceptual understanding. Examples of effective questions include: "Tell me more about that. Can you show me? Do you have a different way to solve this? What do you think about that student's answer? How do you know? Does that make sense to you?"
Key Understandings	**Misconceptions**
• Number lines and empty number lines represent a student's thinking when combining/separating numbers in addition and subtraction. • Students can draw and use an open number line to solve problems. • Numbers on open number lines are evenly spaced. • Number lines can be used to represent a number sentence and to find a solution.	• Every number line starts with zero. • Moving in the wrong direction depending on the operation. For example, in the problem 6+5, the student might start at 6 and move left 5 spaces instead of right, resulting in an answer of 1.

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2-A-2-2

2.A.2.2 Generate real-world situations to represent number sentences and vice versa.

In a Nutshell

Second graders build on their previous work with operations by writing number sentences to represent a real world or mathematical situation involving addition and subtraction. In addition, they write a real world problem to represent a given number sentence. In later grades students will be asked to represent number sentences with real world situations using all operations.

Student Actions	Teacher Actions
• **Develop mathematical reasoning** by justifying their solution strategies, explaining their thinking, questioning each other, and forming conjectures. • **Develop a deep and flexible conceptual understanding** of number sentences by using concrete materials to explore and describe number relationships expressed in open-ended number sentences. • **Develop accurate and appropriate procedural fluency** by writing a number story to match a given number sentence and writing a number sentence to match a given situation.	• **Facilitate meaningful mathematical discourse** about students' strategies for solving number sentences with unknowns. • **Pose purposeful questions,** keeping the focus on students' understanding of numbers and the relationship between addition and subtraction. Asking "Why? How do you know? Will that always be true? Explain your brain." • **Use and connect mathematical representations** by facilitating students' use of concrete materials such as colored counters for accuracy and student understanding. • **Implement tasks that promote reasoning and problem-solving** of an unknown value in which the unknown is in different locations.
Key Understandings	**Misconceptions**
• Number sentences involving addition, subtraction, and unknowns are used to represent given problem situations. • The equal sign means "the same as". • Number sentences can be created to match given story problems. • Story problems can be created to match given number sentences.	• The only format for a problem is a + b = c or a - b = c, not recognizing that it can also be c = a + b or c = a - b. • n = 90 - 13 is read: 13 minus 90 equals n. Students need constant reminders to read left to right on either side of the equal sign. • Students ignore the presence of letters or unknowns in an equation. • An equal sign means "and the answer is." In this way, when they see an equal sign, they want to carry out the operation preceding it. They need to think of the equal sign as meaning "is the same as."

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2-A-2-3

2.A.2.3 Apply commutative and identity properties and number sense to find values for unknowns that make number sentences involving addition and subtraction true or false.

In a Nutshell

Work with number sentences continues as second graders determine if a number sentence is true or false. For example, is 9 + 7 = 14 true or false? They are also able to write their own true number sentences and false number sentences. Second graders build on their understanding of the equal sign as they continue work with variables when finding unknowns in number sentences. The unknowns in given number sentences are found in varying positions. For example, 5 + k = 14, 5 = m - 9, 14 - r = 5.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of number sentences, using concrete materials to explore and describe number relationships expressed in open-ended number sentences (e.g., n + 2 = 6). • **Develop the ability to model** types of equations with unknowns in any position using representations including manipulatives and number lines. • **Develop mathematical reasoning** by justifying their solution strategies, explaining their thinking, questioning each other, and forming conjectures.	• **Facilitate meaningful mathematical discourse** about students' strategies for solving number sentences with unknowns. • **Pose purposeful questions,** such as: "Why? How do you know? Will that always work?" • **Build procedural fluency from conceptual understanding** by monitoring students' use of concrete materials such as colored counters for accuracy and student understanding. • **Elicit and use evidence of student thinking** involving the use of letters for an unknown value in which the unknown is in different locations.
Key Understandings	**Misconceptions**
• Know the equal sign means "the same as". • Solve equations with the unknown in any position. • Determine the truth value of number sentences. • Demonstrate an understanding of the relationship between addition and subtraction.	• The only format for a problem is a + b = c or a - b = c, not recognizing that it can also be c = a + b or c = a - b. • n = 90 - 13 is read: 13 minus 90 equals n. Students need constant reminders to read left to right on either side of the equal sign. • They can ignore the presence of letters or unknowns in an equation. • There are rules that determine which number a letter stands for. For example, e = 5 because e is the fifth letter of the alphabet or y = 4 because y was 4 in the last number sentence. • A letter always has one specific value. • Different letters always represent different numbers. • An equal sign means "and the answer is." In this way, when they see an equal sign, they want to carry out the operation preceding it. They need to think of the equal sign as meaning "is the same as."

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2-GM-1-1

2.GM.1.1 Recognize trapezoids and hexagons.

In a Nutshell

In first grade, students could identify trapezoids and hexagons by pointing to the two-dimensional shape when given its name. Second grade students should be able to both identify and name trapezoids and hexagons. Third grade students will continue using geometric attributes to sort three-dimensional shapes.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of the geometric attributes of trapezoids and hexagons by observing, comparing, and contrasting various two-dimensional shapes. • **Communicate mathematical ideas** to one another as they compare two-dimensional shapes through examples, demonstrations, models, drawing, and logical arguments. • **Develop mathematical reasoning** as they explore and explain why a two-dimensional shape is or is not a trapezoid or hexagon.	• **Implement mathematical tasks** which allow students to discover properties of trapezoids and hexagons through the use of manipulatives, objects, etc. • **Facilitate meaningful mathematical discourse** where ideas about the attributes of trapezoids and hexagons are freely shared, discussed and analyzed. • **Pose purposeful questions**, asking "Why? How do you know? Will that always be true? Explain your brain."
Key Understandings	**Misconceptions**
• Trapezoids are 4-sided flat shapes with straight sides that have a pair of opposite parallel sides. • A hexagon is any six sided polygon.	• Any four-sided shape is a trapezoid. • The sides of a hexagon must be the same length.

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2-GM-1-2

2.GM.1.2 Describe, compare, and classify two-dimensional figures according to their geometric attributes.

In a Nutshell

Students enter second grade with a basic knowledge of shapes. Second graders build on this knowledge by describing shapes according to their attributes, such as sides, angles, and vertices. In third grade, students will sort three-dimensional shapes based on attributes.

Student Actions	Teacher Actions
• **Communicate mathematically** by justifying their thinking and explaining two-dimensional shapes according to geometric attributes. • **Develop accurate and appropriate procedural fluency** of sorting shapes into groups with one or more different attributes and justifying their placements. • **Make conjectures and solve problems** about shapes while working in groups .	• **Pose purposeful questions** that provide opportunities for students to describe the attributes of shapes found in the real world. • **Use and connect mathematical representations** by focusing students on the attributes of various shapes, such as a pentagon is a polygon with 5 sides. • **Implement tasks that promote reasoning and problem solving** using both examples and nonexamples of two-dimensional shapes.
Key Understandings	**Misconceptions**

• Two-dimensional geometric shapes can be analyzed by their characteristics and properties.
• Sides and vertices are attributes of two-dimensional shapes.
	• Squares are not rectangles.
	• A change in orientation changes the shape.
	  ◦ A square is only a square if its base is horizontal.
	  ◦ All triangles sit on a side, i.e. they don't recognize ▷ as a triangle.
	• The only triangle is an equilateral triangle.
	• Shapes have only one label. Not realizing, for example, a square is a parallelogram, a rectangle, and also a rhombus.

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2-GM-1-3

2.GM.1.3 Compose two-dimensional shapes using triangles, squares, hexagons, trapezoids, and rhombi.

In a Nutshell

In first grade, students learned how to compose and decompose larger shapes from/into smaller two-dimensional shapes. Second grade students will continue to combine two-dimensional shapes to create other shapes. For example, a student can use 6 equilateral triangles to build a hexagon. In third grade, students will build three-dimensional figures using unit cubes when a picture or shape is shown.

Student Actions	Teacher Actions
• **Communicate mathematically** by justifying their thinking and explaining two-dimensional shapes according to geometric attributes. • **Develop accurate and appropriate procedural fluency** by sorting shapes into groups with one or more different attributes and justifying their placements. • **Make conjectures and solve problems** about composing shapes while working in groups. • **Develop the ability to model** how to build shapes from other shapes, using diagrams, pattern blocks, geoboards, and tangrams.	• **Facilitate meaningful mathematical discourse** while students describe the attributes of shapes found in the real world. • **Use and connect mathematical representations** by focusing students on the attributes of various shapes, such as a pentagon is a polygon with 5 sides. • **Elicit and use evidence of students' thinking** as they compare both examples and nonexamples of two-dimensional shapes. • **Implement tasks** that promote reasoning and problem solving in the composition of two-dimensional shapes from smaller shapes.
Key Understandings	**Misconceptions**
• Students can describe attributes of two-dimensional shapes (e.g., number of sides and vertices). • Students can compose shapes using materials such as pattern blocks, geoboards or tangram pieces.	• The shape changes as orientation changes. • An equilateral triangle is the only kind of triangle.

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2-GM-1-4

2.GM.1.4 Recognize right angles and classify angles as smaller or larger than a right angle.

In a Nutshell

Second graders have little experience with angles. They are asked only to recognize a right angle and compare other angles to decide whether the angle is smaller or larger than a right angle. In third grade, students will classify angles as acute, right, obtuse, and straight.

Student Actions	Teacher Actions
• **Develop strategies for problem solving** as to how to estimate an angle, selecting and using benchmarks to estimate measurements. • **Develop a deep and flexible conceptual understanding** by comparing and ordering angles based on their size. • **Develop mathematical reasoning** as they explore why one angle is smaller or larger than another angle.	• **Implement tasks that** promote reasoning and problem-solving, using real-life and geometric figures for students to classify. • **Support productive struggle** in learning about angles, providing sets of angles, feedback and assistance as needed, as well as providing multiple opportunities for comparing angle size.
Key Understandings	**Misconceptions**
• A right angle measures to 90° such as the corner of a square. • Some angles are larger than a right angle and some are smaller.	• Angle size is dependent on the length of the sides.

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2-GM-2-1

2.GM.2.1 Explain the relationship between the size of the unit of measurement and the number of units needed to measure the length of an object.

In a Nutshell

As they enter second grade, students have experience with measuring an object or distance with two different units, comparing how and why the measurements differ. As second grade students continue to experiment with length, they will begin to understand that the size of an object and the unit of measurement are inversely related. The smaller the unit of measurement, the more units are needed to measure an object. Inversely, the larger the unit of measurement, the fewer units are needed to measure the same object.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of measurement by measuring real-world objects or distances. • **Develop accurate and appropriate procedural fluency** of measuring by experimenting with different units of measurement. • **Make conjectures** about the number of units needed to measure length by estimating length using a given unit of measurement, experimenting with length, and reflecting on the findings.	• **Establish clear goals** for estimating, measuring, and comparing lengths of objects with different units of measurement. • **Facilitate meaningful mathematical discourse** as students discuss the number of units needed to measure the length of objects using different units of measurement. • **Pose purposeful question**s as students use different units when measuring objects (i.e. "How does using a different unit change our measurement?").
Key Understandings	**Misconceptions**
• Units must be equal in length when taking a measurement. • Different units of measurement will yield different lengths. • The longer the unit, the fewer units are needed.	• Objects and units of measurement don't need to be aligned when measuring. • A number alone describes an object's length. No unit is necessary.

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2-GM-2-2

2.GM.2.2 Explain the relationship between length and the numbers on a ruler by using a ruler to measure lengths to the nearest whole unit.

In a Nutshell

Second graders are not only able to use a ruler to measure length to the nearest whole unit, as they did in first grade, but they are able to discuss the relationship between an object's length and the numbers on a ruler.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of measurement by measuring real-world objects or distances. • **Develop accurate and appropriate procedural fluency** by using a ruler to measure a variety of objects and compare those measurements with other students' measurements.	• **Build procedural fluency** of measuring with a ruler, based on the foundation of conceptual understanding of measurement from first grade. • **Facilitate meaningful mathematical discourse** as students discuss the relationship between length and the numbers on a ruler. • **Pose purposeful questions** to help students recall prior knowledge and justify their thinking.
Key Understandings	**Misconceptions**
• Students need to know the difference between inches and centimeters on a ruler. • Measurement on a ruler involves counting the spaces between the hash marks rather than counting the hash marks themselves.	• Measurement begins at the edge of the ruler rather than at zero. • A number alone describes an object's length. No unit is necessary.

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2-GM-2-3

2.GM.2.3 Explore how varying shapes and styles of containers can have the same capacity.

In a Nutshell

In previous grades, students began to explore capacity, comparing the number of objects needed to fill two different containers and comparing and sorting containers that hold more, less, or the same amount. In second grade, students continue to explore capacity, discovering how containers of different shapes and sizes can have the same capacity. In future grades, students will begin to measure volume.

Student Actions	Teacher Actions
• **Develop the ability to make conjectures, model and generalize** about capacity by filling containers (with substances such as rice or beans) and pouring the contents into other containers of varying shapes and sizes. • **Communicate mathematically** about exploration of capacity.	• **Establish clear goals** for exploring and learning about capacity. • **Implement tasks that promote reasoning** while exploring capacity. For example, teacher asks students to compare how many Pokeballs will fit in two containers of different shape and style. • **Facilitate meaningful mathematical discourse** as students discuss their thinking about capacity involving containers of varying shapes and styles.
Key Understandings	**Misconceptions**
• Containers of varying sizes and styles may or may not hold the same amount.	• "Taller" or "fatter" mean "holds more."

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2-GM-3-1

2.GM.3.1 Read and write time to the quarter-hour on an analog and digital clock. Distinguish between a.m. and p.m.

In a Nutshell

In first grade, students tell time to the hour and half-hour. They now need to read and write time to the quarter hour. They will also distinguish between a.m. and p.m.

Student Actions	Teacher Actions
• **Develop procedural fluency** by accurately telling the time on an analog clock using various strategies and tools. • D**evelop a deep and flexible conceptual understanding** of time by reading an analog and digital clock using appropriate vocabulary. • **Communicate mathematically** by writing the time using the correct notation.	• **Pose purposeful questions** to help students recall prior knowledge of the hands on an analog clock. • **Connect mathematical representations** using time vocabulary and symbols (such as hour, minute, analog, digital, clock, etc.). • **Implement tasks that promote problems solving** using different tools to tell time, and give students opportunities to write the time using the correct format. • **Elicit and use evidence of student thinking** in order to guide instruction and assess understanding of telling time.
Key Understandings	**Misconceptions**
• Students need to understand that a clock is divided into 5 minute intervals and twelve hours. They make the connection that each time the minute hand moves to the next numeral, the time has increased by five minutes. Each time the hour hand moves to the next hour, the time has increased by an hour. • They need to have an understanding that 15 minutes equals a quarter of an hour and there are four quarters in one hour. • Quarter hours are notated by 15 minutes, 30 minutes, and 45 minutes past the hour. • The hour is read and written first, then the minutes. • Telling time is a life skill that they will need to know how to do.	• The hour hand is the minute hand and vice versa. • Minutes are read and written first. • The hour numeral represents the minutes (ex: 1:11 instead of 1:55). • a.m. and p.m. are interchangeable. • Quarter past means 25 minutes past the hour (because with money, a quarter is worth 25 cents) • It is the next hour when the minute hand gets closer to the 12 (ex: They read 2:55 when it is 1:55 because the hour hand is closer to the 2 than the 1).

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2-D-1-1

2.D.1.1 Explain that the length of a bar in a bar graph or the number of objects in a picture graph represents the number of data points for a given category.

In a Nutshell

Students enter second grade with a familiarity of bar-type graphs. Students in second grade learn how data can be categorized and displayed in a bar graph. Students experience categorizing objects in a bar graph in order to learn to make sense of real-world data. In third grade, students will summarize a data set with multiple categories using a bar graph with scaled intervals.

Student Actions	Teacher Actions
• **Communicate mathematically** by analyzing and describing what the length of a bar in a bar graph or number of objects in a picture graph represents. • **Develop accurate and appropriate procedural fluency** by correctly interpreting titles and labels on a bar graph or picture graph.	• **Use and connect mathematical representations** by creating real-world experiences for data collection that have meaning for students (favorite snack, pet, etc). • **Pose purposeful questions** to engage students in a discussion about the meaning of data, such as: "Why do people collect data? Are there different ways to display data? What can we learn from our data?" • **Build procedural fluency from conceptual understanding** of bar-type graphs and picture graphs by providing real-world examples for students to examine and interpret.
Key Understandings	**Misconceptions**
• In order to formulate questions and decide how to represent data that have been gathered, decisions must be made. about how things might be categorized • Graphs are used to represent data from real-life experiences.	• Data can go in any category on a graph. • The category with the greatest quantity is the "winner".

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2-D-1-2

2.D.1.2 Organize a collection of data with up to four categories using pictographs and bar graphs with intervals of 1s, 2s, 5s or 10s.

In a Nutshell

In previous grades, students collected, sorted, and organized data in up to three categories using representations such as tally marks, tables, and Venn diagrams. The picture and bar-type graphs they used demonstrated a one-to-one correspondence. In second grade, students will sort a collection of items up to four categories using pictographs and bar graphs. These graphs will demonstrate intervals of 1s, 2s, 5s, or 10s. In third grade, students will build upon this knowledge, constructing various types of graphs with scaled intervals.

Student Actions	Teacher Actions
• **Develop a productive mathematical disposition** when answering questions and gathering data about themselves and their surroundings./model data using pictographs and bar graphs. • **Communicate mathematically** by describing and comparing categories of data. • **Develop accurate and appropriate procedural fluency** by adding titles and labels in intervals of 1s, 2s, 5s, or 10s.	• **Use and connect mathematical representations** by creating real-world experiences for data collection that have meaning for students (favorite snack, pet, etc). • **Pose purposeful questions** to engage students in a discussion about the meaning of data, such as: "Why do people collect data? Are there different ways to display data? What can we learn from our data?" • **Build procedural fluency from conceptual understanding** of using a collection of data and creating a pictograph or bar graph. • **Support productive struggle** by helping students organize, record, and communicate their thinking in a pictograph or bar graph.
Key Understandings	**Misconceptions**
• In order to formulate questions and decide how to represent data that have been gathered, decisions must be made about how things might be categorized.	• Data can go in any category on a graph. • The category with the greatest quantity is the "winner". • Titles and labels are unimportant and can be ignored.

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2-D-1-3

2.D.1.3 Write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one.

In a Nutshell

In second grade, students will use data from a pictograph or bar graph and write and solve addition or subtraction word problems. In third grade students will be expected to write and solve one- and two-step problems using categorical data.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** by analyzing data in bar-type graphs and tally charts. • **Communicate mathematically** about the information gathered and displayed. • **Develop mathematical reasoning** when interpreting data from pictographs and bar graphs. • **Develop a productive mathematical disposition** by applying the knowledge gained from a collection of data to write and solve one-step word problems.	• **Use and connect mathematical representations** by creating real-world experiences for data collection that have meaning for students (favorite snack, pet, etc). • **Pose purposeful questions** to engage student in a discussion about the meaning of data. • **Facilitate meaningful mathematical discourse** of students' ideas. • **Support productive struggle** by allowing sufficient wait time so that students can formulate and offer responses, and ask questions. • **Implement tasks that promote reasoning and problem solving** by adding to, taking from, putting together, taking apart, comparing, and with unknowns in all positions.
Key Understandings	**Misconceptions**
• Titles and labels are important in understanding data displays. • Data from graphs can be used in everyday life • Addition is used to join sets, subtraction is finding the difference between sets • Students must know how to write a number sentence. • Students need experience working with addition and subtraction to solve word problems which include data.	• Student might think addition and subtraction are interchangeable. • Students may not read the scale correctly. Student may assume all units equal one (Example: One square = 5 people) • The column/row with the most is the winner.

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2-D-1-4

2.D.1.4 Draw conclusions and make predictions from information in a graph.

In a Nutshell

Students will pose questions about the data, the total number of items, compare the number of items in categories and make predictions about the information in a graph.

Student Actions	Teacher Actions
• **Develop a deep and flexible conceptual understanding** of graphs by describing and comparing categories of data, using titles and labels so the information in a graph can be interpreted correctly. • **Make conjectures** about what information a bar graph shows by comparing the data on the graph. • **Communicate mathematically** about the information gathered and displayed on a graph.	• **Use and connect mathematical representations** by creating real-world experiences for data collection that have meaning for students (favorite snack, pet, etc.). • **Pose purposeful questions** to engage students in a discussion about the meaning of data. • **Facilitate meaningful mathematical discourse** of students' ideas. • **Support productive struggle by** allowing sufficient wait time so that students can formulate and make predictions, offer responses, and ask questions.
Key Understandings	**Misconceptions**
• Titles and labels are important in understanding data displays. • Gathering data must take into consideration variability of data. • Students will look for trends or patterns in the data in order to draw conclusions and make predictions. • Process of doing statistics is 1) formulate questions, 2) collect data, 3) analyze data, and 4) interpret results. • Process of doing statistics is 1) formulate questions, 2) collect data, 3) analyze data, and 4) interpret results.	• Data can go in any category on a graph. • The category with the greatest quantity is the "winner". • Ignore titles and labels.

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