Colorado Teacher-Authored Instructional Unit Sample

Mathematics
2nd Grade

Unit Title: Are You Odd or Even?

Colorado's District Sample Curriculum Project

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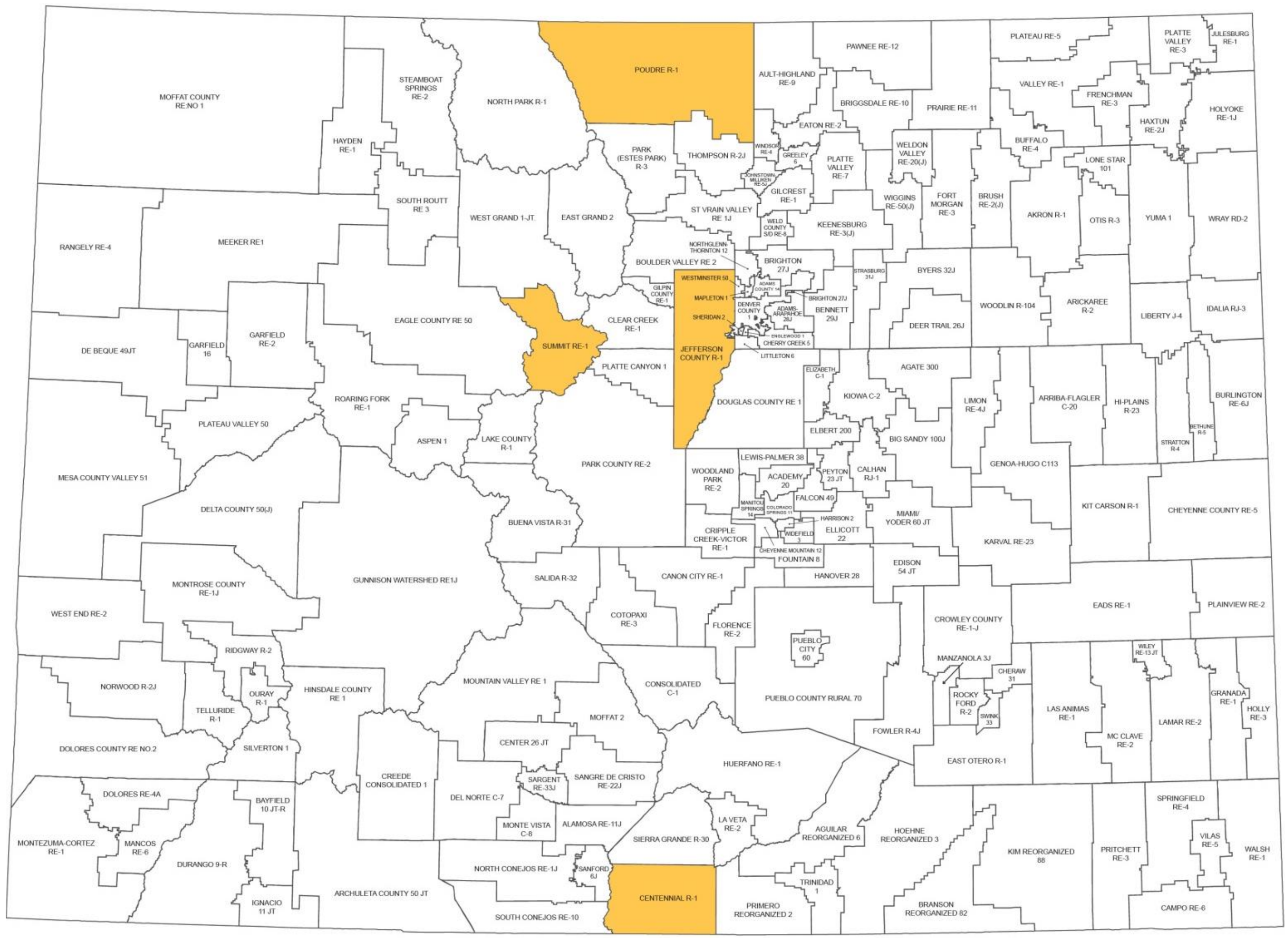

This unit was authored by a team of Colorado educators. The template provided one example of unit design that enabled teacher-authors to organize possible learning experiences, resources, differentiation, and assessments. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students.

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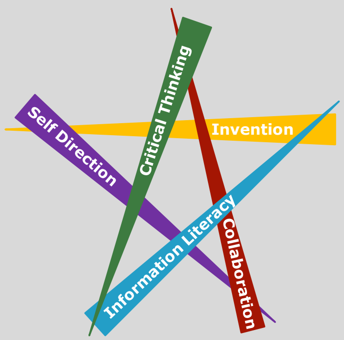
Colorado Teacher-Authored Sample Instructional Unit

Content Area	Mathematics	**Grade Level**	2nd Grade
Course Name/Course Code			

Standard	**Grade Level Expectations (GLE)**	**GLE Code**
1. Number Sense, Properties, and Operations	1. The whole number system describes place value relationships through 1,000 and forms the foundation for efficient algorithms	MA10-GR.2-S.1-GLE.1
	2. Formulate, represent, and use strategies to add and subtract within 100 with flexibility, accuracy, and efficiency	MA10-GR.2-S.1-GLE.2
2. Patterns, Functions, and Algebraic Structures	Expectations for this standard are integrated into the other standards at this grade level.	
3. Data Analysis, Statistics, and Probability	1. Visual displays of data can be constructed in a variety of formats to solve problems	MA10-GR.2-S.3-GLE.1
4. Shape, Dimension, and Geometric Relationships	1. Shapes can be described by their attributes and used to represent part/whole relationships	MA10-GR.2-S.4-GLE.1
	2. Some attributes of objects are measurable and can be quantified using different tools	MA10-GR.2-S.4-GLE.2

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Mathematical Practices:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Unit Titles	**Length of Unit/Contact Hours**	**Unit Number/Sequence**
Are You Odd or Even?	8 weeks	2

Unit Title	Are You Odd or Even?		**Length of Unit**	8 weeks
Focusing Lens(es)	Decision-making/Efficiency	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.2-S.1-GLE.2 MA10-GR.2-S.3-GLE.1 MA10-GR.2-S.4-GLE.1 MA10-GR.2-S.4-GLE.2	
Inquiry Questions (Engaging-Debatable):	• What is the best way (s) to add and subtract numbers? (MA10-GR.2-S.1-GLE.2-N.1) • What makes a strategy efficient?			
Unit Strands	Operations and Algebraic Thinking, Geometry, Measurement and Data, Personal Financial Literacy			
Concepts	Applications, financial decision-making, addition, sum (addends), subtraction, partitioning, odd/even, equal, word problems (adding to, taking from, putting together, taking apart, comparing), unknown, picture and bar graphs, data, fluency, properties of operations, number line diagram, whole numbers, lengths, line segments/points, differences/take-away, rectangular arrays, rows and columns, skip counting, partition, remainder, halves, equation			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing (MA10-GR.2-S.1-GLE.2-EO.a.i, a.ii)	What types of word problems are addition and subtraction word problems? What information do you need to solve a problem? What are strategies for learning addition and subtraction facts?	How do you know whether to use addition or subtraction to solve a problem? Why does fluency with addition and subtraction facts support success in mathematics?
Picture graphs and bar graphs represent data sets and provide means to solve addition and subtraction questions that involve put-together, take-apart, and comparison situations (MA10-GR.2-S.3-GLE.1-EO.a.iii)	What types of questions can you answer from a picture or bar graph?	How do we use information from a graph to solve problems?
A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number (MA10-GR.2-S.4-GLE.2-EO.b.ii)	How do you represent a whole number on a number line diagram? How is addition represented on a number line?	Why would you use a number line to solve addition problems?
A number line diagram can allow the computation of differences by facilitating both comparison and take away models of subtraction (MA10-GR.2-S.4-GLE.2-EO.b.ii)	What are two ways to represent subtraction on a number line?	Why would you use a number line to solve subtraction problems?

Skip counting the number in each row or the number in each column provides one way to determine the total number of objects arranged in rectangular arrays (rows and columns) (MA10-GR.2-S.1-GLE.2-EO.d.iii) and (MA10-GR.2-S.4-GLE.1-EO.c)	How can you show an equation for the total number of objects in an array?	Why is skip counting an efficient way to find the total number of objects in an array?
Even numbers halved into equal parts leave no remainders while odd numbers when split into two equal parts always leave a remainder of one (MA10-GR.2-S.1-GLE.2-EO.d.i, d.ii)	What does it mean for a number to be even? What does it mean for a number to be odd?	Why do both skip counting by two and being able to divide a number by two, with no remainder, help you determine if a number is even?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Use addition and subtraction within 100 to solve one and two step word problems involving situations of adding to taking from, putting together, taking apart and comparing with unknowns in all positions and represent the problem by using drawings and equations with a symbol for the unknown number (MA10-GR.2-S.1-GLE.2-EO.a.i)
- Apply addition and subtraction concepts to financial decision making (MA10-GR.2-S.1-GLE.2-EO.a.ii) *
- Fluently add and subtract within 20 using mental strategies (MA10-GR.2-S.1-GLE.2-EO.b, c)
- Determine whether a group of objects (up to 20) has an odd or even number of members (MA10-GR.2-S.1-GLE.2-EO.d.i)
- Write an equation to express an even number as a sum of two equal addends (MA10-GR.2-S.1-GLE.2-EO.d.ii)
- Partition a rectangle into rows and columns of same-size squares and count to find the total number of them (MA10-GR.2-S.4-GLE.1-EO.c)
- Use addition to find the total number of objects arranged in rectangular arrays with up to 5 row and up to 5 columns and write an equation to express the total as a sum of equal addends (MA10-GR.2-S.1-GLE.2-EO.d.iii)
- Represent whole numbers a lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, . . . (MA10-GR.2-S.4-GLE.2-EO.b.ii)
- Represent whole number sums and differences within 100 on a number line diagram (MA10-GR.2-S.4-GLE.2-EO.b.ii)
- Draw a picture graph and bar graph (with single unit scale) to represent a data set with up to four categories (MA10-GR.2-S.3-GLE.1-EO.a.ii)
- Solve simple put together, take-apart, and compare problems using information presented in picture and bar graphs (MA10-GR.2-S.3-GLE.1-EO.a.iii)

***Denotes connection to Personal Financial Literacy (PFL)**

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*I know the number 18 is even because I can divide it in half with no remainder and when I skip-count by twos starting at 0 I say the number 18.*
Academic Vocabulary:	Addition, subtraction, odd, even, equal, word problems, fluency, lengths, rows, columns, halves
Technical Vocabulary:	Picture graph, bar graph, number line diagram, line segments, points, differences, take away, rectangular arrays, skip-counting, partition, remainder, equation

Unit Description:	This unit focuses on applications of addition and subtraction within 20 and within 100. The students start off with solving word problems with the result unknown. Students then move to word problems with start and change unknowns and develop an understanding of how to use a number line to solve addition and subtraction problems. Students also connect picture and bar graphs to the concepts of addition and subtraction word problems. The culmination of this unit introduces early multiplicative ideas such as skip counting, arrays, and odds/evens.
Unit Generalizations	
Key Generalization:	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing
Supporting Generalizations:	Picture graphs and bar graphs represent data sets and provide means to solve addition and subtraction questions that involve put-together, take-apart, and comparison situations
	A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number
	A number line diagram can allow the computation of differences by facilitating both comparison and take away models of subtraction
	Skip counting the number in each row or the number in each column provides one way to determine the total number of objects arranged in rectangular arrays (rows and columns)
	Even numbers halved into equal parts leave no remainders while odd numbers when split into two equal parts always leave a remainder of one

Performance Assessment: *The capstone/summative assessment for this unit.*	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	You are mentoring a kindergarten student in your school about positive behavior invention supports. Students earn "smart bucks" in your school by being Safe, Motivated, an Achiever, Respectful and Team oriented and spend them in a school store. To help explain to kindergarten students how to earn and spend "smart bucks" you are going to keep a journal over the next eight weeks. Each week you will document the ways you earned and spent your smart bucks by creating addition and subtraction word problems.
Product/Evidence: (Expected product from students)	Students will create a journal that records how they earned and spent their smart bucks over the course of eight weeks. The journal could include: • A drawing showing how at least one "smart buck" is earned or spent each week • A number line each week, which starts with the total from the last week and shows how many smart bucks were earned and how many were spent during the week. • Number sentences for how many smart bucks were earned and how many were spent (e.g, 23-0 = 23, if students didn't spend any smart bucks) • A bar graph or pictograph showing the total smart bucks earned each week over the course of the six weeks

Differentiation: (Multiple modes for student expression)	Students can use visuals such as tally marks or pictures of smart bucks rather than using a number line. Students can create their bar graph on a bar graph template. Students can create a journal entry for each type of addition and subtraction word problem (e.g., adding to, taking from, putting together, taking apart, and comparing).

Texts for independent reading or for class read aloud to support the content

Informational/Non-Fiction	Fiction
	One Hundred Hungry Ants by Elinor J. Pinczes (Lexile level 650) *A Remainder of One* by Elinor J. Pinczes (Lexile level 570) *Even Steven and Odd Todd* by (Lexile level 410) *If you were an odd number* by Marcie Aboff (Lexile level 620) *If you were an even number* by Marcie Aboff (Lexile level 650) *Counting in the Ocean* by Rebecca Rissman (Lexile level 570) *Underwater Counting Even Number* by Jerry Pallotta and David Biedrzychi (Lexile level 730) *Tiger Math* by Ann Whitehead Nagda and Cindy Bickel (Lexile level 810) *Lemonade for sale* by Bettina Ling (Lexile level 380) *The Great Graph Contest* by Loreen Leedy (Lexile level 310)

Ongoing Discipline-Specific Learning Experiences

1.	Description:	Think/work like a mathematician – Engaging in the practice of modeling the solution to real world problems [Mathematical Practice 3]	Teacher Resources:	https://www.sites.google.com/a/cmpso.org/caccss-resources/k-8-modeling-task-force/k-8-modeling-resources (examples of modeling problems and resources for teachers on teaching and scoring them)
			Student Resources:	N/A
	Skills:	Model real world problems by using stated assumptions, mapping relationships with appropriate models, analyze relationships to draw conclusions, interpret results in relation to context, justify and defend the model, and reflect on whether results make sense	Assessment:	Modeling Problems Students utilize models (e.g., number lines and arrays) to represent and analyze relationships of real world problems to draw conclusions and interpret results in relation to the context of the problem.

2.	Description:	Think/work like a mathematician – Engaging in the practice of modeling the solution to real world problems [Mathematical Practice 4]	Teacher Resources:	https://www.sites.google.com/a/cmpso.org/caccss-resources/k-8-modeling-task-force/k-8-modeling-resources (examples of modeling problems and resources for teachers on teaching and scoring them)
			Student Resources:	N/A
	Skills:	Model real world problems by using stated assumptions, mapping relationships with appropriate models, analyze relationships to draw conclusions, interpret results in relation to context, justify and defend the model, and reflect on whether results make sense	Assessment:	Modeling Problems Students utilize models (e.g., number lines and arrays) to represent and analyze relationships of real world problems to draw conclusions and interpret results in relation to the context of the problem.
3.	Description:	Mathematicians fluently add and subtract	Teacher Resources:	http://www.mathematicallyminded.com/ (resources for centers or home activities in the free downloads section)
			Student Resources:	http://www.ixl.com/math/grade-2 (addition and subtraction questions) http://education.fcps.org/tps/SecondGradeOnlineMathGames (online math games) http://www.fisme.science.uu.nl/toepassingen/03373/ (speedy pictures designed to practice fluency) https://www.khanacademy.org/math/arithmetic/addition-subtraction (addition and subtraction questions)
	Skills:	Add and subtract within 20 and within 100 with unknowns in all positions	Assessment:	Fluency Problems Students build fluency adding and subtracting within twenty using mental strategies and within 100 using strategies based on place value understanding, properties of operations, and/or the relationship between addition and subtraction.

Prior Knowledge and Experiences

Student familiarity with join/separate addition and subtraction word problems will provide a strong for this unit. Students would also benefit from fluency with combinations to five and ten as a basis for building fluency with addition and subtraction facts.

Learning Experience # 1		
The teacher may model a matching activity so that students can use number relationships to practice addition and subtraction within 20. *Iconic*: Students can be provided with ten-frames and dot patterns and decide if they are equal or not equal to a given number. *Symbolic*: Students can be provided with addition/subtraction expressions and decide if they are equal or not to a given number.		
Teacher Notes:	This first learning experience assesses students' prior knowledge and comfort with number relationships within 20. The iconic and symbolic representations should focus on patterns such as making five, ten, subtracting through ten, doubles, doubles +1, and doubles -1. This learning experience can be used as the basis of number talks throughout the rest of the year to practice building fluency with basic facts by focusing on number patterns.	
Generalization Connection(s):	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing	
Teacher Resources:	http://www.jennyray.net/elementary-lessons.html (first grade lesson called number relationships, equal or not and the kindergarten lesson decomposing numbers provide templates for the matching activity) (http://www.insidemathematics.org/index.php/classroom-video-visits/number-talks) (video and description of number talks)	
Student Resources:	http://www.fisme.science.uu.nl/publicaties/subsets/rekenweb_en/ (speedy pictures game helps build fluency)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: What does it mean to be equal? How did you decide if an expression or image was equal to a number? What are three different ways to represent the number twelve? How does "making five" or "making ten" help you solve these types of problems? What strategies do you use when playing equal or not equal?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.jennyray.net/elementary-lessons.html (first grade lesson called number relationships, equal or not and the kindergarten lesson decomposing numbers provide templates for the matching game)	Students can find matches for numbers such as 5 or 10 for the first few rounds to build on the fluency skills from kindergarten and first grade
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.jennyray.net/elementary-lessons.html (first grade lesson called number relationships, equal or not and the kindergarten lesson decomposing numbers provide templates for the matching game)	Students can create matching cards for each number from 1 to 20
Key Knowledge and Skills:	• Fluently add and subtract within 20 using mental strategies	
Critical Language:	Make ten, make five, doubles, match, not match, equal, not equal, plus 1, minus 1, strategy	

Learning Experience # 2

The teacher may provide students with (twenty) counters so that students can explore making pairs and pairs plus one (evens and odds).

Enactive: Students can use counters to examine each number from one to twenty to determine if the number can be shared equally between two people.
Iconic: Students can represent each number from one to twenty on ten-frames (or two-row array) by showing pairings for even numbers and pairing plus one for odd numbers.
Symbolic: Students can write an equation showing each even number as a sum of doubles and each odd number as a sum of doubles plus one.

<table>
<tr><td>Teacher Notes:</td><td colspan="2">Students might notice that even numbers always end in 0, 2, 4, 6, and 8. Students should be able to explain this pattern based on the concept of even numbers as any numbers that can be evenly split into two groups and similarly with odd numbers as numbers that have a remainder of one when divided into two equal groups. This activity provides the basis for visualizing doubles and doubles +1 to support fluency with basic facts.</td></tr>
<tr><td>Generalization Connection(s):</td><td colspan="2">Even numbers halved into equal parts leave no remainders while odd numbers when split into two equal parts always leave a remainder of one</td></tr>
<tr><td>Teacher Resources:</td><td colspan="2">http://www.k-5mathteachingresources.com/ten-frames.html (ten frame templates)
http://www.mathworksheetsland.com/2/3evens.html (even and odd quick lesson)
http://ccssmath.org/?page_id=224 (even and odd activities)
https://sites.google.com/a/bryantschools.org/math-common-core-resource-site/home-1/2nd-grade-home/2-0a-3 (even and odd activities)
http://www.engageny.org/sites/default/files/resource/attachments/math-g2-m6-full-module.pdf (topic D for second grade module 6 is even and odd)</td></tr>
<tr><td>Student Resources:</td><td colspan="2">N/A</td></tr>
<tr><td>Assessment:</td><td colspan="2">Students mastering the concept and skills of this lesson should be able to answer questions such as:
What does it mean for a number to be even?
Why does it mean for a number to be odd?</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>N/A</td><td>Students can develop an explanation of how to determine if any number (e.g., numbers larger than twenty) is even or odd and share it with the class</td></tr>
<tr><td>Key Knowledge and Skills:</td><td colspan="2">• Determine whether a group of objects (up to 20) has an odd or even number of members
• Write an equation to express an even number as a sum of two equal addends</td></tr>
<tr><td>Critical Language:</td><td colspan="2">Even, odd, determine, explain, objects, doubles, pair, share, evenly, remainder of one</td></tr>
</table>

Learning Experience # 3

The teacher may use addition flash cards so that students can extend their fluency with addition facts by connecting number relationships to visuals.

Enactive: Students can work with a partner to divide the addition facts into three piles: known facts, counting strategy facts or unknown facts.

Iconic: Students can create an image (e.g., ten frame, finger pattern, dot pattern) for each fact in their counting or wrong answer piles.

Symbolic: Students can write at least one expression for each fact in their counting or wrong answer piles that will help them find the find the answer without counting (e.g., 5 + 6 = 5 + 5 +1), expressions can use ideas such as making five, ten, and doubles.

Teacher Notes:	Students can write their images and expressions on their back of the flash cards. These flash cards can then be used to practice fluency with addition throughout the unit and the entire year. Initially students can describe the image they are visualizing and or the expression they could use to find the right answer. By focusing on relationships students will build the mental pathways for building fluency. It may also be helpful for students to pair related facts together when they are practicing them. For instance, if they are fluent with 5+6 but not 6+5 they can work on these related problems together. Or if they struggle with both 5+6 and 6+5 they can work on 5+5 and 6+6 in a batch of cards. Working on just a few related cards at a time can make the task of building fluency seem manageable for students. This learning experience will be revisited later in the unit with subtraction facts.	
Generalization Connection(s):	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing	
Teacher Resources:	http://www.printableflashcards.net/ (printable flashcards) http://www.k-5mathteachingresources.com/ten-frames.html (ten frames and dot cards)	
Student Resources:	http://www.fisme.science.uu.nl/publicaties/subsets/rekenweb_en/ (speedy pictures game helps build fluency) http://www.fun4thebrain.com/addition_all.html (addition fact games) http://www.sheppardsoftware.com/mathgames/popup/popup_addition.htm (addition games)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: Which number facts are the hardest for you? Why? Which are the easiest? Why? How can a visual image help you solve an unknown fact? How can you use known facts to find unknown facts? Why is counting an inefficient strategy?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.printableflashcards.net/ (printable flashcards) http://www.k-5mathteachingresources.com/ten-frames.html (ten frames and dot cards)	Students can work initially on building fluency for basic facts to ten rather than twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://learnzillion.com/lessons/1528-identify-patterns-on-an-addition-chart (video looking at number patterns on an addition chart)	Students can find number patterns on an addition chart and present create posters to hang around the room for each of the number patterns they find

Key Knowledge and Skills:	• Fluently add and subtract within 20 using mental strategies
Critical Language:	Addition facts, inefficient, efficient, known, unknown, counting, image, expression, pattern, relationship

Learning Experience # 4	
The teacher may demonstrate how to play a number-line game (e.g., the "jump jump" game) so that students can explore the elements of a number line by locating numbers. *Enactive*: Students can use a bead string (e.g., http://mathrack.com/beadStrings.html) to jump from zero to any two-digit number using forward and backward jumps of 1, 10 and 100. *Iconic*: Students can draw open number lines (e.g., http://www.k-5mathteachingresources.com/empty-number-line.html) to jump from zero to any two-digit number using forward and backward jumps of 1, 10 and 100. *Symbolic*: Students can write number stings that correspond to the jumps they made on the number line (e.g., 10 + 10 + 10 – 1 –1 = 28, would represent three jumps of ten forward and two jumps of one backwards).	
Teacher Notes:	When playing the jump jump game students often struggle with the idea of jumping past a number and then jumping backwards to that number. By making it a game to see who can jump to a number using the least number of jumps it encourages students to look for more efficient strategies when using a number line. This efficiency is key when using number lines to solve addition and subtraction problems. This game can be revisited throughout the unit and as students grow comfortable with jumping they can jump by numbers other than 1, 10 and 100. When students move to an open number line their spacing of the 1, 10 and 100 will not be consistent. It is important to discuss how their representation is imprecise but because it is a tool to help them think the inaccuracy in jump sizes are fine. This is one of the reasons to start with the bead strings where the beads ensure the jump sizes are consistent before moving to the less precise but more efficient number line.
Generalization Connection(s):	A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number
Teacher Resources:	http://www.mrhsd.org/userfiles/files/learnathome/Family_Math_Packet.pdf (directions for the jump jump game) http://www.k-5mathteachingresources.com/empty-number-line.html (explanation of empty number lines and methods for introducing number lines to students) http://themathworksheetsite.com/cgi-bin/numline.pl (creating a number line) http://stepintosecondgrade.blogspot.com/2011/09/little-of-this-and-little-of-that.html (can you guess my number game using a number line) http://www.superteacherworksheets.com/number-lines.html (printable number lines)
Student Resources:	N/A
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: How is a ruler similar to a number line? How is a bead string similar or different from a number line? Where is zero on a number line? Where is zero on a bead string? Why is it sometimes better (more efficient) to jump past a number first and then jump back to it?

	How is a jump of 1 different from a jump of 10? How is a jump of 10 different from a jump of 100? What other numbers would you want to jump by besides 1, 10, and 100?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.k-5mathteachingresources.com/math-resources.html (number line template from 0 to 20)	Students can locate numbers on a closed number line from zero to twenty making jumps of ones and tens
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	Students can locate a number by making jumps of ones, twos, fives tens and hundreds Students can start at a number other than zero and make jumps to another number
Key Knowledge and Skills:	• Represent whole numbers a lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, . . . • Represent whole number sums and differences within 100 on a number line diagram	
Critical Language:	Number line, ruler, bead string, zero, skip count, equally spaced units, jumps, forwards, backwards, precision	

Learning Experience # 5	
The teacher may model addition using a number line so that students can explore how a number line can provide a way to solve “add to” word problems with result unknowns (within 100). *Enactive*: Students can use bead strings to model and solve “add to” problems. *Iconic*: Students can use an open number line to model and solve “add to” problems and write the size and direction of the jump above the jumps (e.g., +10 or -2). *Symbolic*: Students can write equations for the “add to” problems they modeled on number lines (e.g., 32 + 15 = 47 or 47 = 32 + 15).	
Teacher Notes:	After playing the jump jump game in the previous learning experience students may think they can only jump by 1, 10 and 100 but students should be encouraged to make a jump of any size with which they have comfort or fluency. Initially, students may want to only break apart one number at a time rather than both. For example, they might start with the number 32 and then add 10 and five 1’s to arrive at 47. Allow students to use a variety of strategies and discuss with students the accuracy and efficiency of strategies. It may help to post around the room a variety of strategy types students create. Students may also believe they need to start at zero. The goal of the jump jump game was for students to gain confidence is locating numbers on a number line. As students to move to other types of problems it will be helpful if they can gain comfort in starting at any number and not just zero.
Generalization Connection(s):	A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing

Teacher Resources:	https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.1 (examples of all types of addition and subtraction word problems, look for addition result unknown problems for this learning experience) http://www.k-5mathteachingresources.com/empty-number-line.html (explanation and resources for using empty number lines to solve addition and subtraction problems) http://ccssmath.org/?page_id=260 (five activities for the number line) www.engageny.org/resource/grade-2-mathematics-module-2 (unit about addition and subtraction for second graders)	
Student Resources:	http://www.sheppardsoftware.com/mathgames/earlymath/fruit_shoot_NumberLine.htm (number line game matching number lines to basic addition problems) http://www.ictgames.com/addition.htm (number line games)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: How can you use a number line to solve "add to" word problems? Why is a number line a helpful tool when solving word problems? What is the most difficult part of using a number line? When solving an addition problem on number line where do you start? Why? What size jumps are you comfortable making on a number line? How can you use strategies such as making ten or jumping by ten to solving addition problems on a number line? What other strategies do you use to solving addition problems on a number line?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.k-5mathteachingresources.com/math-resources.html (number line template from 0 to 20)	Students can solve "add to" result unknown problems on a closed number line for quantities within twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	N/A
Key Knowledge and Skills:	• Represent whole numbers a lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, . . . • Represent whole number sums and differences within 100 on a number line diagram • Use addition and subtraction within 100 to solve one and two step word problems involving situations of adding to taking from, putting together, taking apart and comparing with unknowns in all positions and represent the problem by using drawings and equations with a symbol for the unknown number • Apply addition and subtraction concepts to financial decision making	
Critical Language:	Number line, ruler, bead string, zero, skip count, equally spaced units, jumps, forwards, backwards, precision, counting on, equal sign, addition, addends, sum	

Learning Experience # 6		
The teacher may use subtraction flash cards so that students can extend their fluency with subtraction facts by connecting number relationships to visuals. *Enactive*: Students can work with a partner to divide the subtraction facts into three piles: known facts, counting strategy facts or unknown facts. *Iconic*: Students can create an image (e.g., ten frame, finger pattern, dot pattern) for each fact in their counting or wrong answer piles. *Symbolic*: Students can write at least one expression for each fact in their counting or wrong answer piles that will help them find the find the answer without counting, these can be addition or subtraction expressions (e.g., 11 - 6 = 11 – 1 – 5 or 11-6 is related to 5+5+1).		
Teacher Notes:	Students can write their images and expressions on their back of the flash cards. These flash cards can then be used to practice fluency with subtraction throughout the unit and the entire year. Initially students can describe the image they are visualizing and or the expression they could use to find the right answer. By focusing on relationships students will build the mental pathways for building fluency. It may also be helpful for students to pair related facts together when they are practicing them. Working on just a few related cards at a time can make the task of building fluency seem manageable for students.	
Generalization Connection(s):	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing	
Teacher Resources:	http://www.printableflashcards.net/ (printable flashcards) http://www.k-5mathteachingresources.com/ten-frames.html (ten frames and dot cards)	
Student Resources:	http://www.fisme.science.uu.nl/publicaties/subsets/rekenweb_en/ (speedy pictures game helps build fluency) http://www.fun4thebrain.com/addition_all.html (addition fact games) http://www.sheppardsoftware.com/mathgames/popup/popup_addition.htm (addition games)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: Which number facts are the hardest for you? Why? Which are the easiest? Why? How can a visual image help you solve an unknown fact? How can you use known facts to find unknown facts? Why is counting an inefficient strategy?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.printableflashcards.net/ (printable flashcards) http://www.k-5mathteachingresources.com/ten-frames.html (ten frames and dot cards)	Students can work initially on building fluency for basic facts to ten rather than twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://learnzillion.com/lessons/1528-identify-patterns-on-an-addition-chart (video looking at number patterns on an addition chart)	Students can find number patterns on an addition chart and create posters to hang around the room for each of the number patterns they find which help build fluency with subtraction
Key Knowledge and Skills:	• Fluently add and subtract within 20 using mental strategies	
Critical Language:	Addition facts, inefficient, efficient, known, unknown, counting, image, expression, pattern, relationship	

Learning Experience # 7	
The teacher may model subtraction using a number line so that students can explore how a number line can provide a way to solve "take from" word problems with result unknowns (within 100). *Enactive*: Students can use bead strings to model and solve "take from" problems. *Iconic*: Students can use an open number line to model and solve "take from" problems and write the size and direction of the jump above the jumps (e.g., +10 or -2). *Symbolic*: Students can write equations for the "take from" problems they modeled on number lines (e.g., 47-32=15 or 15 = 47-15).	
Teacher Notes:	The word problems in this learning experience should focus on the action of taking away. Take from word problems naturally lead to a strategy of beginning with the minuend and counting down or taking away the subtrahend to land at the difference on the number line. The next learning experience focuses on compare problems which naturally lead to finding the distance between the subtrahend and minuend. An example of each type of subtraction problem on a number line is on the following website (http://www.k-5mathteachingresources.com/empty-number-line.html), the first two-digit subtraction problem shows a compare problem while the second shows a take from problem. Students may use either strategy but it is important they understand both models of subtraction on a number line. This provides the basis for understanding concepts such as integer subtraction at the middle school level.
Generalization Connection(s):	A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing
Teacher Resources:	https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.1 (examples of all types of addition and subtraction word problems, look for addition result unknown problems for this learning experience) http://learnzillion.com/lessons/2856-solve-subtraction-story-problems-using-an-open-number-line (video showing the use of number lines for subtraction story problems) http://www.k-5mathteachingresources.com/empty-number-line.html (explanation and resources for using empty number lines to solve addition and subtraction problems) http://ccssmath.org/?page_id=260 (five activities for the number line) www.engageny.org/resource/grade-2-mathematics-module-2 (unit about addition and subtraction for second graders)
Student Resources:	https://www.sheppardsoftware.com/mathgames/earlymath/FS_NumberLine_minus.htm (number line game matching number lines to basic addition problems) http://www.ictgames.com/addition.htm (number line games)
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: How can you use a number line to solve "take from" word problems? Why is a number line a helpful tool when solving word problems? What is the most difficult part of using a number line? When solving a subtraction problem on number line where do you start? Why? How can you use strategies such as making ten or jump by ten to solving subtraction problems on a number line? What other strategies do you use to solve subtraction problems on a number line?

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.k-5mathteachingresources.com/math-resources.html (number line template from 0 to 20)	Students can solve "take from" result unknown problems on a closed number line for quantities within twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	N/A
Key Knowledge and Skills:	• Represent whole numbers a lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, . . . • Represent whole number sums and differences within 100 on a number line diagram • Use addition and subtraction within 100 to solve one and two step word problems involving situations of adding to taking from, putting together, taking apart and comparing with unknowns in all positions and represent the problem by using drawings and equations with a symbol for the unknown number • Apply addition and subtraction concepts to financial decision making	
Critical Language:	Number line, ruler, bead string, zero, skip count, equally spaced units, jumps, forwards, backwards, precision, counting back, take away, equal sign, subtraction, difference, subtrahend, minuend	

Learning Experience # 8	
The teacher may model solving subtraction problems using a number line so that students can explore using a number line to solve compare word problems with result unknowns (within 100). *Enactive*: Students can use bead strings to model and solve compare word problems. *Iconic*: Students can use an open number line to model and solve compare word problems and write the size and direction of the jump above the jumps (e.g., +10 or -2). *Symbolic*: Students can write equations for the compare word problems they modeled on number lines (e.g., 47-32=15 or 15 = 47-15)	
Teacher Notes:	The word problems in this learning experience should focus on compare word problems. Compare word problems naturally lead to a strategy of beginning with the subtrahend and counting up to the minuend or vice versa. The difference or answer in both cases is the distance on the number line between the two numbers. This is also a great time to introduce the concept of counting back money. Before we had cash registers that calculated change, sales clerks would start at the cost of the item and count up to the amount given. This can be easily modeled on a number line using the compare or difference model. An example of each type of subtraction problem on a number line is on the following website (http://www.k-5mathteachingresources.com/empty-number-line.html), the first two-digit subtraction problem shows a compare problem while the second shows a take from problem. Students may use either strategy but it is important they understand both models of subtraction on a number line. This provides the basis for understanding concepts such as integer subtraction at the middle school level.
Generalization Connection(s):	A number line diagram can represent whole numbers and sums of numbers by facilitating the combination of line segments as lengths starting from 0 with equally spaced points corresponding to each whole number Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing

Teacher Resources:	https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.1 (examples of all types of addition and subtraction word problems, look for addition result unknown problems for this learning experience) http://learnzillion.com/lessons/2856-solve-subtraction-story-problems-using-an-open-number-line (video showing the use of number lines for subtraction story problems) http://www.k-5mathteachingresources.com/empty-number-line.html (explanation and resources for using empty number lines to solve addition and subtraction problems) http://ccssmath.org/?page_id=260 (five activities for the number line) www.engageny.org/resource/grade-2-mathematics-module-2 (unit about addition and subtraction for second graders)	
Student Resources:	https://www.sheppardsoftware.com/mathgames/earlymath/FS_NumberLine_minus.htm (number line game matching number lines to basic addition problems) http://www.ictgames.com/addition.htm (number line games)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: How can you use a number line to solve compare word problems? What are two different ways to use a number line to solve a subtraction problem? Which is easier for you? Why? When solving a subtraction problem on number line where do you start? Why? How can you use subtraction and a number line to find the amount of your change when you go shopping?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.k-5mathteachingresources.com/math-resources.html (number line template from 0 to 20)	Students can solve "take from" result unknown problems on a closed number line for quantities within twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	N/A
Key Knowledge and Skills:	• Represent whole numbers a lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, . . . • Represent whole number sums and differences within 100 on a number line diagram • Use addition and subtraction within 100 to solve one and two step word problems involving situations of adding to taking from, putting together, taking apart and comparing with unknowns in all positions and represent the problem by using drawings and equations with a symbol for the unknown number • Apply addition and subtraction concepts to financial decision making	
Critical Language:	Number line, ruler, bead string, zero, skip count, equally spaced units, jumps, forwards, backwards, precision, counting back, counting on, compare, take away, equal sign, subtraction, change, distance, difference, subtrahend, minuend	

Learning Experience # 9		
The teacher may provide a variety of one and two step word problems with unknowns in all positions so that students can explore different ways to represent problems. *Enactive/Iconic*: Students can use a variety of models (e.g., number lines, drawings, blocks, bead strings) to solve one and two step word problems. *Symbolic*: Students can write equations for the word problems they solved using a symbol to represent the unknown problem (e.g., 43 = ? + 30; 22 + ? = 88).		
Teacher Notes:	The previous two learning experience were designed to promote the use of the number line, an important tool as students move to numbers such as fractions and integers. In this learning experience students are given the opportunity to solve problems using any model but during class discussions it may be helpful to continue to emphasize number line strategies. In subsequent units students build fluency with place value strategies for adding and subtracting, strategies that emphasize decomposing numbers into tens and hundreds, so making tens and hundreds will support this work. Also, students often conceive of the equal sign as the "answer comes next" this learning experience is an opportunity to emphasize how the equal sign shows equal quantities. Throughout this learning experience be sure to include problems that require students to use addition and subtraction to make personal financial decisions.	
Generalization Connection(s):	Applications of addition and subtraction, represented in word problem contexts, involve adding to, taking from, putting together, taking apart, and comparing	
Teacher Resources:	https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.1 (two and one step word problems) http://cgi-math.pbworks.com/w/page/5500588/Story%20Problems%20to%20Share (examples of one step word problems) http://www.k-5mathteachingresources.com/2nd-grade-number-activities.html (activities for start and change unknown problems) www.engageny.org/resource/grade-2-mathematics-module-2 (unit about addition and subtraction for second graders)	
Student Resources:	N/A	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: Which types of problems were easiest for you to solve? Why? Which types of problems were hardest for you to solve? Why? How does solving a start unknown problem differ from a change or result unknown problem?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	Students can solve one type of word problem (e.g., change unknown add to problems) at a time and focus first on one-step problems Students can solve word problems for quantities within twenty
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://cgi-math.pbworks.com/w/page/5500588/Story%20Problems%20to%20Share (examples of one step word problems)	Students can create word problems for each problem type Students can solve word problems for each problem type using a number line as a model to share with other students in a book or poster format

Key Knowledge and Skills:	• Use addition and subtraction within 100 to solve one and two step word problems involving situations of adding to taking from, putting together, taking apart and comparing with unknowns in all positions and represent the problem by using drawings and equations with a symbol for the unknown number • Apply addition and subtraction concepts to financial decision making
Critical Language:	Word problems, unknown, symbol, addition, subtraction, equation, equal sign

Learning Experience # 10		
The teacher may model how to make picture and bar graphs so that students can explore graphical representations of data and related addition and subtraction problems. *Enactive*: Students can collect and sort data (e.g., the color of cars in the school parking lot). *Iconic*: Students can create a picture and bar graph to represent the data they collected. *Symbolic*: Students can create and solve addition and subtraction word problems based on their picture and bar graphs.		
Teacher Notes:	The previous learning experiences have introduced to students a variety of word problems. In this learning experience students have the opportunity to create their own word problems and share them with other students. When students solve the word problems they should continue to practice writing equations using a symbol to represent the unknown in the problem.	
Generalization Connection(s):	Picture graphs and bar graphs represent data sets and provide means to solve addition and subtraction questions that involve put-together, take-apart, and comparison situations	
Teacher Resources:	http://ccssmath.org/?page_id=268 (activities related to pictographs and bar graphs)	
Student Resources:	http://www.ixl.com/math/grade-2 (data and graphs from R1 to R10), http://www.internet4classrooms.com/skill_builders/graphs_charts_diagrams_math_second_2nd_grade.htm (skill builders for bar graphs)	
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: How are picture and bar graphs similar and different? What types of questions can you answer from a picture or bar graph? How can you use information from a graph to solve problems? How is a bar graph similar to a number line?	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://www.mathworksheetsland.com/topics/graphing/makingbargraphsset.html (templates and directions for creating bar graphs) http://www.mathworksheetsland.com/topics/graphing/makingpictographsset.html (templates and directions for creating picture graphs)	Students can create bar graphs and picture graphs using templates
	http://nces.ed.gov/nceskids/createagraph/default.aspx (online graph tutorial)	Students can create their own bar graph and picture graph from using online graphing tools

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	Students can create picture and bar graphs with scales other than one (e.g., each car represents 2 cars or a frequency scale of 10)
Key Knowledge and Skills:	• Draw a picture graph and bar graph (with single unit scale) to represent a data set with up to four categories • Solve simple put together, take-apart, and compare problems using information presented in picture and bar graphs	
Critical Language:	Horizontal, vertical, survey, tally marks, results, labels, sort, data, chart, symbols, math key, collect, interpret, comparing	

Learning Experience # 11	
The teacher may provide counters (e.g., tiles, chips) and dividers (e.g., pieces of string) so that students can explore how to create and partition arrays (rows and columns). *Enactive*: Students can create grids by rolling a number cube and creating one row using counters then rolling the number cube again to determine how rows of counters to line up under the first row. Students can then use string to represent the row and column divisions. *Iconic*: Students can represent their arrays on paper by drawing lines through a rectangle to create rows and columns. Students can then represent the number of squares in the rectangle by skip counting on a number line the amount in each row. *Symbolic*: Students can write a repeated addition equation (e.g., 2 + 2 + 2 = 6) to find the total number of objects.	
Teacher Notes:	Students should notice that the pieces of string is the same as the number of lines they need to draw in a rectangle to partition into the same number of rows and columns. They may also notice the number of lines is always one less than the number of columns and one less than the number of rows. Students will want to stay consistent in the way they skip count and write their equations. In this situation they skip counted by the number in each row and thus the equation should also be a repeated addition of the rows.
Generalization Connection(s):	Skip counting the number in each row or the number in each column provides one way to determine the total number of objects arranged in rectangular arrays (rows and columns)
Teacher Resources:	https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.4 (array tasks and description of possible misconceptions) https://sites.google.com/a/bryantschools.org/math-common-core-resource-site/home-1/2nd-grade-home/2-0a-4 (activities for teaching arrays) http://www.mathworksheetsland.com/2/4addob.html (worksheets for arrays)
Student Resources:	http://www.internet4classrooms.com/skill_builders/counting_math_second_2nd_grade.htm (skip counting games) http://www.ixl.com/math/grade-2 (skip counting activities)
Assessment:	Students mastering the concept and skills of this lesson should be able to answer questions such as: What is the fastest way to find the total number of objects in an array? Why is skip counting important? How can you show an equation for the total number of objects in an array? What is a row? What is a column?

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide grid paper to support the creation of arrays	Students can create arrays on grid paper to support the row and column structure
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide 12 tiles to make arrays	Students can create as many arrays as possible with 12 tiles and write the corresponding equations Students can write a variety of equations using both addition and multiplication to represent the total number of objects in the array (e.g., 2 + 2 + 2 = 6; 3 + 3 = 6; 2 x 3 = 6)
Key Knowledge and Skills:	• Use addition to find the total number of objects arranged in rectangular arrays with up to 5 row and up to 5 columns and write an equation to express the total as a sum of equal addends • Partition a rectangle into rows and columns of same-size squares and count to find the total number of them	
Critical Language:	Array, row, column, equation, skip counting, repeated addition, number line, rectangle	