

At RPDP, we support educators through professional development. Professional development can occur in a variety of ways: Entire staff trainings, grade level meetings, one-on-one support, etc. We collaborate with administrators and teachers regarding the developing and strengthening math content knowledge, use of best practices in the classroom, we model lessons, and provide support for the use of quality instructional materials.

Providing educators with quality resources in regards to instructional materials is a continuous priority. We provide this support through math content overviews, the use of instructional materials, further practice/skill development materials, and through quality assessments/tasks. As we work to create these resources for educators, we may recommend other quality resources from time to time.

In recent years, some states have received funds to create quality instructional materials for ALL educators for ALL states to access. We have selected some of those materials that we believe support our vision of quality instructional materials that support teachers in providing a solid mathematical foundation for students. For more elementary math resources please visit [Rpdp.net](http://Rpdp.net).





# Representing Addition and Subtraction

## Math/Kindergarten

**Summary:** This unit is an introductory unit designed to enable Kindergarteners to explore how to represent addition and subtraction as a prerequisite to solving addition and subtraction story problems. In the beginning, the focus will be to simply learn to represent addition and subtraction. Once understood and practiced, the focus will shift to solving story problems with addition and subtraction. The work done in the latter part of this unit will lay a foundation for understanding the inverse relationship between addition and subtraction. It is important to note that it is not the intent of this unit for students to gain mastery of solving story problems involving addition and subtraction, as will require ongoing work and conceptual development throughout the year. The ability to represent mathematical thinking will serve students both in problem solving and in communication of reasoning. Students will learn the vocabulary of addition as putting together and that of subtraction as taking away. They will learn to represent addition and subtraction situations using sounds, drawings, and objects. Students will learn to represent addition and subtraction using the part-part-whole diagram and a ten frame. Prompted by the mathematics of children's literature, students will experience acting out situations involving addition and subtraction. Students will also practice representing addition and subtraction stories on a life size number line as well as a desk top number line. Teachers may need to provide extra practice for students as needed. Finally, students will represent addition and subtraction in the context of a store within the dramatic play center of the classroom. This unit consists of 8 lessons and 2 CEPAS and is designed to take approximately 2-3 weeks.

*These Model Curriculum Units are designed to exemplify the expectations outlined in the MA Curriculum Frameworks for English Language Arts/Literacy and Mathematics incorporating the Common Core State Standards, as well as all other MA Curriculum Frameworks. These units include lesson plans, Curriculum Embedded Performance Assessments, and resources. In using these units, it is important to consider the variability of learners in your class and make adaptations as necessary.*



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## Table of Contents

Stage 1 Desired Results .....	3
Stage 2 – Evidence .....	3
Stage 3 – Learning Plan .....	4
Lesson #1 Listening to Numbers - Addition .....	6
Lesson #2 Representing Addition with Part, Part, Whole.....	12
Lesson #3 Storybook Math - Addition.....	17
Lesson # 4 Addition on the Number Line.....	23
Curriculum Embedded Performance Assessment #1 (CEPA).....	29
Lesson #5 Storybook Math - Subtraction.....	34
Lesson #6 Listening to Numbers - Subtraction .....	40
Lesson #7 Representing and Solving Subtraction Problems Using a Crossing Out Strategy.....	46
Lesson # 8 Subtraction on the Number Line.....	52
Curriculum Embedded Performance Assessment #2 (CEPA).....	58



## Stage 1 Desired Results

<p><b>ESTABLISHED GOALS</b> <span style="float: right;"><b>G</b></span></p> <p><b>KOA1</b> Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g.,claps), acting out situations, verbal situations, expressions, or equations.</p> <p><b>KOA2</b> Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.</p> <p><b>SMP1</b> Make sense of problems and persevere in solving them.</p> <p><b>SMP4</b> Model with mathematics.</p> <p><b>SMP7</b> Look for and make use of structure.</p> <p><b>SLK.5</b> Add drawings or other visual displays to descriptions when appropriate to clarify ideas and feelings clearly.</p> <p><b>SLK.6.</b> Speak audibly and express thoughts, feelings, and ideas clearly.</p>	<i>Transfer</i>	
	<i>Students will be able to independently use their learning to...</i> <span style="float: right;"><b>T</b></span>	
	<i>Meaning</i>	
	<p><b>UNDERSTANDINGS</b> <span style="float: right;"><b>U</b></span></p> <p><i>Students will understand that...</i></p> <p><b>U1</b> Adding is putting quantities together.</p> <p><b>U2</b> Subtracting is taking quantities apart.</p> <p><b>U3</b> Addition and subtraction problems can be modeled and solved using various representations.</p>	<p><b>ESSENTIAL QUESTIONS</b> <span style="float: right;"><b>Q</b></span></p> <p><b>Q1</b> How can we show how many we have in all when we add two numbers?</p> <p><b>Q2</b> How can we show how many we have left when we subtract two numbers?</p> <p><b>Q3</b> What strategies can we use to show how many we have?</p> <p><b>Q4</b> How can pictures or tools help us to solve problems?</p>
	<i>Acquisition</i>	
	<p><i>Students will know...</i> <span style="float: right;"><b>K</b></span></p> <p><b>K1</b> Addition is combining two or more groups quantities to make a larger quantity.</p> <p><b>K2</b> Subtraction is taking away one quantity from another quantity to make a smaller quantity.</p> <p><b>K3</b> Adding zero to a quantity does not change the quantity.</p> <p><b>K4</b> Academic vocabulary: put together, take apart, more than, less than, equal to, quantity, and count.</p>	<p><i>Students will be skilled at...</i> <span style="float: right;"><b>S</b></span></p> <p><b>S1</b> Creating models to represent a real world problems involving addition or subtraction.</p> <p><b>S2</b> Explaining and modeling their mathematical thinking orally or in drawings.</p> <p><b>S3</b> Using basic mathematical vocabulary to explain their reasoning about mathematics.</p>

## Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence
<p>Part 1</p> <ul style="list-style-type: none"> <li>Able to count out the total number of pennies for both items purchased</li> </ul>	<p>CURRICULUM EMBEDDED PERFORMANCE ASSESSMENT (PERFORMANCE TASKS) <span style="float: right;"><b>PT</b></span></p> <p>Part 1</p> <p>In the first CEPA, a school store setting is set up as a dramatic play center of the classroom. The</p>



<p>Part 2</p> <ul style="list-style-type: none"> <li>• Able to represent the addition situation</li> <li>• Able to use strategies to find the total amount and the difference.</li> <li>• Able to represent the subtraction situation.</li> </ul>	<p>store is stocked with basic school supplies. In the first case, the student plays the role of the cashier while the teacher plays the role of the customer. The job of the customer is to select two items to purchase. The job of the cashier is to determine the total amount and to represent the transaction on the receipt. The teacher is to observe and record evidence that the student can count the correct number of pennies for each item, count the total amount due, and represent the transaction on the part-part diagram.</p> <p>Part 2</p> <p>In the second CEPA, the teacher and student will reverse roles. The teacher will be the customer while the student plays the cashier. The student will be requested to determine the cost of the item when a coupon is used. The teacher is to observe and record evidence that the student can subtract the amount of the coupon, and represent the transaction on a receipt.</p>
	<p><b>OTHER EVIDENCE:</b>  Student sample work <span style="float: right;">OE</span>  Anecdotal notes</p>

## Stage 3 – Learning Plan

### *Summary of Key Learning Events and Instruction*

This unit is an introductory unit designed to enable Kindergarteners to explore how to represent addition and subtraction as a prerequisite to solving addition and subtraction story problems, and a prerequisite to understanding the inverse relationship between addition and subtraction.

1. **Listening to Numbers:** This lesson provides an auditory opportunity for students to internalize addition as putting together, and to represent what they understand about an addition situation using a part-part mat.
2. **Representing with Part- Part-Whole:** This lesson builds upon the previous lesson by extending the representation to include the total. Students will learn to count on, building on putting together and counting to find the total. Students are given the opportunity to write the numbers to show addition expressions and equations.
3. **Storybook Math - Addition:** This lesson, based on the book Quack and Count, takes students to the “apply” level. It is a time for students to take what they know about addition and make sense of contextual stories in an engaging piece of literature.
4. **Addition on the Number Line:** Here, students will be asked to connect a story situation about adding to a new diagram, the number line. Students will be called upon to make sense of addition on the number line in a kinesthetic way. First, it will be explored with a life size number line with the whole group. Then, it will be explored with desk size number lines with partners.

CEPA 1 School Store, Addition: This is the time to meet with students individually to find out what they understand about addition and how to represent it. While the CEPA requires individual interviews by the teacher, other students can be meaningfully engaged in station work



according to need. This is simply a brief assessment opportunity, not a time to teach.

5. Storybook Math, Subtraction: Much like the earlier storybook lesson, this lesson capitalizes on children's literature. Ten Little Monkeys Jumping on the Bed is used to engage students in the process of making sense of subtraction as taking away. Based on story prompts, students will be guided to represent subtraction situations with actions, fingers, drawings, and numbers.
6. Listening to Numbers, Subtraction: This lesson revisits the auditory opportunity for students to understand and represent subtraction as taking away. Students will be called upon to use what they know about previously learned representations to show how subtraction works. Students who show readiness will demonstrate what they know about the inverse relationship between addition and subtraction.
7. Representing and Solving Subtraction Problems Using a Crossing Out Strategy- In this lesson, many previous skills and concepts converge. Students will first use concrete representations followed by abstract representations to model subtraction. Students will show whether they can count back to solve, decompose to solve, use addition as it relates to subtraction to solve, or if they still have an underdeveloped concept of subtraction.
8. Subtracting on the Number Line

CEPA 2 School Store, Subtracting: This culminating CEPA is a time to meet with students individually to determine what they understand about subtraction and how to represent it. While students have been explicitly taught during the second half of the unit to solve problem situations using subtraction, some students may reveal an understanding of addition as an inverse way to solve a subtraction problem. Again, this is a time to assess for understanding, not to teach.

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# Lesson #1 Listening to Numbers - Addition

**Brief Overview of Lesson:** The focus of this lesson is for students to learn how to model “putting together” problem solving situations. The students will listen to sounds and represent the sounds with cubes (counters or manipulatives) on a part-part mat. The students will count the manipulatives to show putting together. The combinations of the (part/part) addends will have sums up to 10.

As you plan, consider the variability of learners in your class and make adaptations as necessary.

## Prior Knowledge Required:

PK.CC MA.1 Listen to and say the names of numbers in meaningful contexts.

PK.CC MA.2 Recognize and name written numerals 0-10.

PK.CC MA.3 Understand the relationships between numerals and quantities up to 10.

PK.CC MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count a many as seven things in scattered configuration.

PK.CC MA.5 Use comparative language, such as *more/less than*, *equal to*, to compare and describe collections of objects.

PK.OA MA.1 Use concrete objects to model real world addition (putting together) and subtraction (taking away) problems up through five.

MA.2. b.Count, pronounce, blend, and segment syllables in spoken words.

**Estimated Time (minutes):** 50-60 minutes

**Resources for Lesson:** Counters, part-part mats (template at end of unit)



## Lesson #1: Listening to Numbers

**Estimated Time (minutes):** 50-60 minutes

**Overview of the Lesson:** The focus of this lesson is for students to learn how to model “putting together” problem solving situations. The students will listen to sounds and represent the sounds with cubes (counters or manipulatives) on a part-part mat. The students will count the manipulatives to show putting together. The combinations of the (part/part) addends will have sums up to 10.

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

**K.OA.1** 1. Represent addition and subtraction with objects, fingers, mental images, drawings<sup>1</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.

**K.OA.1** 2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1:** Make sense of problems and persevere in solving them

**SMP4:** Model with mathematics

**Essential Question(s) addressed in this lesson:**

- How can we show how many we have in all when we add two numbers?
- What strategies can we use to show how many we have?
- How can pictures or tools help us to solve problems?

**Objectives** Students will be able to represent numbers and show putting together with models, expressions or equations.

**Language Objectives**

- Students will use the targeted academic language- count, add, more, number, put together- to ask or answer questions about putting together.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of how they represent addition situations.
- Students will speak audibly about addition and clearly express thoughts and ideas about addition and subtraction.

**Targeted Academic Language** Count, add, more, number, put together, sum, objects



## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 understand the relationship between numbers and quantities; connect counting to cardinality

## Anticipated Student Pre-conceptions/Misconceptions

Numerals are like letters and don't represent a quantity.

## Instructional Materials/Resources/Tools

- Part-Part work mat, laminated and consumable (1 for each student)
- Cubes, two sided counters or other manipulative
- Materials to make sounds other than clapping, such as drum, tambourine, blocks, bell, etc.
- Pencils, crayons or markers

## Instructional Tips/Strategies/Suggestions for Teacher

Be aware of students who do not yet have the skill of one-to-one correspondence so you can give them opportunities to practice that skill prior to these lessons, and give them support through the lesson.

Whenever possible give the students the opportunity to explain what they are doing orally and prove it.

Set up student stations math workshop stations that support learners around this lesson such as the following:

1. Readiness station: Counting bears with number cards. Student turns a card over and counts out that number of bears. Select number cards that are within the proximal zone of development for groups of students. This should be predetermined.
2. Clapping game: Students turn over number card and clap that number of times. This can be done individually, or with a partner. Partners should verify each other.
3. Listening station with partner: Partner A turns over number card and taps out that number of sounds. Partner B counts out the



corresponding number of objects (i.e. bears).

4. Listening station with teacher: Teacher reads a story problem and student completes the task using various strategies. This can be used with students that need support, practice, or enrichment.
5. Part-part-whole station with teacher: Students will represent the sounds with drawings in the part-part section of the mat, and then will represent the total at the bottom of the mat (the “whole” part). Students can also represent the claps with numerals on the part-part whole worksheet if they show readiness. Students may also be ready to write numeric expressions and equations after listening to the claps, but this is not to be expected. This station may also be a good option for students who need a preview of the next lesson in the sequence.

### Assessment

Observe students’ ability to represent the correct number for each amount of sounds with cubes. Check students’ ability to connect the model (manipulatives) made with the representations used to make a new number. (**SMP4**: Model with mathematics.) Evaluate students’ ability to represent the correct number for each amount of sounds and the ability to join those representations to make a new number with the part-part mat activity.

### Lesson Opening

*Today we are going to talk about ways that we put numbers together. Who can tell me what ways they might use to put numbers together? Today we will listen to how many sounds we hear and we will show how many with cubes (counters or other manipulative).*

Tell the students to listen to how many claps they hear. Clap four times. The students verbally tell how many they hear altogether. Have that many students come to the front of the class. Tell the students to listen again and then clap two (or another number) more times. (The total number of claps will be a sum of 10 or less.) Ask students to tell how many they heard. Bring that number of students to the front of the class. Ask the students if they know how many claps there were all together. (There should be discussion about how student group 1 represents the first group/set/number of claps and student group 2 represents the second group/set/number of claps). (SMP4: Model with mathematics) It is important to emphasize that if we combine/put together group 1 and group, the total number of students equals (is the same as) the total number of claps.) Repeat this activity a few times to model the skill of putting together. The combinations of addends should have sums up to ten. For example: 4 students from group 1 + 3 students from group 2 = 7 students in total.

$$4 + 3 = 7$$



## During the Lesson

Show the children how to combine one part (number/addend) with another part (number/addend) to make a whole (sum). At this point in the year we are looking for students to be able to count to find the sum. Tell students to listen to how many claps they hear. Clap (?) times. Ask students hold up that many fingers on one hand. Ask students to listen again and clap (?) times. Students tell how many claps. Ask students to hold up that many fingers on the other hand. Ask students if they know how many claps were clapped in all. Students count their fingers and tell the teacher the total and prove how they know or got the answer. (There should be discussion about how one hand represents the first group/set/number of claps and the other hand represents the second group/set/number of claps.) *If we combine/put together the fingers on one hand with the fingers on the other hand, the total number of fingers is the same as the total number of claps.* Repeat this activity a few times to model the skill of putting together using fingers.

Hand out part-part laminated mats. Continue clapping other pairs of numbers. Then students represent the number expressions with manipulatives (cubes). For example, clap 5 times and the students will put five cubes on the left side of the mat. Clap 3 times and the students will put three cubes on the right side of the mat. Students will count the cubes in all and some will have the opportunity to share their answer with the group.

## Guiding Questions

1. *What is important to remember when you listen to me clap?* (evidence of one-to-one correspondence)
2. *Tell me how many claps you will hear when you see this many cubes.*
3. *How did you find the sum?* (Note who counts all, who counts on, and who has some mastery of basic addition facts.)

## Lesson Closing

Hand out part-part consumable mats. Students will continue to listen to clapping (or other sound such as drum, tambourine, etc.). This time students will be asked to represent the sounds by drawing the amount of claps. Students will be allowed to draw the sound with any representation. This is a good time to discuss the strategy of using tally marks. The completed part-part consumable mats can be collected to use as a formative assessment.

Facilitate a summary of the lesson by having students share what they learned. Clarify students' understanding with comments such as (if needed): *Today we listened and counted how many claps we heard. We kept track of the number of claps using our fingers, counters and pictures. You will have more opportunities to practice listening, counting, and showing how many in the stations. I will explain what stations are*



*available for you today.* Explain each station and expectations for student work. After station time, conclude by explaining,

*Tomorrow we will listen to a counting story. We will use events from the story to act out ways to add/put together, and ways to subtract/take apart numbers.*



# Lesson #2 Representing Addition with Part, Part, Whole

**Brief Overview of Lesson (what this lesson is about):** The focus of this lesson is for students to learn to model the concept of putting together and the skill of counting on. Students will represent addition by using the part-part-whole mat. They will use manipulatives to represent addition expressions and equations, and then write the numbers to show numerical addition expressions and equations. The combinations of addends will have sums up to 10. As you plan, consider the variability of learners in your class and make adaptations as necessary.

## Prior Knowledge Required:

- PK.CC MA.1 Listen to and say the names of numbers in meaningful contexts.
- PK.CC MA.2 Recognize and name written numerals 0-10.
- PK.CC MA.3 Understand the relationships between numerals and quantities up to 10.
- PK.CC MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count a many as seven things in scattered configuration.
- PK.CC MA.5 Use comparative language, such as *more/less than*, *equal to*, to compare and describe collections of objects.
- PK.OA MA.1 Use concrete objects to model real world addition (putting together) and subtraction (taking away) problems up through five.
- MA.2. b. Count, pronounce, blend, and segment syllables in spoken words.

**Estimated Time (minutes):** 60 minutes

## Resources for Lesson:

- Cubes, two sided counters or other manipulative for counting and making models of addition expressions
- Model/written expression template
- Overhead copy of model/written expression template (or one for smart board)
- Pencils, crayons or markers
- Part-part-whole laminated mats (templates at end of unit)



## Lesson #2 Representing Addition with Part, Part, Whole

**Time (minutes):** 60 minutes

**Overview of the Lesson:** This activity will model the skill of putting together and counting on to solve for the total. The students will represent addition by using the part –part-whole mat. Students will first use manipulatives to represent addition expressions and equations. Students will then write the numbers to show numerical addition expressions and equations. The combinations of addends will have sums up to 10.

### Standard(s)/Unit Goal(s) to be addressed in this lesson:

**K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings<sup>1</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.

**K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1:** Make sense of problems and persevere in solving them

**SMP4:** Model with mathematics

### Essential Question(s) addressed in this lesson:

- How can we show how many we have in all when we add two numbers?
- What strategies can we use to show how many we have?
- How can pictures or tools help us to solve problems?

**Objectives** Students will be able to represent numbers and show putting together with models, expressions or equations.

### Language Objectives

- Students will use the targeted academic vocabulary – count, add, more, counting on, number, put together, number sentence, equal to, equal sign- to ask or answer questions about putting together.
- Students will use manipulatives to clarify ideas and show knowledge of representation of addition.
- Students will speak audibly about addition and subtraction and clearly express thoughts and ideas about addition.

**Targeted Academic Language:** Count, add, more, count(ing) on, number, put together, take apart, equation, number sentence, equal to, equal sign.



## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

## Anticipated Student Pre-conceptions/Misconceptions

- Numerals are like letters and don't represent a quantity.

## Instructional Materials/Resources/Tool

- Cubes, two sided counters or other manipulative for counting and making models of addition expressions
- Model/written expression template found in Unit Resources
- Overhead copy of model/written expression template (or one for smart board)
- Pencils, crayons or markers
- Part-part- whole laminated mats (template at end of unit)

## Instructional Tips/Strategies/Suggestions for Teacher

- Students may not have the skill of one-to-one correspondence so you can give them opportunities to practice that skill prior to these lessons, and give them support through the lesson.
- Students may not be able to relate a representation of objects to a numeral so you can give them opportunities to practice that skill prior to these lessons, and give them support through the lesson.
- Whenever possible give the students the opportunity to explain what they are doing.
- Suggested math workshop stations which support learners around this lesson:
  1. Counting bears with number cards: Student turns a card over and counts out that number of bears. Students repeats this action with another card. Student counts the total amount and turns to a table mate to explain how s/he puts the numbers together.



- Equation station: Turn over a card with a visual representation of a certain number of objects. Write the number of objects in the first blank of a number sentence. Turn over a second card with a visual representation of a certain number of objects. Write the number of objects in the second blank of a number sentence. Count the number of objects all together, and write the number for the total after the equal sign. This can be done individually, or with a partner. Partners should verify each other.
- Listening station with teacher: Teacher reads a story problem and student represents the story using cubes/counters and the part- part-whole work mat. This can be used with students that need support, practice, or enrichment.
- Part- part-whole station: Teacher will provide cups with two counters of two colors. Student will sort one color onto one side of the part- part-whole mat, and sort the other color onto the other side of the mat. Student determines total amount and verifies with a table mate. This exercise can be extended by asking the student to record the putting together situation on a paper part-part-whole diagram.

## Assessment

Observe students' ability to represent the correct number for each quantity of manipulatives represented and the ability to join those representations to make a new group/number. Evaluate their ability to correctly use the part-part- whole template to model addition. Observe students' ability to represent the amount of manipulatives as a written numeral.

**Lesson Opening** *Yesterday we listened to and counted the number of clapping, drum, etc. sounds and showed the number of sounds we heard with cubes on the part-part mat. Then we counted the number of sounds in all. Today we will be representing addition problems with cubes and with drawings. We will use a new tool to do this called a Part -Part -Whole mat.*

Call students' attention to the overhead copy (or other method such as an Elmo or Smartboard), of the part-part-whole template. Tell students the number of manipulatives they will place in the first box of the template. Then have students count along as the manipulatives are placed in the first box of the template. (SMP4: Model with mathematics.)

Ask students what number these manipulatives represent. Tell students the number of manipulatives that they are going to put in the second box of the template. Have students count along as the manipulatives are placed in the second box of the template. Ask what number these manipulatives represent. Ask the students if they know how many manipulatives there are all together. *If we combine/put together group 1 and group 2, the total number of manipulatives will tell us how many there are all together.* Model counting the number of manipulatives in the first box, and continue counting on the numbers in the second box. Repeat this activity a few times to model the skill of putting together and counting on. The combinations of addends should have sums only up to ten.

## During the Lesson



Continuing to use the overhead projector (or other method such as an Elmo or Smartboard), call on a student to name a number less than 10. Instruct students to place that many manipulatives in the first box. Ask another student what number they should have below the box. Model writing the number beneath the first box and have students do the same. Emphasize that the quantity in the box is represented by the numeral. Tell students the number of manipulatives to put in the second box. (Teacher directed here so that the sum is 10 or less, and so that there will be a variation of addends and sums). Ask another student what number they should write below the box. Students then write that number. *How many manipulatives are there in all?* Students count the manipulatives and tell the teacher the total. *This is the sum of the two groups of manipulatives. This is the number that these two numbers are equal to. This is also the number that goes after the equal sign. The equal sign means that the amount of objects on both sides of the equal sign are equal or the same amount.* Repeat this activity to practice the skill. For example, *Who would like to give us a number less than 10?* A student gives the number 6. Students put that number of cubes on the left side of the part- part-whole mat. Call on another student to write the number 6 underneath the group of 6 cubes. Tell the students to put 2 cubes into the right side of the part- part-whole mat. Call on a student to tell the number that needs to be written under the group of 2 cubes. Students then write 2 underneath on the part- part-whole mat. Ask students to count how many cubes there are in all. Call on students to tell the class the total number of cubes (8). Students will now write the total of the manipulatives (8) on the part- part-whole mat template. Have students draw a particular number of objects in the first box, followed by writing the matching number underneath. Then students will draw a particular number of objects in the second box, followed by writing the matching number underneath.

### Lesson Closing

Students then count the total number of objects drawn in all, and write the number after the equal sign in the number sentence. Students will complete a few of these with the teacher. Collect one of these completed templates to be used as a summative assessment. *Today we used manipulatives to show a number. We then wrote the numeral to represent the number of cubes underneath in the number sentence. Next, found how many in all by counting all the cubes in the first box and the cubes in the second box. The total number that we got when we added/joined the cubes is called the sum. The sum was the same when we added/joined the numerals together.* Again, emphasize the combined quantities in the part boxes equals the amount in the whole box as well as the numbers in the number sentence represent the quantities in the boxes. Next the teacher will present the expression as a story problem. For example, *This morning I picked 4 apples from my apple tree. How many cubes do we need to put on the left side of our part- part-whole mat? My son picked 2 apples from my apple tree. How many cubes should we put on the right side of our part- part-whole mat? How many apples did we pick in all? We picked 6 apples!* Model how to write the equation/number sentence:  $4 + 2 = 6$ . *How did you figure that out?* (SMP1: Make sense of problems and persevere in solving them.)

*We will have more opportunities to practice counting, showing and writing how many. I will explain what stations are available for you today. After station time, teacher will conclude by explaining, Tomorrow we will listen to a counting story. We will use events from the story to act out ways to add/put together, and ways to subtract/take apart numbers.*



# Lesson #3 Storybook Math - Addition

## Brief Overview of Lesson:

In this lesson, the book Quack and Count, by Keith Baker is used as a springboard for learning about addition. Students will represent addition problem solving situations using drawings, fingers, objects, and acting out. As you plan, consider the variability of learners in your class and make adaptations as necessary.

## Prior Knowledge Required:

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

**Estimated Time (minutes):** 30-45 minutes

## Resources for Lesson:

Picture book, Quack and Count by Keith Baker

Chart paper

Duck pictures, or counters

Drawing paper

Part-part- whole laminated mats (template at end of unit)



### Lesson#3: Storybook Math - Addition

**Time (minutes):** 60 minutes

**Overview of the Lesson:** In this lesson, the book Quack and Count, by Keith Baker is used as a springboard for learning about addition. Students will represent addition problem solving situations using drawings, fingers, objects, and acting out. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

KOA1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal situations, expressions, or equations.

KOA2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

SMP4 Model with mathematics.

SMP7 Look for and make use of structure.

**Essential Question(s) addressed in this lesson:**

How can pictures or tools help us to solve problems?

How can we show how many we have in all when we add two numbers?

**Objectives:** Students will be able to represent numbers and show putting together with models, drawings or equations.

**Language Objectives:**

- Students will use the targeted academic vocabulary- add, put together, number, more, equal to, objects - to ask or answer questions about putting together.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of addition.
- Students will speak audibly about addition and clearly express thoughts and ideas about addition.

**Targeted Academic Language:** Add; put together, number, more, equal to, objects.



## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinal

## Anticipated Student Pre-conceptions/Misconceptions:

Numerals are like letters and don't represent a quantity.

## Instructional Materials/Resources/Tools:

- Picture book, Quack and Count, by Keith Baker
- Chart paper
- Duck puppets, or counters
- Drawing paper
- Part-part-whole laminated mats (template at end of unit)

## Instructional Tips/Strategies/Suggestions for Teacher:

During the lesson, be sure to scaffold for those students who are not demonstrating an understanding. Re-read the book to engage students in acting out the story. Have chart paper and markers ready while reading the book to record findings.

## Assessment

Students' drawings of the addition problems can be used for a formative assessment to determine next instructional steps based on students' levels of understanding. Take quick notes during observations of students acting out or counting on fingers. Based on observations and anecdotal notes, differentiate instruction based on students' needs. Extension lessons can be provided at centers. For students that do not yet understand one-to-one correspondence, or who have difficulty with counting, a center for counting objects should be provided. See ideas for Math Workshop after lesson closing.



## Lesson Details

### Lesson Opening:

*Yesterday we learned about the Part-part-whole Mat and we practiced how to put two groups together on our mat. Today we are going to read a book titled, Quack and Count. Introduce the book, Quack and Count by explaining that the book is going to show 7 ducklings having fun. Sometimes the 7 ducklings break up into two groups, but there are always 7 ducklings having fun. Explain that their job, while reading the book is to identify the different ways 7 ducklings can break up into smaller groups. Ask the children to use their fingers to represent the number 7. Give the children enough time to count out the number and when everyone has their answers, model the number 7 on your own fingers. Give the children who were unsure or held up the incorrect number of fingers time to adjust their fingers. *Now that we all know how to represent the number 7, we are going to explore all of the different ways in which we can make the number 7.**

Read the book. Pause after each group of ducklings is identified. When the book divides the ducklings into 2 groups onto 2 pages. Ask a child to come up and count out the ducklings on each page. *You have counted \_\_\_ ducklings on this page, and \_\_\_ ducklings on this page. When we put this group of ducklings together with this group of ducklings, how many ducklings are there altogether? Let's count.* Together count out all 7 ducklings. *So it looks like \_\_\_ ducklings on this page plus \_\_\_ ducklings on this page equals 7 ducklings. Thumbs up if you agree with this?* Record students' thinking on chart paper restating the group in an equation. Extend the children's vocabulary and the mathematical operation that is being utilized by reinforcing the addition involved. When reading the book, after each group of 7 is identified, restate the group in numerical terms.

It is important to check in to make sure that all of the children understand and follow along with the lesson and concepts that are being addressed. When you solve a problem such as, *it looks like 5 ducklings plus 2 ducklings equals 7 ducklings?* Ask if they can you show you with their fingers to check for their understanding? Use Think, Pair, Share\* for students to check in with each other for their understanding of the problem and to share out their mathematical understandings.

\* For Think, Share, Pair info go to: <http://www.readwritethink.org/professional-development/strategy-guides/using-think-pair-share-30626.html>



### **During the Lesson:**

Students can draw pictures or use duck pictures to make their own drawings of seven ducks in different groupings. Some students may even draw ducks in three groupings (using three addends). Students who are ready may write the equations to go with their representation. This is an opportunity to quickly assess students' abilities when assigning math stations.

Follow up the reading by acting out the book. Invite 7 children to come up and be the 7 ducklings and explain to the other children that they will help you count and add the ducklings. Stand behind the 7 children and invite the students to count the 7 ducklings as you put your hand on each child's head. Move one child to your left so that there is space between the 6 children and the one child. Invite the students to count the 6 ducklings plus 1. Continue this activity until all of the sets of ducklings have been counted. Repeat the follow-up activity if other children want a turn to be ducklings.

This is an opportunity to check for evidence of MP7 (Look for and Make Use of Structure). Students should use what they know to solve a new problem.

### **Suggested Guided Questions:**

1. *What kind of "math picture" can you draw to represent a duck? (elicit simple representations versus artistic representations)*
2. *What if there were 5 ducks. How many more would we need to have 7 ducks? (exploratory)*
3. \_\_\_\_\_ *Can you tell us how you got that \_\_\_\_? Or, How do you know?*
4. *Thumbs up if you think you can retell what \_\_\_\_\_ said.*

### **Lesson Closing:**

The teacher should refer to the chart paper and do a quick review of student responses. The vocabulary should be emphasized again at this point to continue with the introduction of addition. Use students' drawings as an exit ticket to assess their understanding of the combinations of seven. Make note of students who do not practice precise counting. Students' drawings can be posted to refer to during future lessons. Opportunities should be provided for extension lessons where students can continue to act out the story, represent addition with drawings, or objects during small group time, centers or with partners.

### **Suggested math workshop stations which support learners around this lesson:**

1. Counting ducks or cubes with number cards. Student turns a card over and counts out that number of ducks. This station supports



students who need practice with the prerequisite skill of one to one correspondence.

2. Story station with teacher. Teacher chooses a number 5-10. Teacher provides engaging counters and a plain mat, or plain counters and a mat with a simple picture such as an outdoor pond scene. Teacher models and describes a situation similar to the Quack and Count stories. Next, teacher asks students to model the situation being described. Eventually, roles may be reversed where students have opportunities to describe a putting together situation for a partner to model.
3. Story station with partner. Once students show proficiency with modeling number stories at the teacher station, they will be ready to practice this skill with a partner. This can be an ongoing station that would be best stimulated by occasional readings of other children's literature that promotes addition.
4. Quack and Count partner station. This station builds on listening opportunities presented in the previous lesson. One partner is the Duck, and the other partner is the Counter. The Duck turns over a number card and makes the corresponding number of "quacks". Simultaneously, the Counter models the number of quacks with cubes or other such object determined by the teacher. Partners work together to verify that the number of counters matches the number on the card. Eventually, this station could be used to reinforce listening, modeling of addition, and partner discourse by incorporating elements from other children's literature.
5. Three addends station. This station extends the concept so students can explore how to use three addends to find a sum. Students will have a three part mat, number cards and manipulatives



# Lesson # 4 Addition on the Number Line

**Brief Overview of Lesson:** During this lesson students will continue to develop an understanding of addition, including the counting on strategy, as they add using a number line. Children will use acting out strategy by standing on a number line to model the story problem. As you plan, consider the variability of learners in your class and make adaptations as necessary.

## **Prior Knowledge Required:**

- PK.CC.MA.2. Recognize and name written numerals 0-10.
- PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.
- PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.
- PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.
- KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
- KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

**Estimated Time:** 30-45minutes

## **Resources for Lesson:**

Teacher-created word problems, perhaps based on recently read children's literature

White board/marker or overhead projector/screen

Large laminated number line

Individual number lines for each student



## Lesson #4: Addition on the Number Line

**Time (minutes):** 50-60 minutes

**Overview of the Lesson:** During this lesson, students will stand on a number line and use it as a strategy to act out a story problem. As you plan, consider the variability of learners in your class and make adaptations as necessary.

### **Standard(s)/Unit Goal(s) to be addressed in this lesson:**

**KOA1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, (claps), acting out situations, verbal situations, expressions, or equations.

**KOA2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1** Make sense of problems and persevere in solving them.

**SMP4** Model with mathematics.

**SMP7** Look for and make use of structure.

### **Essential Question(s) addressed in this lesson:**

How can we show how many we have in all when we add two numbers?

How can pictures or tools help us to solve problems?

**Objectives:** Students will be creating a model for addition with a real world problem.

### **Language Objectives:**

- Students will use the targeted academic vocabulary- count, add, more, number, number line, put together, sum, equal to- to ask or answer questions about putting together.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of addition.
- Students will speak audibly about addition and clearly express thoughts and ideas about addition.



**Targeted Academic Language** Count, add, more, number, number line, put together, sum, equal to

**What students should know and be able to do before starting this lesson:** Identify a number between 0-10 on a number line count the total number of objects.

### **Instructional Materials/Resources/Tools**

- Word problems, perhaps based on recently read children’s literature
- White board/marker or overhead projector/screen
- Large laminated number line
- Individual number lines for each student
- Large numerals on card stock, counters (bears, linking cubes, etc).

### **Instructional Tips/Strategies/Suggestions for Teacher**

Be sure to use a laminated number line that is printed large enough so that a student can stand at or on a number. Place this in central location so that each student can observe. (Can also make this number line out of tape in same location). Also be sure to have desktop number lines for each student.

Use effective reading strategies for the word problems such as visualization and retelling, to help students comprehend the story before beginning the mathematics in the problem.

Suggested math workshop stations which support learners around this lesson:

1. Pick a bag station. Prepare small paper bags that each contain 1-10 counters. Students select a bag, empty the contents on the table, and place each counter on a number of the number line starting at 1. Student then turns to a tablemate to say the ending number, which represents the total number of counters in the bag. This station is for students who need continued practice with one to one correspondence.
2. Pick a card station. Student turns a card over and counts out that number of counters on the number line. Student turns to a tablemate to say the total number modeled on the number line. This station supports students who need practice with matching a numeral to a quantity.
3. Story station with teacher. Teacher chooses a number 5-10. Teacher provides engaging counters and desktop number lines. Teacher



tells addition stories similar to those read recently in children’s literature and/or the whole group lesson. Next, teacher asks students to model with counters on the number line the situation being described. Eventually, roles may be reversed where students have opportunities to describe a putting together situation for a partner to model.

4. Story station with partner. Once students show proficiency with modeling number stories on the number line at the teacher station, they will be ready to practice this skill with a partner. This can be an ongoing station that could be stimulated by simple pictures taken from greeting cards, children’s magazines or picture books, or dot cards.
5. Clap and Add partner station. This station builds on listening opportunities presented in previous lessons. One partner is the Clapper, and the other partner is the Adder. The Clapper turns over a number card and makes the corresponding number of claps. Teacher may choose options from any of the previous lessons, such as tapping or animal noises. Simultaneously, the Adder models the number of claps with cubes on the number line. Partners work together to verify that the number of counters matches the number on the card. When students show readiness, partners may turn over two cards instead of one. In this case, the first number should be modeled on the number line before adding the second number. The total number of counters on the number line should be verified through partner discourse.

### **Assessment:**

Formative: Read a new word problem to the class. Ask them to use their number line to add the two numbers together. Use this data to inform next steps in instruction.

### **Lesson Details (including but not limited to :)**

#### **Lesson Opening**

Review, *Yesterday we learned how to show addition by acting out number stories.* Refer to animals and scenarios used previously. *Today, we are going to use a new tool to help us find out how many things are in a story.* Continue by introducing the number line as a new tool. Activate familiarity by eliciting any student recognition of the number line in daily life, such as on the classroom wall, siblings’ schoolwork, thermometers, rulers, etc. Conduct a choral count to ten while demonstrating one-to-one correspondence on the number line.

Next, tell the students you are going to read a story problem to them.

*I had 4 toy trains.*

*I found 3 more toy trains.*



*How many trains do I have now?*

### **During the Lesson**

(SMP1: Make sense of problems and persevere in solving them.) After reading the story problem, ask four students to come and stand on the life size number line. (Hold up a 4 on cardstock). Reread the second part of the story, asking three more students to come stand on the number line. (3 also represented on cardstock.) Model how to count the number of students standing on the number line. (While most students will have the rote counting sequence, it is important to model one-to-one correspondence in counting.) Explain that each student represents a toy train. The last student on the number line is standing on the number 7. This number represents the total number of toy trains in the story. Model how to read the equation that represents this model " $4 + 3 = 7$ ."

Next, model another such story on the life size number line.

*There were 3 quick crabs on the beach.*

*2 more crabs quickly joined them.*

*How many crabs in all?*

After the second story is modeled on the life size number line (SMP4: Model with mathematics.), prepare students to work in partnerships with one desk size number line and cubes/counters. Have several engaging stories ready to share. One partner should represent the first quantity in the story on the number line with cubes or other counters, while the other partner will represent the second quantity on the number line. Together, partners will determine the total quantity represented in the story. To do this, some students will count all the cubes while other students will say the last number represented on the number line as the total quantity. Circulate and observe partnerships in order to select students to share how they determined the total. Model how to say the equation, ask partners to take turns trying to say the equation to each other, and gradually invite students to model how to say the equation to the whole group as they show readiness.

### **Suggested Guided Questions:**

1. *Who feels confident in showing how to solve a problem using the projector?*
2. *What is important to remember as you find the sum?*
3. *So, 3 crabs and 2 crabs are 5 crabs. What if you saw 3 crabs, and 3 more crabs?* This question is to show students how to see structure and generalize.
4. *Who can restate what \_\_\_\_\_ just said?*



## Lesson Closing

Have class return to meeting area and review how to model addition on a number line.

*So, yesterday we read Quack and Count, and we practiced acting out addition stories. Today we learned how to represent an addition story on the number line. Let's close our meeting with a game. I'm going to tell you a story, and I'm going to make a representation on the number line. I would like you to turn and talk to your partner. I want you to explain whether you think my representation and my story match (thumbs up) or if they don't match (thumbs down). Then we will share out. Allow enough time to try 2-3 examples. Select one partnership to defend an argument for each example. Ask students to "prove it!" Tomorrow we will have an opportunity to pretend to shop at the store in the dramatic play center. You will be able to show how to add in order to shop.*



# Curriculum Embedded Performance Assessment #1 (CEPA)

**Overview:** In this CEPA, students will act as a cashier in a school store to demonstrate their understanding of addition. The customer (teacher) has ten cents with which to purchase two items. The cashier (student) must calculate the total cost of the two items, show and explain their thinking, and fill out a receipt (similar to a part-part-whole template). As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Time (minutes):** 10 minutes whole class; 5-10 minutes per individual CEPA

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

**K.OA.1 1.** Represent addition and subtraction with objects, fingers, mental images, drawings<sup>1</sup>, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

**KOA2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1.** Make sense of problems and persevere in solving them.

**SMP4.** Model with mathematics.

**SMP7.** Look for and make use of structure.

**Lesson Resources:** bowl of counters, pennies, “School Store Receipts- Addition”, part-part- whole mats, number line, ten frame, school store items for purchase (cost of two items does not exceed ten cents)

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<sup>6</sup>Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the standards.)



## Lesson: CEPA #1: School Store - Addition

**Time (minutes):** 10 minutes whole class; 5-10 minutes per individual CEPA

**Overview of the Lesson:** In this CEPA, students will act as a cashier in a school store. The customer (teacher) has ten cents with which to purchase two items. The cashier (student) must calculate the total cost of the two items, show and explain their thinking, and fill out a receipt (similar to a part-part-whole template).

### Standard(s)/Unit Goal(s) to be addressed in this lesson:

**K.OA.1 1.** Represent addition and subtraction with objects, fingers, mental images, drawings<sup>2</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.

**KOA2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1.** Make sense of problems and persevere in solving them.

**SMP4.** Model with mathematics.

**SMP7.** Look for and make use of structure.

### Essential Question(s) addressed in this lesson:

- How can we show how many we have in all when we add two numbers?
- What strategies can we use to show how many we have?
- How can pictures or tools help us to solve problems?

**Objectives** Students will be able to represent numbers and show putting together with models, expressions or equations.

### Language Objectives

- Students will use the targeted academic language to ask or answer questions about putting together.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of addition.
- Students will speak audibly about addition and clearly express thoughts and ideas about addition.

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<sup>6</sup>Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the standards.)



**Targeted Academic Language-** Count, add, sum, number, put together, altogether, cents

### **What students should know and be able to do before starting this lesson**

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

### **Instructional Materials/Resources/Tools**

- Pennies, bowl of cubes
- Basic school items with price tags/stickers
- Number line, ten frame, part-part-whole work mat, School Store Receipt - Addition

### **Instructional Tips/Strategies/Suggestions for Teacher**

Note: The intent of a CEPA is for students to *independently* demonstrate their understanding of a concept. For this reason, students should be assessed individually, and not in groups. It is suggested that the teacher assess several students a day until all students are assessed.

Introduce the school store area if students are not already familiar with it. Ideally, students would be familiar with the center prior to the day of the assessment.

- Be sure to price items between 3 and 5 cents
- Demonstrate role expectations
- Orient students to what is available in store



**Assessment:** Observe demonstrated student understanding of the CEPA using the rubric.

### **Lesson Details (including but not limited to :)**

#### **Lesson Opening**

*We have been practicing different ways to show how to put together numbers. The dramatic play area is now a school store. (This is a teacher directed activity to be used for assessment with one student at a time.) In the school store you will have a chance to pretend to buy school supplies. When you do this you will show how to put numbers together. I will work with you one at a time so that you can show me what you know about representing addition.*

#### **During the Lesson**

The “customer” (teacher) will have 10 pennies to spend on school supplies. The customer (teacher) will give the two items to the cashier (student). *I'd like to buy this sticker and this marker. Can you tell me how much that will cost altogether?* The cashier (student) will be responsible for requesting the total amount due. The cashier (student) may use one of the various tools (number line, cubes, ten frame, part-part-whole work mat) available to determine the total. *The sticker cost 3 cents, and the marker cost 4 cents. That will be 7 cents altogether, please.* Prompt the student to explain how to put together the sets. *How did you think about that? Or, show me how you solved that.*

The cashier (student) will then write the customer a receipt that should be checked by the customer. The receipt will be labeled “School Store Receipt,” but will be the same part-part-whole diagram used in Lesson #3.

In the CEPA, students will have an opportunity to use what they know from previous lessons. Materials from previous lessons will be available for students to use to determine and represent the total quantity of two items purchased.

The teacher will use the CEPA Rubric provided to evaluate evidence of student learning rather than simply relying on the completed receipt as evidence of learning.

#### **Lesson Closing**

*So today you practiced putting numbers together in the school store. Tomorrow we will begin to learn how to take numbers apart. That's called subtraction.*



**CEPA Rubric**

	<b>Beginning</b>	<b>Progressing</b>	<b>Mastering</b>
Student can count out total number of pennies for 2 items	student does not have one to one correspondence	Student counts correctly	Student adds amount correctly
Student can explain how to put together the sets	Student cannot explain how to put together the sets	Student explains how to put together with support	Student can explain how to put together the sets
Student can fill out the receipt	Student cannot fill out receipt	Student partially fills out the receipt	Student successfully fills out receipt



# Lesson #5 Storybook Math - Subtraction

## Brief Overview of Lesson:

In this lesson, students will begin to learn about the concept of subtraction through the storybook Ten Little Monkeys Jumping on the Bed by Annie Kubler. Students will represent subtraction with drawings, fingers, objects and acting out. As you plan, consider the variability of learners in your class and make adaptations as necessary.

## Prior Knowledge Required:

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtraction (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

**Estimated Time (minutes):** 50 - 60 minute

## Resources for Lesson:

Dry erase/chalkboard, easel with paper to record numerical sentences and the children's mathematical thinking.

Markers

The book Ten Little Monkeys: Jumping on the Bed by Annie Kubler

10 Unifix Cubes or counters

Drawing paper



## Lesson #5: Storybook Math - Subtraction

**Time (minutes):** 50 - 60 minutes

**Overview of the Lesson:** In this lesson, students will begin to learn about the concept of subtraction through the storybook Ten Little Monkeys Jumping on the Bed by Annie Kubler. Students will represent subtraction with drawings, fingers, objects and acting out. As you plan, consider the variability of learners in your class and make adaptations as necessary.

### **Standard(s)/Unit Goal(s) to be addressed in this lesson:**

KOA1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal situations, expressions, or equations.

KOA2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

SMP4 Model with mathematics.

### **Essential Question(s) addressed in this lesson:**

- How can we show how many we have left when we subtract two numbers?
- What strategies can we use to show how many we have?
- How can pictures or tools help us to solve problems?

**Objectives:** Students will be able to represent numbers and show taking away with models, drawings or equations.

### **Language Objectives:**

- Students will use the targeted academic vocabulary- subtract, take away, left over, difference- to ask or answer questions about taking away/taking apart.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of subtraction.
- Students will speak audibly about subtraction and clearly express thoughts and ideas about subtraction.

**Targeted Academic Language:** Subtract, take away, left over, difference



## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinal numbers

### Anticipated Student Pre-conceptions/Misconceptions:

Students may not have one to one correspondence.

That numbers are like letters and don't represent a quantity.

Students may need to count all objects.

### Instructional Materials/Resources/Tools:

- Drawing paper, dry erase/chalkboard, easel with paper to record numerical sentences and the children's mathematical thinking
- Markers, ten Unifix Cubes or counters
- The book Ten Little Monkeys Jumping on the Bed by Annie Kubler

### Instructional Tips/Strategies/Suggestions for Teacher:

During the lesson, be sure to scaffold for those students who are not demonstrating an understanding. Reread the book to engage students in acting out the story. Have chart paper and markers ready while reading the book to record findings.

In this lesson, students will have an opportunity to Turn and Talk. For more information about this move, please see:

<http://old.newteachercenter.org/collaborative-discussions/turn-and-talk/plan>

**Assessment-** Students' drawings of the subtraction problems can be used for a formative assessment to determine next steps in instruction. Take quick notes during observations of students acting out or counting on fingers. Based on observations and anecdotal notes, differentiate



instruction based on the needs. Extension lessons can be provided at centers. For students that do not have 1-1 correspondence or difficulty with counting, a center for counting objects should be provided. See ideas for Math Workshop after lesson closing.

## Lesson Details

**Lesson Opening:** *Yesterday we were working on our addition problems with a number line.* Briefly review the concept of addition. Explain to the children that today they are going to be learning about something new in Math called subtraction. Ask questions about subtraction. For example, *When I say subtraction, does anybody know what that means? What about take away? Is that the same as subtract?* It is important that your vocabulary is consistent. When introducing subtraction, stick with take away for subtraction operations. Much of what you will be modeling and working with when subtracting will involve the action of taking an object away from a larger group, resulting in a smaller group of objects. Use the [Turn and Talk](http://old.newteachercenter.org/collaborative-discussions/turn-and-talk/plan) (<http://old.newteachercenter.org/collaborative-discussions/turn-and-talk/plan>) protocol for students to discuss the meaning of subtraction. Use the answers children give to ask more questions. Jot down their ideas about subtraction on your easel on the big paper you are using to record the children's mathematical thinking.

Show what subtraction might look like. For example, using your fingers hold up all 10. *I am holding up 10 fingers. What if I subtract or take away 3 fingers?* Tuck 3 of your fingers behind. *How many fingers are left?* Give students time to answer and explain their thinking. Show the students your remaining fingers. *Let's count how many fingers are left?* Count your fingers together. *So we can say that if we have 10 fingers and take away 3 fingers, we have how many left?* Ask for answers and write the number sentence on your sheet of paper  $10 - 3 = 7$ .

Introduce the book, [Ten Little Monkeys Jumping on the Bed](#). *Look at the cover. Do you see all those monkeys on the bed? Let's count all the monkeys on the bed.* Note: Each monkey has a number on their shirt so it is easy to identify all 10 monkeys. *What do you think is going to happen?* Many children may already know this song and will know the next line in the book. When reading the book you will want to rephrase what happens by asking how many monkeys are left on the bed after one falls off.

Read the book. Pause and ask questions after a monkey falls out of the bed. Then ask before turning the page, *how many monkeys are jumping on the bed?* The next page in the book will confirm their answers. Keep recording the numerical equations that you are asking on the big chart paper or dry erase board.  $10 - 1 = 9$        $9 - 1 = 8...$  Show the children how the chart paper and have them begin to connect number sentences with the subtraction that they are doing throughout the book.



## During the Lesson:

Provide the children with an opportunity to act like monkeys! Act out the book. Have 10 children stand up and as each “monkey” bumps their head, have that child sit down. Represent mathematical operation by starting off the book with 10 unifix cubes and detaching one cube for each monkey that falls off the bed. Extend the children’s vocabulary and the underlying mathematical operation that is being utilized by reinforcing the subtraction involved. When reading the book after the children complete a verse, restate the verse in numerical terms. *8 monkeys were jumping on the bed. One fell off. 8 take away 1 equals 7.* If possible, point to the number sentences on the chart you are reinforcing.

Give each child their own set of 10 Unifix cubes. Start with 10 cubes indicating to the children that each cube represents a monkey. As each monkey falls off the bed, have the child take away one Unifix cube. Ask questions throughout the book. *If we now have 4 monkeys jumping on the bed, how many monkeys are on the floor?* Repeat the number sentence. This is an opportunity to check for evidence of MP7, Look for and Make Use of Structure. Students should use what they know to solve a new problem.

Sing the song and have the children show how many monkeys remain with their fingers. Stop after each verse so that the children have an opportunity to display the correct number of fingers on each hand. Students can draw pictures to make their own drawings of ten monkeys falling off the bed in different groupings. Students who are ready may write the equations to go with their representation.

## Suggested Guided Questions:

1. *Who would like to share your thinking about how you grouped your monkeys?*
2. *Are there more ways to group the monkeys?*
3. *Does your grouping look like any other representations we’ve seen before? (dice, dominoes, any other clear groupings)*
4. \_\_\_\_\_ *Can you tell us how you got that \_\_\_\_?*
5. *How did you figure how many monkeys were left on the bed?*
6. *Provide a written equation such as  $10-5=5$ . Who can tell a monkey story that matches this number sentence?*
7. *What if I saw 5 monkeys on the bed, and 3 monkeys on the floor? How can I tell how many monkeys were on the bed at the beginning?*

**Lesson Closing:** Have the students return to the meeting area. After the questions are answered, refer to the chart paper and do a quick review of student responses. The vocabulary should be emphasized again at this point to continue with the introduction of subtraction. Students’ drawings can be posted to refer to during future lessons. Opportunities should be provided for extension lessons where students



can continue to act out the story, represent subtraction with drawings, or objects during small group time, centers or with partners. This is an opportunity to assess student's ability to see if they can see a relationship between addition and subtraction. As you listen to responses, be prepared to capitalize on students who solved problems using addition as a strategy. These students would be candidates for higher-level workshop stations.

### **Suggested math workshop stations which support learners around this lesson:**

1. Counting monkeys or cubes with number cards. Student turns a card over and counts out that number of monkeys. This station supports students who need practice with the prerequisite skill of one to one correspondence.
2. Subtraction station with teacher. This station provides opportunities for students to practice subtraction skills. Copy of Ten Little Monkeys Jumping on the Bed, Unifix cubes, class chart that was made during story. Teacher supervises while partners act out the story. For students who show readiness, choose one page to draw and write equation.
3. Subtraction station with partner. Students who consistently and accurately represent subtraction at the teacher station are ready to practice this skill with a partner.
4. Take away bags. Prepare bags/cups with 5-10 cubes each. Partner A rolls a dot cube. Partner B takes away the corresponding number of cubes. Both partners count to determine the difference.
5. On and Off the Bed: Provide a bed (index card, paper, etc.) and 10 monkeys (counters). Partners take turns dropping the monkeys on the bed. Some will land on the bed, and some will land on the floor. Students will explain to each other with addition or subtraction how many monkeys are on or off of the bed.
6. Match it station. Provide cards that show subtraction equations and part-part-whole diagrams. Partners work together to sort and match equations with the corresponding diagrams.
7. Hiding Ducks station. Provide ducks/cubes, and a cup or piece of felt. Predetermine the total quantity less than 10. Partners take turns hiding some of the ducks under the cup or felt, while the other partner determines the missing number based on what is visible. This is an opportunity to develop an understanding of the inverse relationship of addition and subtraction.



## Lesson #6 Listening to Numbers - Subtraction

**Brief Overview of Lesson:** The focus of this lesson is to model the skill of taking away. Students will begin with a predetermined amount of cubes (counters or manipulatives) on a ten frame (no larger than 10). The students will then listen to a certain amount of claps. The students will then remove that amount of cubes from the amount of cubes on the ten frame.

As you plan, consider the variability of learners in your class and make adaptations as necessary.

### Prior Knowledge Required:

PK.CC MA.1 Listen to and say the names of numbers in meaningful contexts.

PK.CC MA.2 Recognize and name written numerals 0-10.

PK.CC MA.3 Understand the relationships between numerals and quantities up to 10.

PK.CC MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count a many as seven things in scattered configuration.

PK.CC MA.5 Use comparative language, such as *more/less than*, *equal to*, to compare and describe collections of objects.

PK.OA MA.1 Use concrete objects to model real world addition (putting together) and subtraction (taking away) problems up through five.

MA.2. b.Count, pronounce, blend, and segment syllables in spoken words.

**Estimated Time (minutes):** 50-60 minutes

**Resources for Lesson:** ten frame, cubes/counters, materials to make sounds other than clapping, such as a drum, tambourine, blocks, bell, etc.



## Lesson # 6 Listening to Numbers - Subtraction

**Time (minutes):**50-60 minutes

**Overview of the Lesson:** The students will listen to sounds as numbers and take away the number of sounds within the model representations. The students will use these models to help represent subtraction expressions.

### **Standard(s)/Unit Goal(s) to be addressed in this lesson:**

**K.OA.1** 1. Represent addition and subtraction with objects, fingers, mental images, drawings<sup>1</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.

**K.OA.1** 2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1:** Make sense of problems and persevere in solving them

**SMP4:** Model with mathematics

### **Essential Question(s) addressed in this lesson:**

How can we show how many we have left when we subtract two numbers?

What strategies can we use to show how many we have?

How can pictures or tools help us to solve problems?

**Objectives** Students will be able to represent numbers and show taking apart with models, expressions or equations.

### **Language Objectives**

- Students will use the targeted academic language to ask or answer questions about putting together.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of addition and subtraction.
- Students will speak audibly about addition and subtraction and clearly express thoughts and ideas about addition and subtraction.

**Targeted Academic Language** Count, subtract, less, number, difference, remaining, take apart, objects, ten frame



## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

## Instructional Materials/Resources/Tools

- Ten frame, laminated (1 for each student)
- Cubes, two sided counters or other manipulative
- Materials to make sounds other than clapping, such as drum, tambourine, blocks, bell, etc.
- Pencils, crayons or markers

## Instructional Tips/Strategies/Suggestions for Teacher

Be aware of students who do not yet have the skill of one-to-one correspondence so you can give them opportunities to practice that skill prior to these lessons, and give them support through the lesson.

Whenever possible give the students the opportunity to explain what they are doing orally.

Suggested math workshop stations which support learners around this lesson:

1. Counting bears with number cards. Student turns a card over and counts out that number of bears.
2. Clapping game. Partner A will turn over number card and fill the ten frame with that number of counters. Partner B will roll a die (labeled with 1,1,2,2,3,3) and clap the number of times shown on the die. Partner A will subtract that number of counters from the ten frame. Partner A will explain how the subtraction is modeled. Partner B should verify Partner A.



3. Listening station with teacher. Teacher reads a story problem and students complete the task using the ten frame. This can be used with students that need support, practice, or enrichment.
4. Monkey stories station. Provide a copy of Ten Little Monkeys Jumping on the Bed ( or other appropriate story), counters, and ten frames. Partners take turns acting out parts of the story with manipulatives (teacher choice).
5. Ten frame station. Provide ten frames, cubes, and a die labeled 1,1,2,2,3,3. Partners fill their won ten frame with cubes. Partners take turns rolling the die, and removing the correct amount of cubes. The winning player must roll the correct number in order to clear the ten frame. Prompt students to describe what they did on their turn. *I had 9 cubes. I took away 2 cubes. Now I have 7 cubes.*

### Assessment

Formative: Observe students' ability to recognize the number of sounds and correlate the quantity of sounds to a number. Observe students to see if they remove the correct number of manipulatives from the original amount to make a new number. (**SMP4**: Model with mathematics.)

### Lesson Opening

*Yesterday we talked about the Ten Little Monkeys. When each monkey fell off of the bed, there was one less monkey in the group. Who can tell me what they remember? Today we will listen to how many sounds we hear and we will take away that many cubes (counters or other manipulative) from what we have.*

Call 10 students to the front of the room. Tell the students to listen to how many claps (or other sound such as drum, tambourine, or a softer sound for students who might have sensory issues etc.) they hear. Clap (1) time. The students verbally tell how many they hear. Then have one student leave the group of ten. Ask the students how many students are left. (*That's right! When we have 10 and we take 1 away, we have 9 remaining.*) Tell the students to listen again and then clap (2) times. Ask students to tell how many they heard. Then have that many students leave the group. Ask the students if they know how many students are left. (*That's right! When we have 9 and we take 2 away, we have 7 remaining.*) Repeat this activity a few times to model the skill of putting taking away. The beginning number should not be more than 10.

### During the Lesson

Show students how to take away a number from a larger number and discuss what number is remaining. At this point in the year we are



looking for students to be able to understand the concept of taking away. Ask the students to put up 10 fingers. (The intent is to guide students through the progression from whole bodies, to fingers, and eventually ten frames.) Tell students to listen to how many claps they hear. Clap (?) times. The students tell how many claps. Ask students to put that many fingers down. Ask students to count how many fingers are remaining. Repeat this activity a few times to model the skill of taking apart using fingers.

Give each student a 10 frame and cubes (or other manipulatives). Tell the students to put 10 cubes on the ten frame. Clap 2 times. Ask the students how many claps they heard. Tell the students to take that many cubes away from 10. Ask the students how many are left. (*So when we start with 10 cubes and we take away 2 cubes, we have 8 cubes remaining*) Repeat this activity beginning with different numbers in the ten frame and taking away various numbers so that many different examples of taking away are represented. Model each situation with an equation.

At this point students are ready to practice this skill with partners. Provide a ten frame and ten cubes to each set of partners. The students will take turns clapping and subtracting cubes from the ten frame. For those students who are ready, have them write a number sentence/equation for each problem solving situation.

Look for students who have quick recognition of the remaining cubes. These students will be able to build upon their ability to subitize when breaking apart numbers.

### **Suggested Guided Questions:**

1. *What part of the story does this picture represent? (Point to a specific part of the ten frame.)*
2. *What if I heard 4 claps, so I took away 4 cubes? When I looked at the ten frame, I saw 5 cubes. How could I figure out how many I started with?  $4 - 4 = 0$*
3. *What if I started with 7 cubes? And, I know I took some away but I'm not sure how many. But, I know I now have 2 cubes. What could I do to solve how many cubes I took away?  $7 - \underline{\quad} = 2$  Note: this is a more advanced problem. Use it selectively.*
4. *Does this match? Here is a ten frame with some x's. Here is a number sentence. Is there a connection between the number sentence and the ten frame representation? Did I do this correctly? (Offer correct and incorrect examples. Have students create an argument, and critique the reasoning of others.)*



## Lesson Closing

Give each student a 10 frame and cubes (or other manipulative). Tell the students to put 10 cubes on the ten frame. Clap 2 times. Ask the students how many claps they heard. Tell the students to take that many cubes away from 10. Ask the students how many are left. *So when we start with 10 cubes and we take away 2 cubes, we have 8 cubes remaining.* Repeat this activity beginning with different numbers in the ten frame and taking away various numbers so that numerous different examples of taking away are represented. *Today we practiced taking away. We started with one amount, then we took some away and we counted how many were remaining. We did this with our bodies, our fingers, and then with cubes on the ten frames. When we get up from the rug, we will have more opportunities to practice listening, counting, and showing taking away. I will explain what stations are available for you today. After station time gather students at the rug. Have a ten frame and cubes ready. To end math time today we are going to play a short game. I'm going to clap and show numbers on the ten frame. I want you to turn and talk to your partner to discuss whether you saw me model addition or subtraction. Be prepared to explain how you know whether it was addition or subtraction. Think about if you saw me model putting together, or taking apart.*

Conclude by telling the students, *Tomorrow we will practice taking away by listening to stories. We will draw how many we have in the beginning of the story, and then we will cross out how many we are taking away.*



# Lesson #7 Representing and Solving Subtraction Problems Using a Crossing Out Strategy

**Brief Overview of Lesson (what this lesson is about):** The focus of this lesson is for students to model the concept of taking apart numbers. The students will represent subtraction by crossing out pictures. Students will first use manipulatives to represent subtraction expressions and equations. Students will then write the numbers to show numerical subtraction expressions and equations. Finally, students will show the difference between two numbers.

As you plan, consider the variability of learners in your class and make adaptations as necessary.

## **Prior Knowledge Required:**

PK.CC MA.1 Listen to and say the names of numbers in meaningful contexts.

PK.CC MA.2 Recognize and name written numerals 0-10.

PK.CC MA.3 Understand the relationships between numerals and differences up to 10.

PK.CC MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count a many as seven things in scattered configuration.

PK.CC MA.5 Use comparative language, such as *more/less than*, *equal to*, to compare and describe collections of objects.

PK.OA MA.1 Use concrete objects to model real world addition (putting together) and subtraction (taking away) problems up through five.

**Estimated Time (minutes):** 50-60 minutes

## **Resources for Lesson:**

Whole group story problem with pictures/rebus (see examples below)

Overhead copy of whole group story problem

Independent story problem

Pencils, crayons or markers



## Lesson #7 Representing and Solving Subtraction Problems Using a Crossing Out Strategy

**Time (minutes):**50- 60 minutes

**Overview of the Lesson:** The focus of this lesson is for students to model the concept of taking apart numbers. The students will represent subtraction by crossing out pictures. Students will first use manipulatives to represent subtraction expressions and equations. Students will then write the numbers to show numerical subtraction expressions and equations. Finally, students will show the difference between two numbers. As you plan, consider the variability of learners in your class and make adaptations as necessary.

### Standard(s)/Unit Goal(s) to be addressed in this lesson:

- K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings<sup>1</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.
- K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
- SMP1:** Make sense of problems and persevere in solving them
- SMP4:** Model with mathematics

### Essential Question(s) addressed in this lesson:

- How can we show how many we have left when we subtract two numbers?
- What strategies can we use to show how many we have?
- How can pictures or tools help us to solve problems?

**Objectives** Students will be able to represent the difference between two numbers and model taking away using a crossing out strategy.

### Language Objectives

- Students will use the targeted academic vocabulary- Count, subtract, less., number, take away, equation, number sentence, equal to, equal sign-to ask or answer questions about taking away/taking apart situations.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of subtraction.



- Students will speak audibly about subtraction and clearly express thoughts and ideas about subtraction.

### **Targeted Academic Language**

Count, subtract, less. number, take away, equation, number sentence, equal to, equal sign

### **What students should know and be able to do before starting this lesson**

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

### **Anticipated Student Pre-conceptions/Misconceptions**

- Numbers are like letters and don't represent a quantity.

### **Instructional Materials/Resources/Tools**

- Whole group story problem with pictures/rebus (see examples below)
- Overhead copy of whole group story problem
- Independent story problem
- Pencils, crayons or markers

### **Instructional Tips/Strategies/Suggestions for Teacher**

Be aware of students who do not yet have the skill of one-to-one correspondence so you may provide them additional opportunities to further develop this skill.

Whenever possible, provide ample opportunities for students to explain and prove what they are doing orally. This will assist them in developing oral speaking skills in mathematics.



Suggested math workshop stations which support learners around this lesson:

1. Circle game. Partner A will turn over number card and draw that number of circles. Partner B will roll a die (labeled with 1,1,2,2,3,3) and cross out that number of circles shown on the die. Partner A will explain how the subtraction is modeled. Partner B should verify Partner A. Switch roles.
2. Listening station. Partner A will turn over a number card and draw that number of circles (can also use stamps). Partner B will roll a die (labeled 1,1,2,2,3,3) and clap the number of times shown on the die. Partner A will cross out that same number of circles. Partners verify each other and switch roles.
3. Story problem station with teacher. Teacher provides a variety of story problems like those used during direct instruction. Under teacher supervision, students have the opportunity to read the problem written in the form of a rebus, and solve the problem using the strategy of crossing out. This station can be a gradual release station where students gain independence with each problem they solve. Those students who show readiness may practice this activity with a partner.
4. Now how many? teacher station. This station will support students who are just beginning to understand taking away and crossing out. The teacher will provide bags/cups containing up to ten counters. The student will count to find out how many, and draw that many circles as done during direct instruction. The teacher will remove one counter and ask *Now how many do we have?* The student will cross out one circle and determine how many are left. Students who show readiness may play this as a partner activity.
5. Take Two station. Provide simple rebus stories that include two subtrahends. Provide objects, paper and pencil. Allow students to make meaning and attempt to represent these situations in partnerships.

## Assessment

Formative: Observe individual students' ability to represent the correct number for each amount by drawing pictures and to recognize what is not crossed out as the difference. Evaluate students' ability to represent the correct number for each item in the story problem as well as look for the crossing out of the correct number.

## Lesson Details

### Lesson Opening

*Yesterday we learned how to listen to claps, and to show subtraction on the ten frame. Today we will represent subtraction story problems by*



*drawing pictures and crossing out.* (SMP4: Model with mathematics.)

Call students' attention to the overhead copy (or other method such as an Elmo or Smartboard), of the written story problem. Read the simple story aloud. Ask students to close their eyes and visualize the problem as you read each step. Ask students to Turn and Talk about the problem before beginning to explain it.

Review how to draw "math drawings" (versus "art drawings") and how to cross out the number needed to subtract.

*Listen to the story written on the board:*

I saw 7  on the porch.

3  ran away.

How many  were left on the porch?

*I am going to draw 7 circles to represent the kittens. Alternatively, you can model the problem with cubes or other manipulatives. How can I show that 3 kittens ran away? How could you show how many kittens are left? Let's count how many are left. Let's try another story. This next story is an opportunity for observation, as well as a chance for students to suggest other symbols to use to represent objects in the story.*

### **During the Lesson**

Hand out a similar story problem for students to try at their tables. Ask students to close their eyes and visualize the problem as you read each step. Ask students to Turn and Talk about the problem before beginning to explain it.

Circulate the students and make note of students who may struggle with this strategy, of students who are able to use this strategy independently, and of students who are ready for more challenge.



There were 10  on the tree.

I picked 2  .

How many  are still there?

### Suggested Guided Questions:

1. *What part of the story does this picture represent? (Point to a specific part of the picture.)*
2. *What if I picked 1 more orange? (Probe for understanding of 1 less.)*
3. *If I picked 5 oranges, and there were still 5 oranges on the tree, How many did I start with?*
4. *What if I saw 10 oranges on the tree? Then I started picking, and I noticed there were only 4 oranges left on the tree. How many did I actually pick?*

### Lesson Closing

*Today we used a strategy called crossing out to show how many are taken away in a story problem. So if I pick 2 oranges off of the tree, will there be more oranges or less oranges on the tree than in the beginning? Who would like to share their work? You drew ten circles to represent ten oranges, and then you then crossed out 2 of them. How many oranges are left on the tree? Is there anyone who can state in their own words how to use crossing out to help them subtract?*

If any students show readiness, pose this question: *What if this happened? There were 10 oranges on the tree. I picked 2. Then my brother picked 2. How many were left on the tree?* Student response will inform whom you should steer to the Take Two station.

This question is an opportunity to see who will use addition to solve a subtraction situation. *What if the wind started really blowing, and I saw 6 oranges on the ground and 3 in the tree. How many were in the tree before it got windy?*



# Lesson # 8: Subtraction on the Number Line

**Brief Overview of Lesson (what this lesson is about):** In this lesson students will act out a subtraction story problem by standing on a number line as a strategy to solve the problem. As you plan, consider the variability of learners in your class and make adaptations as necessary.

## **Prior Knowledge Required:**

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition, (putting together), and subtraction, (taking away), problems up through five.

KCC2 Count forward beginning from a given number within the known sequence,

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

**Estimated Time:** 30-45minutes

## **Resources for Lesson:**

Word problems, perhaps based on recently read children's literature

White board/marker or overhead projector/screen

Large laminated number line, individual number lines for each student



## Lesson #8: Subtraction on the Number Line

**Time (minutes):** 50-60 minutes

**Overview of the Lesson:** During this lesson the teacher will read a story problem. Students will stand on a number line and use it as a strategy to act out a story problem.

### **Standard(s)/Unit Goal(s) to be addressed in this lesson:**

**KOA1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, (claps), acting out situations, verbal situations, expressions, or equations.

**KOA2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**SMP1** Make sense of problems and persevere in solving them.

**SMP4** Model with mathematics.

**SMP7** Look for and make use of structure.

### **Essential Question(s) addressed in this lesson:**

How can we show how many we have left when we subtract two numbers?

How can pictures or tools help us to solve problems?

**Objectives:** Students will create a model for subtraction with a real world problem.

### **Language Objectives:**

- Students will use the targeted academic language to ask or answer questions about taking away.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of subtraction.
- Students will speak audibly about subtraction and clearly express thoughts and ideas about subtraction.



**Targeted Academic Language** Count, subtract, less, number, number line, take away, sum, equal to

**What students should know and be able to do before starting this lesson:** Identify a number between 0-10 on a number line and count the total number of objects.

### **Instructional Materials/Resources/Tools**

- Word problems, perhaps based on recently read children’s literature
- White board/marker or overhead projector/screen
- Large laminated number line
- Individual number lines for each student

### **Instructional Tips/Strategies/Suggestions for Teacher**

Laminated number line is printed large enough that a student can stand at or on a number. Place this in central location so that each student can observe. (Can also make this number line out of tape in same location). Be sure to have desktop number lines for each student. Ensure students know not to count until they move off of the number line.

Math workshop stations which support learners around this lesson:

1. Pick a bag station. Teacher prepares small paper bags that each contain 1-10 counters and a number card with number 1-4. Students select a bag, empty the contents on the table, and place each counter on a number of the number line starting at 1. Student then reads the number card aloud and removes that number of counters from the number line. Student turns to a tablemate to describe how s/he solved the problem.
2. Story station with teacher. Teacher chooses a number 5-10. Teacher provides engaging counters and desktop number lines. Teacher tells subtraction stories similar to those read recently in children’s literature and/or the whole group lesson. Next, teacher asks students to model with counters on the number line the situation being described. Eventually, roles may be reversed where students have opportunities to describe a subtraction situation for a partner to model.
3. Story station with partner. Once students show proficiency with modeling number stories on the number line at the teacher station, they will be ready to practice this skill with a partner. This can be an ongoing station that could be stimulated by simple pictures taken from greeting cards, children’s magazines or picture books, or dot cards.
4. Clap and subtract partner station. This station builds on listening opportunities presented in previous lessons. Teacher determines



the total starting number. For example, *Today you will play “clap and subtract” with the number 7. You will start with 7 cubes, and subtract the number you hear your partner clap.* One partner is the Clapper, and the other partner is the Subtractor. The Clapper turns over a number card and makes the corresponding number of claps. Teacher may choose options from any of the previous lessons, such as tapping or animal noises. Simultaneously, the Subtractor models the number of claps with cubes on the number line. Partners work together to verify that the number of counters matches the solution.

5. Take Two station. Provide simple rebus stories that include two subtrahends. Provide objects, paper and pencil. Allow students to make meaning and attempt to represent these situations in partnerships.
6. Race to zero station. Provide number lines, cubes and a die marked 1,1,2,2,3,3. Partners fill their number lines with ten cubes. Partners take turns rolling the die, and removing that amount from the number line. Partners describe what happened with each turn. *I had 8. I rolled 8. Now I have 5.* The winning player must roll the correct number to clear the number line of cubes.

### **Assessment:**

Read a new word problem to the class. Ask them to use their number line to subtract.

### **Lesson Details (including but not limited to:)**

#### **Lesson Opening**

Review, *Yesterday we solved subtraction problems by drawing pictures and crossing out. Remember how we used the number line to solve addition problems? Today we are going to use the number line to solve subtraction problems. Listen to this story.*

*I had 7 toy trains. Jose took 1 of my trains. How many trains do I have now?* (SMP4 Model with Mathematics)

#### **During the Lesson**

After reading the story problem, ask 7 students to come and stand on the life size number line. (Hold up a 1 on cardstock). Reread the second part of the story, asking the last student to step off of the number line. Model how to count the number of students remaining on the number line. While most students will have the rote counting sequence, it is important to model one-to-one correspondence in counting. (SMP7: Look for and make use of structure.) Explain that each student represents a toy train. The last student on the number line is standing on the number 6. This number represents the total number of toy trains after taking away one train. Model how to say the equation that represents this model  $7-1=6$ .



Next, model another such story on the life size number line.

*There were 5 orange pumpkins on a vine.*

*Sally picked 2 pumpkins off the vine.*

*How many pumpkins are still on the vine?*

After the second story is modeled on the life size number line, prepare students to work in partnerships with one desk size number line and cubes/counters. Have several engaging stories ready to share. One partner should represent the total quantity in the story on the number line with cubes, while the other partner will represent the quantity taken away from the number line. Together, partners will determine the difference represented in the story. To do this, some students will count all the cubes while other students will say the last number represented on the number line as the total quantity. Circulate and observe partnerships in order to select students to share how they determined the difference. Model how to read the equation, ask partners to take turns trying to say the equation to each other, and gradually invite students to model how to say the equation to the whole group as they show readiness. Make note of students who struggle with

- taking away more than one from the number line
- students who take away cubes from the beginning of the number line and still say the last number covered by a cube
- students who do/do not check their answer for reasonableness
- students who are ready for more challenge

### **Suggested Guided Questions:**

1. *What part of the story matches this part of your number line? (Point to any one of the three parts: total, difference, subtrahend)*
2. *Let me hear you explain to your partner how to subtract on the number line.*
3. *What if I picked 2 more pumpkins off the vine?*
4. *What if there were some pumpkins. Then I picked 3. When I looked again, only saw 3 pumpkins. That makes me wonder how many there were to begin with?*
5. *What if I saw 8 pumpkins on the vine? Then I started picking, and I notices there were 4 pumpkins left on the vine. Hmm, how many did I pick?*

### **Lesson Closing**

#### **Summary**



Have class return to meeting area and review how to model subtraction on a number line.

*Today we used a number line to help us subtract. Take a minute, and think about a story problem to be used on the number line. Partner A, share your story with partner B. (Wait time.) Partner B, share your story with partner A. Who feels confident in sharing their story, and showing us how to use the number line to represent the story?*

*When you get up from the rug to go to stations, you will find Take Two from yesterday. Today, Take Two will ask you to use the number line, not crossing out, to solve subtraction problems. Tomorrow we will have an opportunity to pretend to shop at the store in the dramatic play center. You will be able to show how to subtract when you shop.*

*Note: Provide students with many opportunities to practice addition and subtraction on the number line.*



# Curriculum Embedded Performance Assessment #2 (CEPA)

## Lesson: CEPA #2: School Store, Subtraction

**Time (minutes):** 10 minutes whole class; 5-10 minutes per individual CEPA

**Overview of the Lesson:** Students will once again visit the school store center to represent and solve subtraction problem solving situations. The “customer” (teacher) will have 10 pennies to spend on a school supply item. The customer (teacher) will give the item to the cashier (student). *I’d like to buy this pencil grip. I have this coupon. Could you tell me how much money that will cost?* The cashier (student) will be responsible for determining the total amount due. The cashier (student) may use one of the various tools (number line, cubes, ten frame, part-part-total work mat) available to determine the total. The cashier (student) will then write the customer a receipt, which should be checked by the customer. The receipt will be labeled My Shopping Receipt. As you plan, consider the variability of learners in your class and make adaptations as necessary.

### Standard(s)/Unit Goal(s) to be addressed in this lesson:

**K.OA.1** 1. Represent addition and subtraction with objects, fingers, mental images, drawings<sup>3</sup>, sounds (e.g., claps), acting out situations verbal explanations, expressions, or equations.

**KOA2** Solve addition and subtraction word problems, and add and subtract within 10,e.g., by using objects or drawings to represent the problem.

**SMP1.**Make sense of problems and persevere in solving them.

**SMP4.** Model with mathematics.

**SMP7.** Look for and make use of structure.



## Essential Question(s) addressed in this lesson:

How can we show how many we have left when we subtract two numbers?

What strategies can we use to show how many we have?

How can pictures or tools help us to solve problems?

**Objectives:** Students will be able to represent numbers and show taking apart with models, expressions or equations.

## Language Objectives

- Students will use the targeted academic language to ask or answer questions about taking away.
- Students will construct drawings and use manipulatives to clarify ideas and show knowledge of representation of subtraction.
- Students will speak audibly about subtraction and clearly express thoughts and ideas about subtraction.

## Targeted Academic Language

Count, add, subtract, more, less, number, take away, difference, objects

## What students should know and be able to do before starting this lesson

PK.CC.MA.2. Recognize and name written numerals 0-10.

PK.CC.MA.3. Understand the relationship between numerals and the quantity of ten.

PK.CC.MA.4 Count many kinds of concrete objects and actions up to ten, using one-to-one correspondence, and accurately count as many as seven things in a scattered configuration.

PK.OA.MA.1 Use concrete objects to model real-world addition (putting together) and subtracting (taking away) problems up through five.

KCC2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

KCC4 Understand the relationship between numbers and quantities; connect counting to cardinality

## Instructional Materials/Resources/Tools

- Pennies, Bowl of cubes



- Basic school items with price tags/stickers, school store receipt, pretend coupons
- Number line, ten frame
- Subtraction Part-Part-Total mat

### **Instructional Tips/Strategies/Suggestions for Teacher**

- Copy and prepare coupons in advance.
- Be sure to price items between 5-10 cents.
- Demonstrate role expectations.
- Orient students to what is available in store.

**Assessment** Observe the skills of the students using the rubric.

### **Lesson Details (including but not limited to:)**

#### **Lesson Opening**

*We have been practicing different ways to show subtraction and taking away. As you know, the dramatic play area is a school store. (This is a teacher directed activity to be used for assessment with one student at a time.) In the school store you will have a chance to pretend to buy school supplies. When you do this you will show me how to take away one quantity from. I will work with you one at a time so that you can show me what you know about representing subtraction. (SMP4 Model with mathematics)*

#### **During the Lesson**

This is the general procedure for the school store assessment. The “customer” (teacher) will have 10 pennies to spend on a school supply item. The customer (teacher) will give the item to the cashier (student). *I'd like to buy this pencil grip. I have this coupon. Could you tell me how much money that will cost?* The cashier (student) will be responsible for determining the total amount due. The cashier (student) may use one of the various tools (number line, cubes, ten frame, part-part-total work mat) available to determine the total. *The pencil grip costs 6 cents. The coupon says subtract 1 cent. So, that will cost you 5 cents, please.* Prompt the student to explain how to subtract the amount of the



coupon. *How did you think about that? Or, show me how you solved that.* The cashier (student) will then write the customer a receipt, which should be checked by the customer. The receipt will be labeled My Shopping Receipt.

For each student, select various items to purchase and have the student show and tell you how much you owe after subtracting the amount of the coupon. Have each student fill out the receipt. Repeat this process three times, one for each coupon.

Use the CEPA Rubric provided to evaluate evidence of student learning rather than simply relying on the completed receipt as evidence of learning.

### Lesson Closing

*Today you pretended to be a cashier in our classroom school store, and I pretended to be the customer. You had a chance to show me how to subtract when you used a coupon to tell me the total cost of the school supply item that I wanted to buy.*

### CEPA Rubric

	<b>Beginning</b>	<b>Progressing</b>	<b>Mastering</b>
<b>Student can count out total number of pennies for 1 item</b>	Student does not have one to one correspondence	Student counts amount correctly, but rechecks	Student counts amount correctly, with ease
<b>Student can determine the difference accurately</b>	Student can subtract one cent accurately	Student can subtract two cents accurately	Student can subtract three cents accurately
<b>Student can explain how to subtract the amount of the coupon</b>	Student cannot explain how to subtract the amount of the coupon	Student explains how to subtract the amount on the coupon with support	Student can explain how to subtract the amount on the coupon independently
<b>Student can fill out the receipt</b>	Student cannot fill out receipt	Student partially fills out the receipt	Student successfully fills out receipt



# List of Unit Resources

## #1 Listening to Numbers - Addition:

- Part-part work mat, laminated and consumable (enough for each student)
- cubes, two sided counters or other manipulative
- materials to make sounds other than clapping- drum, blocks, tambourine, etc.
- pencils, crayons or markers

## #2 Representing with Part, Part, Whole:

- Part-part-whole mats
- cubes/ counters
- pencils, crayons

## #3 Storybook Math - Addition:

- Quack and Count, by Keith Baker
- Cubes/ counters, duck pictures
- Chart paper and drawing paper

## #4 The Number Line, Addition:

- prepared story problems with sums to 10
- white board and markers
- life-size number line
- individual/ desktop number lines

## CEPA 1 School Store, Addition

## #5 Storybook Math - Subtraction



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- Ten Little Monkeys Jumping on the Bed, by Annie Kubler
- Cubes/counters
- Chart paper and drawing paper

### **#6 Listening to Numbers - Subtraction**

- ten frames
- cubes/counters
- sound makers (clap, bell, blocks)

### **#7 Representing and Solving Subtraction Problems Using a Crossing Out Strategy**

- prepared story problems
- projector
- paper and pencil

### **#8 The Number Line - Subtraction**

- life size number line
- desk top number lines
- cubes/counters

### **CEPA 2 School Store - Subtraction**

- School supply items from CEPA 1
- Coupons
- “School Store Receipt, Subtraction”
- Bowl of cubes
- Ten frame
- Number line
- Pencil

General Math workshop materials: number cards, prepared word problems, various counters, previously read children’s math literature, previously used noise makers, paper bags, desk top number line, part-part work mats, ten frames



# My Shopping Receipt

_____ ¢	_____ ¢
Total= _____ ¢	



Coupon

Subtract

1 cent



Coupon

Subtract

2 cents



Coupon

Subtract

3 cents



# Part

# Part



<b>Part</b>	<b>Part</b>
<b>Whole</b>	

