First Grade Unit 6: Figure the Facts with Penguins

Big Conceptual Idea: **K-5 Progression on Counting and Cardinality and Operations and Algebraic Thinking** (pp. 12-17), **K-5 Progression on Number and Operations in Base Ten** (pp. 6-7), **K-6 Progression on Measurement and Data (Measurement Part)** (pp. 8-11)

Throughout the unit the Math Practices are introduced and used. Find student friendly posters [here](#).

Links might require you being logged into your Bridges Educator Site. If the link does not work for you, copy and paste the http address into a browser.

### Mathematical Background:
- Read Bridges Unit Overview pages (pp. i-vi).

### Unit Essential Questions for the Teacher:
What strategies can be used to solve different word problem types, and how can the reasoning strategies already developed support this work?

### Instructional note:

This unit’s big idea picks up where Unit 4 left off. It continues to work on Phase II of fluency development (flexible, efficient, accurate, and appropriate) applying earlier strategies developed within 10 to solve basic number combinations within 20. While Phase I focuses on constructing meaning and counting strategies, Phase II involves reasoning strategies. Students have begun to develop addition and subtraction strategies in previous units, and in this unit, students apply these strategies to word problems of all types to develop a broader understanding of addition and subtraction operations. Students will use the number rack as a tool to make sense of problems that involve unknowns. **Student understanding of the relationships between numbers and the operations of addition and subtraction support the big idea of part-part-whole relationships.**

In Table 1, **Common addition and subtraction situations** of the Nevada Academic Content Standards (NVACS), twelve different problem types appropriate for first grade development are defined (2010, p.88). “This classification of problem types is based on years of research on how children think about addition and subtraction” (Carpenter, Fennema, Loef Franke, Levi, & Empson, 2015, p. 13). Note that the “add to result unknown” in top left box of the table is the most accessible problem type for students as they can directly model the action in the problem. The problem types in the table increase in complexity from left to right. Comparison problems are considered most challenging for first grade students. Teachers might easily differentiate problems, by changing the wording (context), using this chart as an example. Teachers might also differentiate, by using the same problem type, but changing the number quantities within the problem.

“Children’s ability to solve word problems depends to a great degree on their ability to understand and model the action or situation in the problem. Variations in the wording of the problems and in the situations they depict can make a problem more or less difficult for children to solve. We can make problems easier for children by making the action or relationships in the problems as clear as possible and using contexts that are familiar to the children in the class such as games some children play at home, things that a child collects....” (Carpenter et al., 2015, p. 12).
Therefore, teachers will see a variety of strategies that students use to approach solving these problems such as: **direct modeling** the action and relations in problems, **counting strategies**, and **derived number facts**. When directly modeling the actions, teachers-observe students physically representing all three quantities in a problem and the action or relationship involving those quantities before counting the resulting set. For example, when given a word problem (e.g. John had 11 marbles and his friend gave him 7 more marbles for his birthday. How many marbles does he have now?) students will use manipulatives or drawings to make a set of 11 and then make a set of 7. They will push them together and count the resulting set. A counting strategy is easy to identify because students will abstract one number, typically, by holding a number in their head, or conserving it, and work from there. For example, students recognize that it is not necessary to actually construct each set. Students might count on from 11, using physical objects, such as fingers to keep track of counts. A Derived Fact is when students use a fact or strategy that they do know to help them with an unknown fact. For example, with 11+7 the students might know 10+7 already, then use that knowledge to add just one more (as one more than 10 is 11). “All of the strategies described come naturally to young children. Children do not have to be taught that a specific strategy goes with a particular type of problem. With opportunity and encouragement, children construct for themselves strategies that model the action or relationship in a problem. Similarly, they do not have to be shown how to count on or be explicitly taught specific Derived Facts. In an environment that encourages children to use procedures that are meaningful to them, they will construct these strategies” (Carpenter et al., 2015, p. 4).

It is important to watch students solve these problems. Select students to share their thinking and strategy in a staircase of complexity model. For example, choose a student who used **direct modeling** to share first, then select someone who used a **counting strategy** next. The reason for doing this is to create equal opportunity for all students to access the thinking of others. Sharing a strategy all students can understand first allows this equity to occur. The challenge and rigor comes into play when the next “level” of strategy is shared and students who are on the cusp of that level of thinking are encouraged to attempt that strategy next time. Using multiple strategies to solve varying degrees of difficult story problems can engage students in productive struggle. “Children must have the tools and prior knowledge to solve a problem and not be given a problem that is out of reach, because otherwise they will struggle without being productive; however, children should not be given tasks that are straightforward and trivial because they will not struggle with mathematical ideas and further develop their understanding” (Van de Walle, Karp, Lovin, Bay-Williams, 2014, p. 16). Finding this balance is how a teacher can support rigorous classroom instruction, offer the appropriate scaffolding for students through discussion and strategy sharing, and provide multiple entry and exit points for students in problems.

A word of caution to educators when scaffolding for students, “…we do not recommend that children be taught key-word strategies to help them solve problems. Such strategies are ineffective in dealing with anything but a narrow set of problem situations and discourage children from making sense of the problems they solve” (Carpenter et al., 2015, p. 14). In the article, **13 Rules That Expire** (click blue hyperlink to access this complimentary article from NCTM), authors Karp, Bush and Dougherty (2014) describe challenges that occur when keywords lead students to “grab” the numbers from the problem, performing a computation without attending to the meaning of the entire problem.

Throughout the school year, Number Corner provided many opportunities for students to engage in computation through word problems. October Number Corner featured autumnal objects on the calendar markers to elicit student-created “math stories.” These math stories or word problems were developed with input from the class and recorded on the Calendar Grid Observations Charts. January Number Corner featured equations on the calendar markers and invited students to create word problems to match the equations. The equations varied the unknown in all positions to create opportunities to explore result unknown, change unknown and start unknown problems. These are powerful connections to point out to students during Unit 6 instruction.
### Essential Academic Vocabulary

Use these words consistently during instruction.

<table>
<thead>
<tr>
<th>New Academic Vocabulary:</th>
<th>Review Vocabulary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use these words consistently during instruction to begin to develop understanding.</td>
<td><strong>(Vocabulary taught prior grades or units)</strong></td>
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<tr>
<td><em>a Word Resource Card is available</em></td>
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<tr>
<td>Count on*</td>
<td>Add*</td>
</tr>
<tr>
<td>Foot*</td>
<td>Double ten-frame</td>
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<tr>
<td>Join</td>
<td>Equal*</td>
</tr>
<tr>
<td>Missing addend</td>
<td>Equation*</td>
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<tr>
<td>Whole*</td>
<td>Greater than*</td>
</tr>
</tbody>
</table>

### Additional terminology that students might need support with:
- chart
- strategy
- take-away
- minus
- observation
- plus
- pair
- partner

### Standards listed in **bold** indicate a focus of the lesson.

<table>
<thead>
<tr>
<th>NVACS (Content and Practices)</th>
<th>Big Idea</th>
<th>Mathematical Development</th>
<th>Instructional Clarifications &amp; Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.OA.1 1.OA.5 1.OA.6 1.NBT.2</td>
<td><strong>MP.2</strong></td>
<td>Developing the Big Idea: Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition as they solve story problems about penguins.</td>
<td>Instructional NOTE:</td>
</tr>
<tr>
<td>Access Prior Learning:</td>
<td><strong>K.OA.2</strong> Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem.</td>
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<td></td>
<td>Unit 4 Module 4 sets the stage for this work.</td>
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<td></td>
<td>Subitizing.</td>
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<tr>
<td>1.OA.5</td>
<td><strong>MP.7</strong></td>
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<tr>
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<td><strong>MP.7</strong></td>
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<tr>
<td>Instructional NOTE:</td>
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<tr>
<td></td>
<td>Send home the <em>Family Letter</em> found <a href="https://example.com">here</a>.</td>
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<tr>
<td></td>
<td>This <a href="https://example.com">teacher tool</a> by Visnos, suggested on the Bridges Educator site, animates penguins on icebergs. Use the round sliding toggles at the bottom to select the number of penguins on each iceberg.</td>
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<tr>
<td></td>
<td>See the digital display of Baby Penguins (p. T1) for this lesson <a href="https://example.com">here</a>.</td>
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<td></td>
<td>Read the Math Practices in Action in the margin (p. 5).</td>
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<td></td>
<td>This problem type is an add to result unknown, the easiest problem type. Teachers might see students needing to direct model using their number rack. Students might count out 10 by 1s, then slide and count another 2, finally starting over from 1 and counting all 12 beads by 1s. This is likely the least sophisticated strategy teachers will see. Other students might slide over 10 beads without counting individual beads and count on saying “11, 12.” This is a counting-on strategy. Other students might use the anchor of 10 as a friendly number and easily add 2 mentally. When selecting students to share, begin with someone who direct modeled and then choose someone who employed a counting strategy or derived fact.</td>
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<td></td>
<td><strong>Enrichment:</strong> See Step 10 (p. 6)</td>
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<td><strong>Child Watching:</strong></td>
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<td>Observe for students direct modeling with cubes or number racks. Support by suggesting students “challenge themselves and try Johnny’s (enter your own student’s name) strategy and count on by holding a number in their head. This is a big idea called Conservation of Number and needs to be developed to successfully use the counting-on strategy.</td>
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<td></td>
<td>Observe for students using the counting-on strategy.</td>
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<td></td>
<td>Observe for students who mentally add and provide the challenge option in step 10.</td>
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</table>
Module 1- Session 2: Penguin Huddles & Penguin Pals

**1.OA.1**
1.OA.5
1.OA.6
1.OA.7
1.OA.8
1.NBT.2

**MP.2**
**MP.7**

**Access Prior Learning:**
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem
- Unit 4 module 4 sets the stage for this work
- Subitizing
- Session 1

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through composition and decomposition as students solve story problems about penguins.

**Instructional NOTE:**
- See the digital display of Penguin Huddles (p. T3) for this lesson
- The first problem is an add to change unknown problem type, which is more difficult than the previous lesson.
- Be sure to introduce the new “count on” vocabulary card as well as discuss “missing addend” (no card).

**Enrichment:** See Step 11 (p. 11)

**Child Watching:**
- As this is a more challenging problem type, many students might need to direct model. On a number rack this might look like: students count out 10 on the top, then add by 1s to the bottom until they get to 14. Then students go back and count the four on the bottom they added to find the missing addend. 10 + ___ = 14
- Observe for students using the Counting On strategy, conserving the first number in their head and counting up until they arrive at the result.
- Some students might mentally derive the fact without using manipulatives or counting strategies.
- Make a note taker to keep track of which students are doing which strategy to inform your instruction. It is hopeful that a majority of your students will be using reasoning strategies (Phase 2 of fluency development) to derive the facts (use known facts to solve unknown facts). Students using direct model consistently should be guided towards trying the other more efficient strategies.

Module 1- Session 3: Penguin Egg Doubles

**1.OA.6**
1.NBT.1

**MP.2**
**MP.7**
**MP.8**

**Access Prior Learning:**
- K.OA.A.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- Session 1 & 2
- Counting by 2s

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition as they solve story problems about penguins. Students will strengthen understanding of doubles facts to support their fluency development and use of doubles facts to create a reasoning strategy of doubles + and doubles -.

**Instructional NOTE:**
- Read the Math Practices in Action in the margin (p. 17).
- This lesson will support repeated reasoning abilities and the transition into using doubles as a reasoning strategy for fluency development.
- See the digital display materials https://bridges.mathlearningcenter.org/digital-materials/session-3-penguin-egg-doubles

**Enrichment:** Using two dice will increase the number to double, leading to sums beyond 20

**Child Watching:**
- Watch for students who struggle and encourage the use of just one die

Module 1- Session 4: Nine Fish, Ten Fish

**1.OA.1**
1.OA.6

**MP.4**
**MP.5**
**MP.7**

**Access Prior Learning:**
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem
- Previous Sessions

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition as they solve story problems about penguins. Students will strengthen their understanding of +10 facts and how to use +10 facts in relation to +9 facts to support student fluency development.

**Instructional NOTE:**
- See the online digital tools with the add and subtract spinner and cards
  https://bridges.mathlearningcenter.org/digital-materials/work-place-6a-spin-win-bingo
- See the Work Place Sentence Frames for Unit 6 here.
- These strategy posters for addition might be useful to support students in using +10 and +9 facts.
- Read the About This Session in the margin (p. 20)

-continues on next page-
In this lesson, the context is centered around penguins eating fish for breakfast and then more for lunch. In step 2, the problem posed is an add to, result unknown. In Step 3, the problem posed is also an add to, result unknown problem.

Child Watching:
- Observe for students who are having difficulty using the add 10 or add 9 strategy while playing Spin to Win Bingo. Students might not know where to start or rely on counting by 1s. Use Work Place Guide for suggestions to support (p. T8).
- Take notes on which students are counting by 1s and which students are counting on. It can inform tomorrow’s lesson.

Module 1- Session 5: Fishing for Subtraction Strategies

Access Prior Learning:
- 1.OA.1
- 1.OA.4
- 1.OA.6
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem
- Previous Sessions

Instructional NOTE:
- See the Subtraction Strategy Posters.
- In step 3, the introductory problem is a take from, result unknown problem type. Bridges calls this the Take Away strategy.
- In step 7, a second problem is posed and it is a compare, difference unknown problem type. This problem type is more challenging. Students might struggle with trying to direct model these types of problems and might need support and scaffolding. “Comparison problems involve comparing two quantities. The third quantity in these problems does not actually exist but is the difference between the two amounts” (Van de Walle et al., 2014, p. 129). “The challenge in comparison problems comes from the fact that two quantities are being described using language that can be complex for children. Fewer, less than, more, bigger, and greater than are the terms typically used to describe the relationships in comparison problems” (Van de Walle et al., 2014, p. 131).
- In step 12, problem #3 is posed. It is a take from, result unknown problem type, making it an easier problem than #2. Consider rearranging these and solve problem #3 prior to problem #2.
- In step 16, More Molly & Ollie Stories (found on p. T13) is a set of additional word problems to present and discuss with students.
  - Problem #1 is another compare, difference unknown problem type. This problem type is particularly challenging for students because there is no physical action to model or act out. Students might direct model by creating a set of 12 objects to represent the 12 fish that Ollie caught and a separate set of 9 objects to represent the 9 fish Molly to caught. Then they must determine the relationship between the quantities and compare the two sets. Students may have difficulty devising a plan to compare the sets. A common direct modeling strategy is match objects from the set one to one until one set is used up. The number of unmatched objects remaining in the larger set indicates how many more are in the larger set. The dialogue in Step 16 presents a more sophisticated counting up strategy in which the student does not make a set of objects for each quantity. The student models 9 and counts up to 12 and determines 12 is 3 more than 9.
  - Problem #2 is a take from, result unknown problem type.
  - Problem #3 is a take from, result unknown problem type.
  - Problem #4 is a compare, difference unknown problem type.

Enrichment: The nature of these problem types is enriching, and students can try more than one strategy on each problem.

Child Watching:
- Observe and document what students are using which strategies.
- Watch for students struggling with the comparison problem types and scaffold with manipulatives, perhaps use cubes as well as the number rack.
- Connect the comparison situation with a story that is more familiar in context than penguins and fish. Sharing cookies with a sibling or friend might be a more relatable context.
Module 2- Session 1: Double-Flap Dot Cards Ten to Twenty

Access Prior Learning:
- K.OA.1- Represent addition and subtractions with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem
- K.OA.3- Decompose numbers less than or equal to 10 into pairs in more than one way
- Subitizing
- Previous Sessions and Unit 2 Module 2 Session 1

Developing the Big Idea:
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition as they solve story problems about penguins. Students will strengthen their understanding of subtraction problems and explore different strategies to solve subtraction problems. Relating the subtraction problem to a related addition problem supports the part-part-whole relationships.

Instructional NOTE:
- The idea of the “fact family” made its appearance the last time Dot Cards were used in Unit 2. Students might remember how to relate this concept to their real lives by stating that each family is made up with different members. Consider drawing a house on the board, putting the three numbers in the corners of the roof’s triangle, and writing the corresponding facts in the box.

Enrichment: Challenge students to create story problems that are more complex, like a change unknown, start unknown, or comparison problem.

Child Watching:
- Observe for students who confuse the subtrahend and the minuend in their subtraction equation. (No need to teach students those terms yet.)
- Check for understanding of the written addition equations. Determine if students can explain the parts of the equation, such as which number represents the total, what each symbol means, which number represents the quantity on the left side of the card and which number represents the quantity on the right side of the card.
- Check for understanding of the written subtraction equations. Determine if students can explain the parts of the equation, such as which number represents the total and why it is placed to the left of the minus sign. Have students act out the equation with objects or use the corresponding double flap card to check for mistakes.

Module 2- Session 2: Double-Flap Penguin Picture Cards

Access Prior Learning:
- K.OA.1- Represent addition and subtractions with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem
- K.OA.3- Decompose numbers less than or equal to 10 into pairs in more than one way
- Subitizing
- Previous Sessions and Unit 2 Module 2 Session 1

Developing the Big Idea:
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition as they solve story problems about penguins. Students will strengthen their understanding of subtraction problems and explore different strategies to solve addition and subtraction problems. Relating the subtraction problem to a related addition problem supports number relationships.

Instructional NOTE:
- Read the About This Session in the margin (p. 12)
- Read the Math Practices in Action (p. 15)
- Double-Flap Penguin Picture Cards p. 1 shows the combination of 4 and 10. In step 1, the sample discussion shows how students might consider the various combinations to make 14 that could be hiding under the flaps. Guide students towards considering Doubles Plus or Minus One fact, an Add Ten fact or Add Nine fact. They should eliminate a Doubles Plus One fact (7 + 8 = 15 and 7 + 6 =13).
- Double-Flap Penguin Picture Cards p. 2 shows the combination of 6 and 7. This is a Doubles Plus One fact.
- Double-Flap Penguin Picture Cards p. 1 shows the combination of 9 and 4. This is an Add Nine fact.

Enrichment: Challenge students to create story problems that are more complex, like a change unknown, start unknown, or comparison

Child Watching:
- Observe for students who are still counting all or counting up from the quantity that is less on the Double-Flap cards. Refer to the addition strategy posters and ask students to identify what type of fact they worked on and model how to use the more efficient strategy to add the quantities. In step 18, create a practice opportunity by giving the students number combination that lends itself to the strategy you modeled. Students can use this number combination to create their personal Double-Flap card.

Module 2- Session 3: Penguins Marching Two by Two

Access Prior Learning:
- K.OA.1- Represent addition and subtractions with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by

Instructional NOTE:
- The idea of the “fact family” made its appearance the last time Dot Cards were used in Unit 2. Students might remember how to relate this concept to their real lives by stating that each family is made up with different members. Consider drawing a house on the board, putting the three numbers in the corners of the roof’s triangle, and writing the corresponding facts in the box.

Enrichment: Challenge students to create story problems that are more complex, like a change unknown, start unknown, or comparison problem.

Child Watching:
- Observe for students who confuse the subtrahend and the minuend in their subtraction equation. (No need to teach students those terms yet.)
- Check for understanding of the written addition equations. Determine if students can explain the parts of the equation, such as which number represents the total, what each symbol means, which number represents the quantity on the left side of the card and which number represents the quantity on the right side of the card.
- Check for understanding of the written subtraction equations. Determine if students can explain the parts of the equation, such as which number represents the total and why it is placed to the left of the minus sign. Have students act out the equation with objects or use the corresponding double flap card to check for mistakes.
**Module 2: Session 4: Addition Facts Flash**

**Access Prior Learning:**
- K.OA.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- K.OA.2- Solve addition and subtraction word problems, and add and subtract within 10, by using objects or drawings to represent the problem.
- K.OA.3- Decompose numbers less than or equal to 10 into pairs in more than one way.
- Subitizing

**Instructional NOTE:**
- Read the About This Session in the margin (p. 24)
- The importance of this lesson is not so much about collecting the facts that align to each category as “Doubles, or Doubles Plus or Minus One” etc. It is more about helping students understand that some strategies are more appropriate to use than other strategies depending on the numbers. Students need to be able to select and accurately apply methods that are appropriate for the context and the numbers involved by choosing an appropriate strategy. Create space in the conversation to discuss the selection of strategies.
- Consider collecting a grade on this Work Place. Use the grading rubric 6B attached to the Suggestions for Reporting Progress documents. Note: Allow several days of exposure to the Work Place before collecting a grade.

**Enrichment:** *Work Place Game Variations* (p. T9)

**Child Watching:**
- Observe for students who have difficulty solving double facts and support with using other strategies while noting they need extra time to work on doubles in a meaningful way, such as real world examples of doubles and pair-wise ten frame dot cards. There are ten doubles facts from 0 + 0 to 9 + 9. Children often discover the pattern of doubles and the mathematical idea that when a number is doubled it is joining two equal groups. These doubles become anchors for other facts. The goal is that students will later use doubles to derive other facts.

**Module 2: Session 5: Pick Two to Make Twenty**

**Access Prior Learning:**
- K.OA.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations

**Instructional NOTE:**
- Read the About This Session in the margin (p. 30)
- Read the Math Practices in Action in the margin (p. 31)

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Module 3- Session 1: Penguin Problems: Joining

**Access Prior Learning:**
- K.OA.1- Represent addition and subtractions with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- Kinder students worked on one of the problem types in this lesson, add to, result unknown
- Extended lessons in Unit 3 on commutativity and associativity.

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of composition and decomposition. Students will strengthen their understanding of addition problems and the use of different addition strategies.

**Instructional NOTE:**
- To provide learning opportunities to support 1.OA.2 this session is recommended to be extended over 2 days.
- Thinking about the Problem Situation Table, from the standards and the beginning of this document, these problems will be in the Add To row (NVACS, 2010, p.88).

**Day 1: Complete lesson using the notes below:**
- The first problem posed is an add to, result unknown problem type. Teachers might see students using 3 strategy types:
  - Direct model: Draw or count out 9 & 5
  - Counting Strategy: Not representing the 9 or 5 at all, but just counting up
  - Derived Fact: 9 is close to 10+5=15, so it is one less than 15

The lesson suggests demonstrating a derived fact strategy with the number rack. Some students might not need to use the number rack to do this. Step 3 states "Ask students to solve it on their number rack." Perhaps rephrase this with "Solve this however you would like." Then draw from the strategies seen around the room for the conversation.

- The second problem posed is an add to, change unknown problem type. Again, consider suggesting they solve it anyway they like. This will be more difficult.
  Teachers might see students using 3 strategy types:
  - Direct model: Draw or count out 8 penguins, then slide more until they reach 12
  - Counting Strategy: Abstracting 8 (holding it in their head) then counting up until they reach 12
  - Derived Fact: I know that 8+2 is 10, and if I had 2 more it'll be 12. So 2+2 is 4.

If your students have difficulty with these two problems, consider changing the numbers and continue working with these two problem types instead of doing the third problem type.

- The third problem is an add to, start unknown. This is a very difficult problem for 1st graders. Students should be exposed to this type of problem, but the standards don’t call for security of this until 2nd grade. This problem type is difficult because direct modeling is difficult and relies on a grab, check and adjust strategy for dealing with the start unknown. If students were direct modeling the other two problems, they might struggle with this. Students who direct model follow the problem in order as it is written. This problem starts with “Some penguins.”

Teachers might see students attempt this by just grabbing “some” cubes or move “some” beads. Then students will move/add 5 more and check to see if it is 11. Students might do this over and over in a guess and check method until they come to 11. Then students will go back and count the ones they started with.

- The assessment binder under the Bridges Unit Assessment tab provides the scoring guide for this checkpoint (p. 65). It can also be downloaded from the site and scores entered digitally to create a color coded spreadsheet.
  https://bridges.mathlearningcenter.org/implementation

- Combinations & Stories Checkpoint p. 2
  Problem #3a is an add to, result unknown problem type.
  Problem #3b is an add to, change unknown problem type.

**Child Watching:**
- Observe for students struggling to select two numbers that will be closest to 20. The game might be adjusted for a target to 10.
- Observe student strategy selection for combining numbers. What strategies are students using? Is the strategy appropriate/efficient for the numbers?
- Use the Scoring Guide (p. 65) to assess students and inform your instruction.

-continues on next page-
Day 2:
- The following task addresses 1.OA.2, and continues addressing the properties of associativity and commutativity. This task and a rubric for assessing it are available in the Q3 Grading Suggestions documents, found on the C & I webpage.

We have eight penguins and three ledges - one large, one medium-sized and one small.

There are 5 penguins on the large ledge, 2 on the medium ledge and 1 on the small ledge.

Can you find another way to place penguins so that there are the most on the large ledge and least on the small ledge?

Try to find as many ways as you can to put the penguins on the ledges with the most on the large ledge and the least on the smallest ledge. If you think you have found them all, explain how you know those are all the possibilities.

Enrichment: See Step 11 or change the numbers in the problem and provide another opportunity (p. 7).

Child Watching:
- Observe for student strategies. Are students direct modeling? Are students using a counting strategy? Are students using a derived fact? Select students to share in that order.
- Observe for students applying the Commutative and Associative Properties.

Module 3 - Session 2: Penguin Problems: Separating

<table>
<thead>
<tr>
<th>1.OA.1</th>
<th>1.OA.4</th>
<th>1.OA.6</th>
<th>1.OA.8</th>
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<tbody>
<tr>
<td>MP.1</td>
<td>MP.3</td>
<td>MP.7</td>
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Access Prior Learning:
- K.OA.1: Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- Kinder students worked on one of the problem types in this lesson, take from, result unknown

Instructional NOTE:
- Teachers might consider using an A/D/E day and extending this lesson across 2 days.
- Thinking about the Problem Situation Table, found in the standards and at the beginning of this document, today’s problems will be in the Take From row 2 (NVACS, 2010, p. 88).
- The first problem posed is a take from, result unknown problem type. Kinder students worked with these problem types, therefore, you might consider posing the problem and sending students to solve it however they want. You might see students using 3 strategy types:
  - Direct model: Draw or count out 12, remove 3, and then count the 9 remaining
  - Counting Strategy: Not representing the 12 at all, but just counting back 11, 10, 9. Similarly, students might even count up from 9 employing the efficient “Think Addition” strategy,
  - Derived Fact: 12 - 2 is 10, and one less is 9.

Developing the Big Idea:
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of the part-part-whole relationships. Students will strengthen their understanding of subtraction story problems and the use of different addition strategies.

The lesson suggests demonstrating a derived fact strategy with the number rack. Some students might not need to use the number rack to do this. Instead ask these students to use it or another tool to justify their thinking and reasoning. Step 3 states “Ask students to solve it on their number rack.” Perhaps rephrase this with “Solve this however you would like.” Then draw from the strategies you see around the room for the conversation, focusing the conversation on efficient strategies for the numbers or the context provided.

- If many students struggled with the first problem, consider changing the numbers and engage students in another take from, result unknown problem.
- If your students were successful with the first problem, move forward with the second problem, a take from, change unknown problem type. Step 6 suggests that students will likely count up from 8 to 14. This is only true if students are no longer needing to Direct Model. If students are still Direct Modeling, they will follow the steps in the problem exactly as the story presents.

-continues on next page-
Students will count out 14 first, then they will move beads or cubes away until they have 8 left, finally counting how many they moved away. If students no longer need to directly model, they might use a Counting Strategy such as counting back from 14 to 8 on their fingers or number rack, by conserving 14, and saying 13, 12, 11, 10, 9, 8. Students might also use a Derived Fact. For example, one fact they might use is their knowledge of 14-4= 10, then subtract 2 more to get 8. 4 and 2 is 6 total.

- The third problem is a take from, start unknown problem. Start unknown problems are much more difficult as students who direct model and follow the problem exactly as it is written will be confused when they see “Some penguins were standing.” These students might attempt to solve the problem by just grabbing “some” cubes, or moving “some” beads over. Through a trial and error system, these students might move cubes back and forth until they get to 9. When students are finally left with 9, they might count how many the “some” was that they started with; other students might not know what to count to find the solution. Students who are using Counting Strategies might count them together by counting up. Derived Fact strategies students to use their knowledge of related addition facts 9+6=16). Note: students might need more time working on this problem.

- Be cautious about trying to turn strategies into a procedure by coaching “when you see this box empty you just need to add, even though there is a subtraction sign.” Allowing students to solve problems in their own way and listen to each other’s strategies will result in more success for this hard work of making sense of the problem and understanding the operations.

Enrichment: If students are in the Recall Stage of fluency for these numbers, “I just know it” will be their explanation. If this is the case, you can challenge students by changing the numbers in the problem. Also, see Step 11 (p. 13). The rigor of the start unknown problem types is built into the standards.

Child Watching:
• Observe for student strategies. Are students direct modeling? Are students using a counting strategy? Are students using a derived fact? Select students to share in that order.

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**Module 3- Session 3: Counting Penguin Feathers**

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<thead>
<tr>
<th>1.OA.1</th>
<th>1.OA.6</th>
<th>1.OA.7</th>
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<td><strong>MP.2</strong></td>
<td><strong>MP.3</strong></td>
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**Access Prior Learning:**
- K.OA.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- Kinder students worked on both of the problem types in this lesson, Put Together/Take Apart Result Unknown and Change Unknown

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of the part-part-whole relationships. Students will strengthen their understanding addition and subtraction story problems.

**Instructional NOTE:**
- Read the About this Session in the margin, (p. 16).
- Thinking about the Problem Situation table, found in the standards and the beginning of this document, these problems will be in the Put Together/Take Apart, row 3 (NVACS, 2010, p. 88).
- The first problem is a Put Together/Take Apart Result Unknown problem type. Teachers might see students using three strategy types.
  - Direct Model: Students might draw or count out 6 & 4 and then count all
  - Counting Strategy: Not representing both numbers, but just counting up/down from one of the quantities
  - Derived Fact: 9 is close to 10+5=15, so it is one less than 15

The lesson is collecting all the possible combinations (the different parts) that can make the whole.

- Consider just posing the chart, setting the stage for the work, and sending students off to come up with as many combinations as they can, rather than keeping them in a whole group. Reconvene and share out your selected group’s strategy.

-continues on next page-
• In making the combinations, students who are direct modeling might need to use black and white cubes and manipulate them to create their combinations. Some students won’t care what color the cubes are. Other students might be able to see the patterns in the chart. If we start with 1+9, then switch one over to the other color it will be 2+8, then 3+7. Do not force students to see this, yet be looking for students who might be discovering this repeated reasoning. Choose these students to share as the last share of the day.

• Consider collecting a grade on this Work Place. Use the grading rubric 6c attached to the Suggestions for Reporting Progress documents. Note: Allow several days of exposure to the Work Place before collecting a grade.

**Enrichment:** See Step 12 (p. 18)

**Child Watching:**
• Observe for student strategies. Are students direct modeling? Are students using a counting strategy? Are students using a derived fact? Select students to share in that order.

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### Module 3- Session 4: Comparing Penguins

**Access Prior Learning:**
- K.OA.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- Although the standards do not call for kinder students to work with these more difficult problem types, they might have been exposed to them in the Kinder Bridges Materials

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of part-part-whole relationships. Students will strengthen their understanding addition and subtraction story problems, and the use of different strategies to work with them.

**Instructional NOTE:**
- Thinking about the Problem Situation Table, found in the standards and the beginning of the document, these problems will be in the Compare, row 4 (NVACS, 2010, p. 88). These problems are very difficult for students because the problems are difficult to directly model. Students cannot rely on the words alone in the problem to guide them, they have to use internal knowledge to “know” that they must compare them, and what it means to compare them. This lesson sets up students to develop the knowledge of comparing.

**Enrichment:** Consider posing the problem and having students work through it in small groups, rather than using your number rack to illustrate each.

**Child Watching:**
• Observe for student strategies. Who is trying to Direct Model? What strategies are students using to compare? Are students making one to one matches and seeing what is left? Are students using a counting up strategy?

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### Module 3- Session 5: Unit 6 Assessment

**Access Prior Learning:**
- K.OA.1- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions or equations
- All the previous sessions

**Developing the Big Idea:**
Students will deepen their understanding of the relationships between numbers and the operations of addition and subtraction through supporting the big idea of the part-part-whole relationships. Students will strengthen their understanding addition and subtraction story problems, and the use of different strategies to work with them.

**Instructional NOTE:**
- The Assessment Binder under the Bridges Unit Assessment tab provides the scoring guide for the for Unit 6 Assessment (p. 70) It can also be downloaded from the site and scores entered digitally to create a color coded spreadsheet. See the right hand side where it says, “assessment tools.”
- Standards 1.OA.1, 1.OA.4, 1.OA.6, 1.OA.7, 1.OA.8 are targeted for mastery according to the Grade 1 Assessment Map in the assessment binder under the Assessment Overview tab (pp. 13-15).
- Problems in number 5 of the assessment are take from, change unknown, take from, result unknown, and compare problems. If students are not successful with solving these during the assessment, consider giving them a few add to, result unknown and add to, change unknown problems just to formatively assess where they are able to be successful.

-continues on next page-
• Note that the portion of the assessment assessing addition and subtraction facts is a “gentle timed” test. Read the note on page 28 of the lesson for more descriptions. Research shows that timed tests create anxiety (Boaler, 2015). The intention of the 3-minute marker on this assessment is intended to support the goal of students coming to an answer using a reasoning strategy within 3 seconds. Do not feel tied to the timed aspect of this assessment. Consider being creative in assessing this skill. The goal of the assessment is for teachers to be able to identify how students are developing in fluency and to notice what strategies they are using. Consider replacing that part of the assessment with the assessment tool, created for APTT fluency assessment. It can be found on the Family Game resources section of the WCSD Curriculum and Instruction website.

Child Watching:
• Teachers should be concerned about those students struggling with one or more of the following: (See Assessment Binder, Bridges Unit Assessment tab, p. 61 for more information).
  • Solving addition and subtraction story problems within 20.
  • Counting on and counting back to solve addition and subtraction combinations within 20.
  • Adding and subtracting with sums and minuends to 10 using strategies that are efficient, accurate and flexible.
  • Working from familiar facts such as doubles, make 10s, and add 10s.
  • Counting to 120
  • Reading and writing numbers to 100
  • Understanding that whole numbers between 10 and 100 are composed of 10s and 1s.

Module 4 - Session 1: Emperor Penguins

Access Prior Learning:
• K.MD.1- Describe and compare measurable attributes of objects such as length or weight.
• K.MD.2- Directly compare two objects with a measurable attribute in common to see which object has “more of”/“less of” the attribute and describe the difference
• Kinder students focused with units of measure such as shoes to determine lengths.
• Unit 4 Module 4 Sessions

Instructional NOTE:
• The terms inches and feet are used in this lesson. However, the expectation is not about using those standard units (as they are second grade standards). The focus of this work should be the application of using what students have learned about number lines and reinforcing that turning the line vertically to use as a measuring tool does not change the tool or use.
• Using string to observe length is a great way to maintain the linear measurement attribute. It also supports students in constructing the idea of transivity, which is important when direct comparison cannot be used. “In situations when direct comparison is not possible or convenient, they should be able to use indirect comparison and explanations that draw on transivity” (K-6 Progression on Measurement and Data, 2011, p. 8).
• When making comparisons, students might count up from the smallest number.
• Consider permanently posting the penguins’ strings next to the labeled measuring strip. This will support students who need a concrete model, allowing them to connect the concrete string to the abstract label on the measuring strip, and support further direct comparisons.

Securing the Big Idea:
Although students are looking at measurements, the relationships between numbers continues to be developed. Students use the measurements of the penguins and apply the lengths to comparison problem types, supporting the big idea of the part-part-whole relationships.

Child Watching:
• Observe for strategies that students use in determining the difference. Are students counting up from the smallest number? Are students counting back from the largest number? Are students counting by 10s off the decade (16, 26, 36)?
### Module 4- Session 2: Little Blue Penguins

**1.NBT.1**
- K.MD.1- Describe and compare measurable attributes of objects such as length or weight

**1.NBT.3**
- K.MD.2- Directly compare two objects with a measurable attribute in common to see which object has “more of”/“less of” the attribute and describe the difference

**1.MD.1**
- Kinder students focused with units of measure such as shoes to determine lengths.

**1.MD.2**
- Unit 4 Module 4 Sessions
- Previous lesson

#### Access Prior Learning:
- Kinder students focused with units of measure such as shoes to determine lengths.
- Unit 4 Module 4 Sessions
- Previous lesson

#### Instructional NOTE:
- Read the About This Session in the margin (p. 10).
- Consider posting a student’s height measuring strip (created in Unit 4, Module 4, Session 1) next to the class measuring strip (displaying all penguin string lengths). Use the student’s height measuring strip to compare with penguins’ strings to place in height order. Consider labeling the comparisons on sticky notes, using written words and mathematical notation. This provides students another opportunity to engage with 1.MD.1, ordering three objects by length.

#### Enrichment:
- If time students can explore measuring other objects.

#### Child Watching:
- Observe for students struggling with the use of the vocabulary words. Shorter than, taller than, more than, greater than, less than. Use them interchangeably.

#### Securing the Big Idea:
- Although students are looking at measurements, the relationships between numbers continues to be developed. Students use the measurements of the penguins and apply the lengths to comparison problem types, supporting the big idea of the part-part-whole relationships.

### Module 4- Session 3: Me & the Penguins Again

**1.NBT.1**
- K.MD.2- Directly compare two objects with a measurable attribute in common to see which object has “more of”/“less of” the attribute and describe the difference

**1.NBT.3**
- Kinder students focused with units of measure such as shoes to determine lengths.

**1.MD.1**
- Unit 4 Module 4
- The previous lessons

#### Access Prior Learning:
- Kinder students focused with units of measure such as shoes to determine lengths.
- Unit 4 Module 4
- The previous lessons

#### Instructional NOTE:
- Students will likely use a counting up or counting down strategy to find the difference between their height and the emperor penguin, as the difference will be minimal and the numbers are close together. The little blue penguin portion of the lesson provides a good opportunity to look for counting strategies. Watch for students who operate on 10s and 1s separately by counting up to a decade number then counting by 10s or by counting by 10s or off the decade.
- Consider using this lesson as an opportunity to provide students the option to solve these questions using whatever tools and strategies they would like. Students might get the cubes out and make lengths for themselves and the penguins, then comparing from there. Watch for students trying to use the cubes against the inch measuring strip. The cubes are not exactly an inch long, so 45 cubes will not equal 45 inches. If students discover this, it is a great opportunity to discuss the importance of equal length units when comparing, and address misconceptions that students might have.
- Student Book page 48 & 49 (problems 1, 2, and 3 only) can be used as an assessment of 1.MD.1.

#### Enrichment:
- See second bullet above

#### Child Watching:
- Observe for students struggling with the use of the vocabulary words. Shorter than, taller than, more than, greater than, less than. Use them interchangeably.

#### Securing the Big Idea:
- Although students are looking at measurements, the relationships between numbers continues to be developed. Students use the measurements of the penguins and apply the lengths to comparison problem types, supporting the big idea of the part-part-whole relationships.

### Module 4- Session 4: Penguin Pairs

**K.CC standards**
- These next two lessons can provide opportunities for the teacher to pull aside and work with any students who might need more support based on the Unit 6 Assessment.

#### Access Prior Learning:
- K.CC standards

#### Developing the Big Idea:
This lesson works on counting by 2s using the stage that has been set with penguins, while exploring these patterns, students are exercising their counting and arithmetic skills and developing a deeper understanding about even numbers. This will strengthen students’ knowledge about the relationships between numbers.

#### Instructional NOTE:
- These next two lessons can provide opportunities for the teacher to pull aside and work with any students who might need more support based on the Unit 6 Assessment.
- Read Math Practices in Action in the margin (p. 21)
- The lesson sets the stage for tomorrow’s lesson.
- This lesson is for exposure only. Determining whether a group of objects has an odd or even number of members is 2nd grade standard.

#### Enrichment:
- See Step 8 (p. 22)
### Session 5: Counting by Twos with Penguin Pairs

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<td>1.NBT.1</td>
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<td>MP.7</td>
<td></td>
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<tr>
<td>MP.8</td>
<td></td>
</tr>
</tbody>
</table>

**Developing the Big Idea:**
This lesson works on counting by 2s using the stage that has been set with penguins, while exploring these patterns, students are exercising their counting and arithmetic skills and developing a deeper understanding about even numbers. This will strengthen students' knowledge about the relationships between numbers.

**Instructional NOTE:**
- This lesson can provide opportunities for the teacher to pull aside and work with any students who might need more support based on the Unit 6 Assessment.
- This lesson is for exposure only. Determining whether a group of objects has an odd or even number of members is 2nd grade standard.

**Enrichment:** See Step 4 (p. 25),

### References


