

SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE

| Content Area | 2 nd Grade Math |
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| Recommended Days of Instruction | 2nd Nine Weeks |
| <p>Standard 2-2: The student will demonstrate through the mathematical processes an understanding of the base-ten numeration system; place values; and accurate, efficient, and generalizable methods of adding and subtracting whole numbers.</p> <p>2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)</p> <p>2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)</p> <p>2-2.10 Analyze the magnitude of digits through 9,999 on the basis of their place value.</p> | |
| <p>Standard 2-3: The student will demonstrate through the mathematical processes an understanding of numeric patterns and quantitative and qualitative change.</p> <p>2-3.1: Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4)</p> <p>2-3.2: Translate patterns into rules for simple multiples. (B2)</p> <p>2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects. (B4)</p> | |
| <p>Standard 2-5: The student will demonstrate through the mathematical processes and understanding of the value of combinations of coins and bills and the measurement of length, weight, time, and temperature.</p> <p>2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)</p> <p>2-5.2: Use coins to make change up to one dollar. (B3)</p> <p>2-5.3 Use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers.</p> <p>2-5.7 Use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval.</p> <p>2-5.8 Match a.m. and p.m. to familiar situations.</p> | |
| <p>* These indicators are covered in the following 4 Modules for this Nine Weeks Period. Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.</p> | |

| Module 2-1 Year Long Mathematics Indicators | | | |
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| Indicator | Recommended Resources | Suggested Instructional Strategies | Assessment Guidelines |
| Module 1-1 Lesson A 2-2.10 Analyze the magnitude of digits through 9,999 on the basis of their place values. (B4) | STANDARD SUPPORT DOCUMENT http://www.ed.sc.gov/apps/aso/standards NCTM's Online Illuminations http://illuminations.nctm.org | See Instructional Planning Guide Module 1-1 <u>Introductory Lesson A</u> See Instructional Planning Guide Module 1-1, Lesson A <u>Additional Instructional Strategies</u> | See Instructional Planning Guide Module 1-1 <u>Lesson A Assessing the Lesson</u> |
| Module 1-1 Lesson B 2-5.3: Use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius | NCTM's Navigations Series <u>Teaching Student-Centered Mathematics Grades K-3</u> and <u>Teaching Elementary and Middle School Mathematics Developmentally 6th Edition</u> , John Van de Walle | See Instructional Planning Guide Module 1-1 <u>Introductory Lesson B</u> | See Instructional Planning Guide Module 1-1 <u>Lesson B Assessing the Lesson</u> |

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| <p>and Fahrenheit thermometers. (C3)</p> <p>2-5.7 Use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval. (C3)</p> <p>2-5.8 Match <i>a.m.</i> and <i>p.m.</i> to familiar situations. (A2)</p> | <p><u>NCTM's Principals and Standards for School Mathematics</u> (PSSM)</p> | | |
| <p>Module 1-1 Lesson C</p> <p>2-5.3: Use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers. (C3)</p> | | <p>See Instructional Planning Guide Module 1-1 <u>Introductory Lesson C</u></p> <p>See Instructional Planning Guide Module 1-1, Lesson C <u>Additional Instructional Strategies</u></p> | <p>See Instructional Planning Guide Module 1-1 <u>Lesson C Assessing the Lesson</u></p> |
| Module 2-2 Patterns, Relationships and Functions | | | |
| Indicator | Recommended | Suggested Instructional Strategies | Assessment |

| | Resources | | Guidelines |
|--|--|--|--|
| Module 2-2 Lesson A 2-3.1 Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4) 2-3.2 Translate patterns into rules for simple multiples. (B2) | STANDARD SUPPORT DOCUMENT http://www.ed.sc.gov/apps/aso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series | See Instructional Planning Guide Module 2-2 <u>Introductory Lesson A</u> See Instructional Planning Guide Module 2-2, Lesson A <u>Additional Instructional Strategies</u> | See Instructional Planning Guide Module 2-2 <u>Lesson A Assessing the Lesson</u> |

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| <p>Module 2-2 Lesson B</p> <p>2-3.3 Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects. (B4)</p> | <p>Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle</p> <p>NCTM’s Principals and Standards for School Mathematics (PSSM)</p> | <p>See Instructional Planning Guide Module 2-2 <u>Introductory Lesson B</u></p> | <p>See Instructional Planning Guide Module 2-2 <u>Lesson B Assessing the Lesson</u></p> |
| <p>Module 2-3 Money</p> | | | |
| <p>Indicator</p> | <p>Recommended Resources</p> | <p>Suggested Instructional Strategies</p> | <p>Assessment Guidelines</p> |

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| <p>Module 2-3 Lesson A</p> <p>2-5.1 Use a counting procedure to determine the value of a collection of coins and bills. (C3)</p> <p>2-5.2 Use coins to make change up to one dollar. (B3)</p> | <p>STANDARD SUPPORT DOCUMENT http://www.ed.sc.gov/apps/aso/standards</p> <p>NCTM's Online Illuminations http://illuminations.nctm.org</p> <p>NCTM's Navigations Series</p> <p>Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle</p> <p>NCTM's Principals and Standards for School Mathematics (PSSM)</p> | <p>See Instructional Planning Guide Module 2-3 Introductory Lesson A</p> <p>See Instructional Planning Guide Module 2-3, Lesson A <u>Additional Instructional Strategies</u></p> | <p>See Instructional Planning Guide Module 2-3 <u>Lesson A Assessing the Lesson</u></p> |
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| Module 2-4 Addition and Subtraction | | | |
|--|--|---|--|
| Indicator | Recommended Resources | Suggested Instructional Strategies | Assessment Guidelines |
| Module 2-4 Lesson A 2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6) | STANDARD SUPPORT DOCUMENT http://www.ed.sc.gov/apps/aso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series | See Instructional Planning Guide Module 2-4 Introductory Lesson A | See Instructional Planning Guide Module 2-4 <u>Lesson A Assessing the Lesson</u> |

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| <p>Module 2-4 Lesson B</p> <p>2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)</p> | <p>Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle</p> <p>NCTM's Principals and Standards for School Mathematics (PSSM)</p> | <p>See Instructional Planning Guide Module 2-4 <u>Introductory Lesson B</u></p> | <p>See Instructional Planning Guide Module 2-4 <u>Lesson B Assessing the Lesson</u></p> |
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MODULE

2-1

Year Long Math Indicators

This module addresses the following indicators:

2-2.10: Analyze the magnitude of digits through 9,999 on the basis of their place values. (B4)

2-5.3: Use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers. (C3)

2-5.7: Use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval. (C3)

2-5.8: Match *a.m.* and *p.m.* to familiar situations. (A2)

These indicators were first introduced in Module 1-1, 1st nine weeks. These indicators should be revisited all year long. **See notes for revisiting in this module. There will not be actual lessons in this module, rather teachers should read the teacher notes and refer to module 1-1 as the building blocks.** These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

• Continuum of Knowledge

2-2.10 Analyze the magnitude of digits through 9,999 on the basis of their place value.

- In kindergarten, the students analyze the magnitude of digits through 99 on the basis of their place values. (K-2.6). In first grade, students analyze the magnitude of digits through 999 on the basis of their place values. (1-2.9)
- In second grade, students analyze the magnitude of digits through 9,999 on the basis of their place values. (2-2.10)
- In third grade students, analyze the magnitude of digits through 999,999 on the basis of their place values. (3-2.12)

2-5.3 Use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers.

- Kindergarten students use nonstandard units to explore the measurement concepts of length and weight. (K-5.3). In first grade, students use whole inch units to measure the length of an object (1-5.4).
- Second grade students use appropriate tools to measure objects to the nearest whole unit measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers. (2-5.3)
- Third grade students use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches; measuring liquid volume in fluid ounces pints, and liters; and measuring mass in grams. (3-5.2)

2-5.7 Use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval.

- Kindergarten students used analog and digital clocks to tell time to the hour. (K-5.6) First grade students used analog and digital clocks to tell and record time to the hour and half-hour. (1-5.8)
- In second grade, students use analog clocks to tell and record time to the nearest quarter hour and to the nearest five minute interval. (2-5.7)
- Third grade students will use analog and digital clocks to tell time to the nearest minute. (3-5.5)

2-5.8 Match a.m. and p.m. to familiar situations.

- This standard is not addressed at the Kindergarten or first grade level.
- Second grade students will match a.m. and p.m. to familiar situations. They also use analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval (2-5.7)
- In third grade, students use analog and digital clocks to tell time to the nearest minute (3-5.6).

- **Key Concepts/Key Terms**

*These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

- | | |
|----------------------|-----------------|
| • *digits | • *Weight |
| • *Place value | • *Ounces |
| • *Value | • *Pounds |
| • *Units/ones | • *Temperature |
| • *Tens/rods | • *Thermometer |
| • *Hundreds/flats | • *Fahrenheit |
| • *Thousands/cube | • *Celsius |
| • *Standard form | • *Degrees |
| • *Expanded form | • *Length |
| • *Compose/decompose | • *Analog |
| • *Equivalent forms | • *Digital |
| • *Measure | • *Time |
| • *Unit | • *Clock |
| • *Ruler | • *Hour |
| • *Centimeter | • *Half-hour |
| • *Feet | • *Quarter hour |
| • *Yard | • *Minute |
| • *Liquid volume | • *Interval |
| • *Cup | • *A.M./ a.m. |
| • *Quart | • *P.M./ p.m. |
| • *Gallon | |
| • *Weigh | |

Teacher Notes: Mathematics learning builds over the course of time. This is especially true with concepts such as number sense; equivalencies; weight, linear, and liquid measurement; time; money, just to name a few. As a result some topics are best acquired through repeated exposure in small on-going intervals of time. Therefore, while an introductory lesson has been provided for the concepts addressed in Module 1-1, First Nine Weeks, it is important to point out that students will need on-going formal and informal experiences throughout the year to ensure the automaticity and flexibility that is demonstrated with mathematical understanding.

Second grade students should continue to use concrete and pictorial materials to build understanding on the concepts addressed in Module 1-1, First Nine Weeks, for these year long indicators. Please refer to this Module and provide learning experiences that builds on prior learning to meet the indicators. Use the *Additional Instructional Strategies/Differentiation Variations* to gradually increase the capacity and allow student understanding to develop through repeated exposure.

MODULE

2-2

Patterns, Relationships, and Functions

This module addresses the following indicators:

2-3.1: Analyze numeric patterns in skip counting that use the numerals 1 through 10. (B4)

2-3.2: Translate patterns into rules for simple multiples. (B2)

2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numbers, symbols and objects. (B4)

This module contains 2 lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need.

ADDITIONAL LESSONS will be required to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

- **Continuum of Knowledge**

2-3.1: Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4)

- In kindergarten, students identify simple patterns. (K-3.1) Students analyze simple repeating and growing relationships to extend patterns. (K-3.2) Students translate simple repeating and growing patterns into rules. (K-3.3). In first grade, students analyze numeric patterns in addition and subtraction to develop strategies for acquiring basic facts. (1-3.1) Students analyze numeric relationships to complete and extend simple patterns. (1-3.4)
- In second grade, students analyze numeric patterns in skip counting that uses numerals 1 through 10. (2-3.1)
- In third grade, students create numeric patterns that involve whole-number operations. (3-3.1) Students apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (3-3.2)

2-3.2: Translate patterns into rules for simple multiples. (B2)

- In kindergarten, students translate simple repeating and growing patterns into rules. (K-3.3)
- In first grade, students translate patterns into rules for simple addition and subtraction. (1-3.2)
- In second grade, students translate patterns into rules for simple multiples. (2-3.2)
- In third grade, students create numeric patterns that involve whole number operations. (3-3.1)

2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects. (B4)

- In kindergarten, students analyze simple repeating and growing relationships to extend patterns. (K-3.2)
- In first grade, students analyze numbers relationships to complete and extend simple patterns. (1-3.4)
- In second grade, students analyze relationships to complete and extend growing and repeating patterns involving numbers, symbols and objects. (2-3.3)
- In third grade, students use symbols to represent an unknown quantity in a simple addition, subtraction, or multiplication equation. (3-3.3)

- **Key Concepts/Key Terms**

*These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

- *Skip counting
- *Patterns
- *Numeric
- *Multiples
- *Patterns
- *Rules
- * Growing pattern
- *Repeating pattern
- *Extend
- *Core (the part that repeats)
- *Element (the numbers, symbols, objects)
- *Analyze

II. Teaching the Lesson(s)

1. Teaching Lesson 2-2A Skip Counting Patterns

2-3.1: Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4)

For this indicator, it is **essential** for students to:

- Skip count using numerals 1 – 10
- Have a knowledge of pattern organization

For this indicator, it is **not essential** for students to:

- Create numeric patterns

2-3.2: Translate patterns into rules for simple multiples. (B2)

For this indicator, it is **essential** for students to:

- Skip count using numerals 1 – 10
- Apply skills and knowledge about translating patterns into rules for simple addition and subtraction.

For this indicator, it is **not essential** for students to:

- Understand the concept of multiplication

a. Indicators with Taxonomy

2-3.1: Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4)

Cognitive Process Dimension: Analyze

Knowledge Dimension: Conceptual Knowledge

2-3.2: Translate patterns into rules for simple multiples. (B2)

Cognitive Process Dimension: Understand

Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson**Materials:**

Paper 100's charts, 5 for each child

Paper

Colored Pencils or highlighters

Lesson: *Adapted from Navigating through Algebra in Prekindergarten-Grade 2 and Van de Walle, p. 194, Activity 12.22*

Have the students skip count by 2's, starting at zero and shade in the numbers on the 100's chart. When they finish shading (circle if shading will be too dark), have the students work in pairs to identify all of the patterns they see. Ex: All of the even numbers are shaded. Every other column is shaded.

Have them continue doing this on a different 100's chart for 3's, 4's, 5's, and 10's. Discuss all of the patterns each group has found.

Ask:

- What are you noticing about all of the charts?
- What might happen if you start on 2 and count by 3's? by 5's?
- What do you think would happen if you skip counted by 2's and 5's on the same chart?

Working in pairs or trios, ask the students: After identifying all of these patterns and discussing them, what do you know will always be true about counting by 2's? Write these rules and post them in the room as a reminder of what they discovered? Continue doing this with 3's, 4's, 5's and 10's.

Initially, you may want to focus on rules that begin or end at 0 because of students' familiarity with numbers verbalized when counting by twos, threes, fours, and fives. It is important, however, for students to perform jumping rules that do not start or end at 0. In these instances, the students may focus more on the rules that generate the landing numbers because they are less familiar with the landing numbers.

As the students gain experience with jumping rules, you may want them to record both the jump number and the landing number in a table. For example, for the rule "Start at 3 and jump forward two spaces with each jump," the students would complete a table like the one below:

| Number of jumps | Landing Number |
|-----------------|----------------|
| 1 | ? |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |

After multiple experiences with skip counting, extend growing, and repeating patterns, students need to begin translating these patterns into rules.

In preparation for Module 2-3, *Money*, have students count by 5s, 10s, 25s, and 50s. At first start counts at zero and later to some multiple of your skip. For example, begin at 225 and count by 25s. Counts by 10 should also begin at numbers ending in 5 as well as multiples of 10. Also, count backwards by these same amounts. (adapted Van de Walle, p. 194, Activity 12.22)

c. Misconceptions/Common Errors

Using multiples is not to be confused with multiplication facts.

d. Additional Instructional Strategies/Differentiation

Students in second grade build on prior knowledge of skip counting by starting with any number 1-10 and skip counting through 100. Students should analyze the relationship between the numbers created by skip counting with any number.

While a pattern can be identified by merely skip counting, the mathematics in this indicator goes deeper. Students should analyze the numeric relationship between numbers created as a result of the skip counting. For example, when skip counting by 3, students should examine the relationship between 3, 6, 9, etc. the difference between each element is also a pattern- a difference of 3 each time.

This seems obvious to the adult learner, but it is a numeric relationship that must be analyzed by students in order to develop number sense and comprehension.

Students notice how numeric patterns repeat via addition which leads to multiples, not multiplication.

Have the students do some skip counting where the start number is a number other than zero. This can be done with the 10's chart or by letting them use calculators. Have them identify any patterns they can find.

e. Technology

- Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding
- Learning Planet: Students choose from numbers 1 -10 to skip count by and continues an already started pattern.
<http://members.learningplanet.com/act/count/free.asp>
- Counting Patterns to 100 <http://www.ixl.com/math/practice/grade-2-counting-patterns-up-to-100> (enter site as guest)
- Skip Counting Sequences <http://www.ixl.com/math/practice/grade-2-skip-counting-sequences>
- Skip Counting Stories <http://www.ixl.com/math/practice/grade-2-skip-counting-stories>
- Skip Counting Puzzles <http://www.ixl.com/math/practice/grade-2-skip-counting-puzzles>
- Interactive Hundreds Chart (Use this chart online for practice.)
<http://www.apples4theteacher.com/math/games/100-number-chart-one.html>
- SMART Board Interactive Whiteboard Lessons and Resources
<http://www.scholastic.com/interactivewhiteboards/>
- Additional SMART Notebook interactive lessons and activities can be found by browsing the site below. Teachers can browse by grade level, subject, or curriculum standard(s).
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>.

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. Teachers should observe students as they skip count and determine patterns. Students patterns on hundreds boards and in tables should represent an understanding of this concept. Student responses to the questions embedded in the lesson should determine future learning experiences needed.

2. Teaching Lesson 2-2B Complete or Extend Simple Patterns

2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects.
(B4)

For this indicator, it is **essential** for students to:

- Understand growing and repeating patterns
- Complete and extend patterns
- Recognize even and odd patterns

For this indicator, it is **not essential** for students to:

- None noted

a. Indicators with Taxonomy

2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects.
(B4)

Cognitive Process Dimension: Analyze

Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Lesson adapted from *Navigating through Algebra in Prekindergarten-Grade 2*: NCTM Navigations Series: Jumping Rules

Materials:

A number line for the floor with the numbers 0-30

Several hundreds charts for each student

Counters

Crayons or markers

Pencil and paper

Lesson:

With the number line on the floor, have a student walk on the line as the students call out the numbers. Discuss animals that hop and have the

student pretend that he/she is an animal that hops **two** spaces at a time. Starting at 0, have the student jump five jumps as the other students call out the numbers he/she jumps on (0, 2, 4, 6, 8, 10).

Give each child a hundreds chart and a counter. Have students explore other jumping rules using the hundreds chart as their number line and their counter as their jumping animal.

Rule: Start at 0. Jump three spaces forward.

0 3 6 9 ...

Rule: Start at 1. Jump two spaces forward.

1 3 5 7 ...

Rule: Start at 30. Jump five spaces backward.

30 25 20 15 ...

Rule: Start at 13. Jump 10 spaces forward.

13 23 33 43 ...

After the students have explored a couple of jumping rules with counters on the hundreds chart, they pick one rule to represent. They are to color in the appropriate squares to represent their chosen jumping rule. On another sheet of paper, students record the shaded numbers from their chart. In whole group, discuss the patterns created on their hundreds charts.

As the students follow the rules, ask questions such as:

If you continue jumping, what number will you land on next?

Will you ever land on (name a number)? How do you know?

How many more jumps will it take to land on (name a number)?

What is your rule?

Have students work in pairs to solve them.

c. Misconceptions/Common Errors

Students often think that *all* patterns are repeating patterns.

d. Additional Instructional Strategies/Differentiation

In a repeating pattern, the core must be repeated at least twice.

Growing patterns consist of a series of separate steps, with each new step related to the previous one according to the pattern.

For most repeating patterns, the elements of the pattern can be numbered 1, 2, 3, and so on.

Before students begin to extend the pattern, have them predict exactly what element will be in number 15 position or the number 27 position.

Students should be required to provide a reason for their prediction, preferably in writing. Students should then extend the pattern and check their prediction. If their prediction is incorrect, have them examine their reasoning and try to figure out why the prediction was off. Van de Walle (2006)

Show students the first three or four steps in a pattern. Provide them with appropriate materials and grid paper, have them extend the patterns recording each step, and explain why their extension indeed follows the pattern. Van de Walle (2006) Square numbers and triangular numbers are examples that could be used.

With the students working in pairs, have them explore jumping patterns on the calculator. One student can do the pattern on the calculator while the other student records the pattern on paper. Then, have the students create their own patterns. They might want to explore two jump rules such as: "Start at 2. Jump forward 5 spaces and then back 2 spaces."

Write problems like these on task cards:

- You start at 1 and jump four spaces forward. How many jumps will it take to land on 13?
- You start at 2 and land 11 after three jumps. What could be the rule?
- Create a rule that lands you on 7 after two jumps.
- You start at a number and make five forward jumps. Each jump is three spaces long. You land on 17. On what number did you start?

e. Technology

- Crazy Pattern Machine (Students find the missing piece among a group of colors, shapes, letters, or numbers. The game can be set anywhere from easy to hard.) http://funschool.kaboose.com/preschool/learn-abcs/games/game_crazy_pattern_machine_the.html?trnstl=1
- Complete the Patterns from National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/category_g_1_t_2.html
- Pattern Blocks from National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_2.html?open=activities&from=category_g_1_t_2.html
- Calculating Patterns from Illuminations Online Lessons (In this sequence of lessons, students represent patterns in different ways.) <http://illuminations.nctm.org/LessonDetail.aspx?id=U146>

- Creating, Describing, and Analyzing Patterns from Illuminations Online Lessons (In these series of lessons, students learn about repeating and growing patterns, analyze repeating patterns, and describe patterns.)
<http://illuminations.nctm.org/LessonDetail.aspx?id=U71>
- Pattern Generator
<http://www.shodor.org/interactivate/activities/patterngenerator/>
- Shaping Patterns and Dancing Shapes [Students verbally explain and then create with a stretch rope several geometric shapes (triangle, rectangle, square, and circle). Students also identify and create the missing shape in a set of patterns. After exploring ways to arrange the four geometric shapes, students work in small groups to create a dance, transitional movements, including all four shapes.]
<http://artsedge.kennedy-center.org/content/2281/>
- Interactive 100 Chart (Students can use this chart online to create patterns with numbers.)
<http://www.apples4theteacher.com/math/games/100-number-chart-one.html>
- Number Cracker (Students obtain a secret code in this game by choosing the next number within a series of numbers. Levels range from Easy to Super Brain.)
<http://www.funbrain.com/cracker/index.html>
- Meet Paul Pattern(Play with patterns.)
http://www.harcourtschool.com/activity/paul_pattern/
- Pattern Builder (Use the piano keys to make your own pattern. Then, play the pattern!)
<http://www.harcourtschool.com/activity/pattern/pattern.html>
- SMART Board Interactive Whiteboard Lessons and Resources
<http://www.scholastic.com/interactivewhiteboards/>
- Additional SMART Notebook interactive lessons and activities can be found by browsing the site below. Teachers can browse by grade level, subject, or curriculum standard(s).
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>.

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. Student responses to these questions should guide future instructional opportunities. After multiple experiences with skip counting, extend growing, and repeating patterns, students should be able to begin translating these patterns into rules. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module. The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

2-3.1: Analyze numeric patterns in skip counting that uses the numerals 1 through 10. (B4)

The objective of this indicator is to analyze, which is in the “analyze conceptual” cell of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples: therefore students should analyze numeric patterns in skip counting that uses the numerals 1 through 10. The learning progression to **analyze** requires students to recall how to skip count through 10 and recognize skip counting patterns and differentiate patterns by reasoning systematically (2-1.4).

2-3.2: Translate patterns into rules for simple multiples. (B2)

The objective of this indicator is to understand, which is in the “understand conceptual” cell of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples: therefore students should translate patterns into rules for simple multiples. The learning progression to **understand** requires students to recognize skip counting patterns and differentiate patterns by reasoning systematically (2-1.4). The students will explain and justify the rules for simple multiples. (2-1.3)

2-3.3: Analyze relationships to complete and extend growing and repeating patterns involving numeric, symbols and objects. (B4)

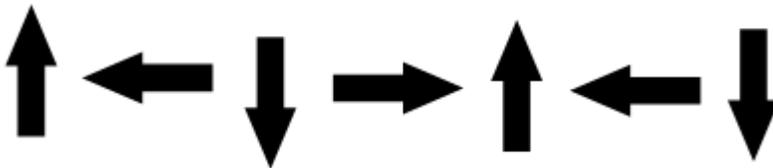
The objective of this indicator is to analyze, which is in the “analyze conceptual” cell of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples: therefore students should analyze relationships

to complete and extend growing and repeating patterns involving numbers, symbols, and objects.

The learning progression to **analyze** requires students to identify a growing or repeating pattern, recall and recognize the pattern, then analyze patterns by reasoning systematically (2-1.4). Students should explain and justify their answers (2-1.3) using a variety of forms of communication (2-1.6).

1. Terry was making a pattern on the hundreds chart. He started at 3 and colored that square yellow. Then he colored 7, 11, 15, and 19. What will be the next three numbers that are colored on the hundreds chart? Explain how you solved the pattern.

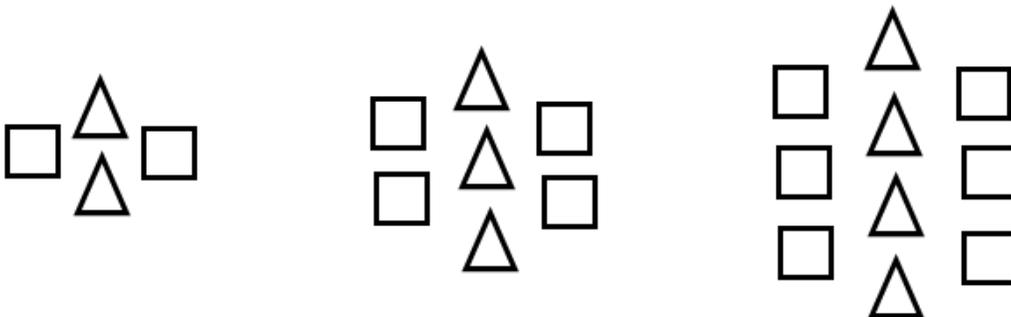
2. What will be the tenth shape in this pattern?



3. Write one or two sentences to describe the above pattern (in number 2).

The following assessment task #4 is adapted from **Developing Number Concepts, Book 3** by Kathy Richardson, Dale Seymour Publications. Page 41.

4. Study the pattern below. Draw the fifth design in this pattern. Explain how you decided what to draw.



MODULE

2-3

Money

This module addresses the following indicators:

2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)

2-5.2: Use coins to make change up to one dollar. (B3)

This Module consists of 1 introductory lesson. This lesson is **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

Continuum of Knowledge

2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)

- In kindergarten, students identified the value of the coins penny, nickel, dime, and quarter and a dollar (K-5.1). In first grade, students used a counting procedure to determine the value of a collection of coins totaling less than one dollar (1-5.1). Students also had experiences representing a nickel, a dime, a quarter, a half-dollar, and a dollar in combinations of coins (1-5.2). First grade students represented money by using the cent and dollar notation. (1-5.3)
- In second grade, students use a counting procedure to determine the value of a collection of coins and bills (2-5.1).
- Third grade students make change by using the fewest possible number of coins (3-5.1).

2-5.2: Use coins to make change up to one dollar. (B3)

- At the Kindergarten level, making change is not addressed. First grade students used a counting procedure to determine the value of a collection of pennies, nickels, dimes and quarters totaling less than one dollar (1-5.1). Students also had experiences representing a nickel, a dime, a quarter, a half-dollar, and a dollar in combinations of coins. (1-5.2) First grade students represented money by using the cents and dollar notation. (1-5.3)
- In second grade, students will use a counting procedure to determine the value of a collection of coins and bills (2-5.1). Students will also use coins to make change up to a dollar. (2-5.2).
- In third grade, students change using the fewest number of coins possible (3-5.1).

- **Key Concepts/Key Terms**

*These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

* Penny
*Nickel

*Dime
*Quarter

*Half -dollar
 *Dollar
 *Cents
 *Change

*Value
 *Coins
 *Bills

II. Teaching the Lesson

1. Teaching Lesson 2-3A Determine Value of Bill/Coin Collection

2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)

For this indicator, it is **essential** for students to:

- recognize and identify the value of a penny, nickel, dime, quarter, half-dollar, and dollar bill
- use a counting procedure to determine the value of a collection of coins and bills
- know how to represent money using the cent and dollar notation
- know how to skip count by 5's, 10's, 25's

For this indicator, it is **not essential** for students to:

- make change with coins and bills

2-5.2: Use coins to make change up to one dollar. (B3)

For this indicator, it is **essential** for students to:

- identify a penny, nickel, dime, quarter, and half-dollar
- recall the value of a penny, nickel, dime, quarter and half-dollar
- use a counting procedure to determine the value of a collection of coins and bills
- know how to represent money using the cent and dollar notation

For this indicator, it is **not essential** for students to:

- make change using the fewest coins possible at this grade level.
- make change with amounts over \$1.00.

a. Indicators with Taxonomy

2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)

Cognitive Process Dimension: Apply

Knowledge Dimension: Procedural Knowledge

2-5.2: Use coins to make change up to one dollar. (B3)

Cognitive Process Dimension: Apply

Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson**Lesson Materials:**

Counting coins include pennies, nickels, dimes, and quarters.
Counting bills-- dollars (ones).

Suggested Literature Connections:

Alexander Who Used to Be Rich Last Sunday by Judith Viorst
Alexander's grandparents give him a dollar and he spends it on a variety of things.

Twenty-Six Letters and Ninety-Nine Cents by Tana Hoban. This book deals with combinations of coins.

Procedure

Each student should have his or her own set of money. Call an amount out loud, and/or write it on the board. Each student should count out the correct amount of money to make that amount.

Beginners should start with only pennies, counting to numbers 10 cents or less. Slowly add more coins and increase the amount, based on the students' skill level.

Variation

Have the students count money to a certain amount, only using specific types of coins or bills. For example, ask students to count to \$1.00 only using dimes, or only using dimes and nickels.

Variation

Students should count money using the smallest number of coins possible. For example, \$1.00 would be 4 quarters.

Group Variation

Instead of the teacher deciding on the amount, have the students work in pairs, or in small groups with one person calling an amount to count. After counting, each student may say which coins and/or bills they used. For small groups, students should take turns with the next turn going to the person sitting on their right.

c. Misconceptions/Common Errors

- Students may confuse nickels and quarters and the values of each. Students have a tendency to identify the value of a nickel as 25 cents and a quarter as 5 cents.

- Students may think the size of a coin is related to its value. Students may believe that smaller coins have less value. For example, a nickel is would be worth more than a dime because it is larger in size.

d. Additional Instructional Strategies/Differentiation

- Provide many opportunities for students to identify and count collections of coins using real coins or models of real coins.
- Students must have numerous opportunities to make change using manipulatives before proceeding to identifying coins needed to make change using picture models.
- Money Skip Counts activity 12.32 (Van de Walle 2007) Explain to the students that they will start skip counting by one number and at your signal they will shift to a count by a different number. Begin with only two different amounts, say, 25 and 10. Write these numbers on the board. Point to the larger number (25), and have students begin to skip-count. After three or more counts, raise your hand to indicate a pause in the counting. Then lower your hand and point to the smaller number (10). Children continue the skip count from where they left off but now count by 10s. Use any two of these numbers: 100, 50, 25, 10, 5, and 1. Always start with the larger. Later, try three numbers, still in descending order.
- How Much More with Coin Numbers? (Van de Walle activity 5.31) At the top of the board, write the values of the coins: 25, 10, 5, and 1. Include 50 if half-dollars are in your curriculum. Write four start and target numbers as in "How Much More?" In this task, however, students must use only numbers in the list to create the difference. They should write down each number they use as they use it. Furthermore, they should try to use as many of the larger numbers as possible, or, in other words, as few "coins" as possible. For example, if the target is 75 with a start of 58, they would write 1, 1, 10, 5. When students share their solutions, do not criticize those who do not use a minimal number of "coins." Rather, always ask if anyone can do it with fewer "coins". Ask this even when the solution is the desired one.

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding

has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

- Change Maker (Set this game to the easy level since students are only required to make change using less than \$1.00. Also, make sure that students choose US Currency. Have coins available for use while playing the game.)
<http://www.funbrain.com/cashreg/>
- Money Desk (Students have to drop coins onto the desk showing the correct amount. The "easy" level shows the amount as students drop the coins and has extra coins to use. The "normal" level does not show the amount but has extra coins. The "difficult" level does not show the amount and has a limited number of coins to use.)
<http://www.apples4theteacher.com/java/counting/money.html>
- Money flashcards (Aplusmath's interactive money-counting flash cards present one problem at a time, using dollar bills, quarters, dimes, nickels and pennies.)
<http://www.aplusmath.com/cgi-bin/flashcards/money>
- Count Money from National Library of Virtual Manipulatives
http://nlvm.usu.edu/en/nav/frames_asid_325_g_1_t_4.html?from=category_g_1_t_4.html
- Number Cents: A Series of Lessons from Illuminations (In this unit, students explore the relationship among coins, count coins, write story problems that involve money, and use coins to make patterns. Lessons should be adapted to include bills.)
<http://illuminations.nctm.org/LessonDetail.aspx?id=U67>
- SMART Board Interactive Whiteboard Lessons and Resources
<http://www.scholastic.com/interactivewhiteboards/>
- Additional SMART Notebook interactive lessons and activities can be found by browsing the site below. Teachers can browse by grade level, subject, or curriculum standard(s).
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>.

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. Teachers should observe students during this activity and adjust the skill level as necessary. Increase or reduce the counting amount or the types of coins and/or bills. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module. The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

2-5.1: Use a counting procedure to determine the value of a collection of coins and bills. (C3)

The objective in this indicator is to use which is in the “apply procedural knowledge” cell of the Revised Taxonomy table. Procedural knowledge is using a specific set of steps and knowing when to use appropriate procedures. The learning progression to **use** requires students to recognize the coins and recall the value of each coin. Students should also recall their prior knowledge of determining the value of a collection of coins only. As students analyze a collection of coins and bills, they should generate conjectures (2-1.2) about how to determine the value of the collection and exchange these ideas (2-1.2) with their classmates. Students should be able to determine the value of a collection of coins using manipulatives (concrete) and picture models. Students should also be able to explain and justify their answers (2.1-3) using appropriate mathematical language.

2-5.2: Use coins to make change up to one dollar. (B3)

The objective in this indicator is to use which is in the “apply conceptual knowledge” cell of the Revised Taxonomy table. Conceptual knowledge is the interrelationship between basic elements (individual coins) within a larger structure (coins that can be used to make change in a given situation) and how these function together. The learning progression to **use** requires students to recognize the coins and recall the value of each coin. Students should also recall their prior knowledge of determining the value of a collection of coins only. As students analyze a situation where change is given, students should generate conjectures (2-1.2) about how to determine the coins to be used when change is given up to one dollar and exchange these ideas (2-1.2) with their classmates. Students should be able to determine which coins should be used when making change up to one dollar

using manipulatives (concrete) and picture models. Students should also be able to explain and justify their answers (2.1-3) using appropriate mathematical language.

1. Tamika bought a pencil for \$0.20. She gave the clerk \$1.00. What was her change? Draw or list the coins the clerk will give her.

2. Danny had this amount of money in his wallet.



a. His friend, Chris, had \$3.48. Draw a picture to show the dollars and coins that Chris might have had.

b. Who had the most money? How do you know?

3. Which group of money has the greatest value? How do you know?



MODULE

2-4

Addition and Subtraction

This module addresses the following indicators:

2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)

2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)

This module contains 2 lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need.

ADDITIONAL LESSONS will be required to fully develop the concepts.

I. Planning the Module

The first bullet under the Continuum of Knowledge represents students prior knowledge and/or skills related to this standard. It is recommended that students are pre-assessed on this prior knowledge.

Continuum of Knowledge

2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)

- In kindergarten, students represented simple joining and separating situations through 10. (K-2.4) and developed an understanding that addition results in increase and subtraction results in decrease. (K-2.5) In first grade, students summarized the inverse relationships between addition and subtraction. (1-2.7) Students generated strategies to add and subtract without regrouping two-digit numbers. (1-2.7) They have recall of basic addition facts through $9 + 9$ and corresponding subtraction facts.(1-2.6)
- In second grade, students generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (2-2.7)
- In third grade, students apply an algorithm to add and subtract whole numbers fluently. (3-2.3)

2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)

- In second grade, students generate strategies to round numbers through 90 to the nearest 10. (2-2.9)
- In third grade, students apply procedures to round any whole number to the nearest 10, 100, or 1000. (3- 2.4)

Key Concepts/Key Terms

*These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.

*Add
*Subtract
*Strategies
*Two-digit
*Place value

*Tens
*ones
*Round
*Estimate
*Whole Number

II. Teaching the Lesson(s)

1. Teaching Lesson 2-4 A Adding Two-Digit Numbers

2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)

For this indicator, it is **essential** for students to:

- To make the connection between the concrete/pictorial models and the symbolic form when working with two-digit numbers that do not involve regrouping.
- Create their own strategies using concrete/pictorial models when working with two-digit numbers that involve regrouping.

For this indicator, it is **not essential** for students to:

- Learn a traditional algorithm involving regrouping.

a. Indicators with Taxonomy

2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)

Cognitive Process Dimension: Create

Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Lesson: As students generate strategies, teachers need to assist them in recording their thoughts. Recording their thoughts on chart paper gives the students a chance to associate the written idea with the verbal reasoning. Consider using a horizontal format instead of a vertical format for recording thoughts to encourage students to think beyond an algorithm. A horizontal format provides an opportunity to see their ideas as traditional writing.

It is important, however, to be sure to discuss with individual students or with your class as a whole to determine the recording method that best meets their needs.

The following problem is a suggestion.

The two Scout troops went on a field trip. There were 36 Boy Scouts and 28 Girl Scouts. How many Scouts went on the trip?

Invented Strategies for Addition with Two-Digit Numbers

| | | | |
|--|--|---|---|
| <p>Two Scout troops went on a field trip. There were 36 Boy Scouts and 28 Girl Scouts. How many Scouts went on the trip?</p> | | | |
| <p>Add Tens, Add Ones, Then Combine</p> <p style="text-align: center;">$36 + 28$</p> <p>30 and 20 is 50. 6 and 8 is 14. 50 and 14 is 64.</p> | $\begin{array}{r} 36 \\ + 28 \\ \hline 50 \\ 14 \\ \hline 64 \end{array}$ | <p>Move Some to Make Tens</p> <p style="text-align: center;">$36 + 28$</p> <p>Take 2 from 36 and put it with the 28. The 36 is now 34. The 28 is now 30. 34 and 30 is 64.</p> | $\begin{array}{r} 2 \\ \hline 36 + 28 \\ \hline 34 + 30 \\ 64 \end{array}$ |
| <p>Add on Tens, Then Add Ones</p> <p style="text-align: center;">$36 + 28$</p> <p>36 and 20 is 56. Add the 8. 56 and 8 is 64.</p> | $\begin{array}{l} 36 + 28 \rightarrow \\ 36 + 20 \rightarrow 56 \\ 56 + 8 \rightarrow \\ 60, 64 \end{array}$ | <p>Use a Nice Number and Compensate</p> <p style="text-align: center;">$36 + 28$</p> <p>36 and 30 is 66. That is 2 extra, so the answer is 64.</p> | $\begin{array}{l} 36 + 28 \\ 36 + 30 \rightarrow \\ 66 - 2 \rightarrow \\ 64 \end{array}$ |

Invented Strategies for Subtraction with Two-Digit Numbers

| | | | |
|---|--|--|---|
| There are 52 cards in a deck. 13 of those are hearts. How many are not hearts? | | | |
| <p>Add Tens to Get Close, Then Ones</p> <p style="text-align: center;">$52 - 13$</p> <p>13 and 40 is 53 so 40 is too much.</p> <p>13 and 30 is 43. 7 more is 50. 2 more is 52.</p> <p>30 and 7 and 2 is 39.</p> <p>Add Tens to Overshoot and Then Come Back</p> <p style="text-align: center;">$52 - 13$</p> <p>13 and 40 is 53. That is 1 too much. So 1 from 40 is 39.</p> | 13 30 43 7 50 2 52 <hr style="width: 20%; margin: 0 auto;"/> 39 | <p>Add Ones to Make a Ten, Then Tens and Ones</p> <p style="text-align: center;">$52 - 13$</p> <p>13 and 7 is 20. 20 and 30 is 50. 2 more is 52.</p> <p>7 and 30 and 2 is 39.</p> <p>Also.</p> <p>13 and 7 is 20. 20 and 32 is 52. 32 and 7 is 39.</p> | <p style="text-align: center;">$52 - 13$</p> $ \begin{array}{r} 13 + 7 \rightarrow 20 \\ + 30 \rightarrow 50 \\ + 2 \rightarrow 52 \\ \hline 39 \end{array} $ $ \begin{array}{r} 13 + 7 \rightarrow 20 \\ 20 + 32 \rightarrow 52 \\ 32 + 7 \rightarrow 39 \end{array} $ |
| | $13 + 40 \rightarrow 53$ $53 - 1 \rightarrow 52$ $40 - 1 \rightarrow 39$ | | |

c. Misconceptions/Common Errors

- Students may think there is only one way to add or subtract.
- Generate strategies means that the students invent their own strategy for solving problems. However, they can share their strategies with each other and learn from their peers. Students should only use strategies that they understand. Having

students generate strategies takes longer at first but saves time because concepts don't have to be re-taught, students make fewer errors, and they develop number sense.

d. Additional Instructional Strategies/Differentiation

Students should be given problem solving situations that require them to regroup, second grade students should generate their own strategies using their knowledge of place value and basic addition and subtraction facts. The emphasis is on students being able to generate a strategy that works and showing the strategy using pictorial or concrete models. With regard to regrouping, second grade students should NOT be required to symbolically (numbers only) solve addition and subtraction problems that require regrouping. When generating strategies students should be able to select the most efficient method to solve a problem and to justify the reasonableness of their answers. The expectation is they will *generate strategies* of their own choosing to add and subtract the quantities instead of learning a teacher-directed algorithm. The part-part-whole model should be emphasized to connect the concepts.

When generating strategies students should be able to select the most efficient method to solve a problem and to justify the reasonableness of their answers. The expectation is they will *generate strategies* of their own choosing to add and subtract the quantities instead of learning a teacher-directed algorithm. The part-part-whole model should be emphasized to connect the concepts. However, students should not learn a traditional algorithm involving regrouping until third grade.

When computational problems are embedded in simple contexts, students seem to be more engaged. The choice of story problems influences the strategies students use to solve them. Students should be exposed to all types of problems. (Refer back to module 1-3 lesson E for an explanation of problem types)

Create one or two story problems that involve 2-digit computation with re-grouping. Some of the problems might be thought of as subtraction problems, however, the students may choose to use an add on strategy. Group the students in pairs and give them a copy of the problem. Have a variety of manipulatives available for the students to use. Let the students know that you will discuss their method of solving the problem.

Allow plenty of time to solve a problem. Listen to the different strategies students are using, but do not interject your own. Challenge able students to find a second method, solve a problem without models, or improve on a written explanation. Allow children who are not ready for thinking with tens to solve using simple counting methods.

The most important part of the lesson is the sharing of the strategies after they solve the problem. The disciplinary literacy strategy of *Think, Pair, Share* “involves students in discussing key ideas or concepts.” (Pugalee. *Developing Mathematical and Scientific Literacy: Effective Content Reading Practices*, pgs. 130-131)

Ask the students to try their strategy out with different numbers to see if it will work. Keep a “Strategy Poster” in the classroom with the strategies that the students share. Encourage students to try the strategies that other students have tried if they understand them.

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

- <http://www.thinkingblocks.com> This site has a tutorial using thinking blocks as a strategy for solving addition and subtraction problems in a contextual form. There are part whole, compare and multiple step problems to solve using a visual aid to set the problem up for solution.
- Base 10 Blocks Addition from National Library of Virtual Manipulatives (Set the number of columns to two since 2nd graders on add two-digit numbers.)
http://nlvm.usu.edu/en/nav/frames_asid_154_g_1_t_1.html?from=category_g_1_t_1.html
- Base 10 Blocks Subtraction from National Library of Virtual Manipulatives (Set to two columns.)
http://nlvm.usu.edu/en/nav/frames_asid_155_g_1_t_1.html?from=category_g_1_t_1.html

- Chip Abacus from National Library of Virtual Manipulatives
http://nlvm.usu.edu/en/nav/frames_asid_209_g_1_t_1.html?open=activities&from=category_g_1_t_1.html
- Ghost Blasters 3 (Two digits plus two digits. Students play in pairs to blast the answer. Have manipulatives available to help students.)
<http://www.oswego.org/ocsd-web/games/Ghostbusters3/ghostadd3.html>
- Electronic Abacus
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=8>
- Mystery Picture: Subtract 2-digit numbers
<http://www.dositey.com/addsub/mystery2S.htm>
- Add Two-Digit Numbers (Supply manipulatives to help students.)
<http://www.ixl.com/math/practice/grade-2-add-two-two-digit-numbers>
- Subtract Two-Digit Numbers (Supply manipulatives to help.)
<http://www.ixl.com/math/practice/grade-2-subtract-two-digits>
- SMART Board Interactive Whiteboard Lessons and Resources
<http://www.scholastic.com/interactivewhiteboards/>
- Additional SMART Notebook interactive lessons and activities can be found by browsing the site below. Teachers can browse by grade level, subject, or curriculum standard(s).
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>.

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. Student responses to the questions and the various strategies students generate to solve problems should be explained by the student, indicating how the student determined the correct response. However, other formative assessment strategies should be used.

2. Teaching Lesson 2-4 B Round to Nearest 10 (Up to 90)

2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)

For this indicator, it is **essential** for students to:

- Have experience with a number line as well as concrete objects.
- Understand that they may want to round numbers to make mental calculations easier.
- Create their own strategies

For this indicator, it is **not essential** for students to:

- apply a formal procedure to round numbers to the nearest 10, 100, or 1000.

a. Indicators with Taxonomy

2-2.9: Generate strategies to round numbers through 90 to the nearest 10. (B6)

Cognitive Process Dimension: Create

Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Since this is the first time students are exposed to rounding, explain to them that rounding is a strategy used to help people estimate answers. Sometimes people want to estimate to see if their answer makes sense and sometimes people don't need an exact answer, so they find an estimate, which is quicker.

Write the tens from 0 to 90 on paper plates. Using these plates, create a number line on a wall in the classroom or hallway. Place the plates at least 5 feet apart and at student eye-level or slightly above. Write the numbers 1 through 89 on index cards, one number per card. Shuffle the cards. Have student(s) draw a card. Each student goes to the number line and stands at the actual location of the number. The student will justify rounding the number to the nearest ten and tape the card with the number under the rounded solution.

Explain that rounding to the nearest ten is an easy way to make "nice" numbers that are easy to add or subtract.

c. Misconceptions/Common Errors

No typical student misconceptions noted at this time.

d. Additional Instructional Strategies/Differentiation

To round a number simply means to substitute a nice number that is close so that some computation can be done more easily. A number line with nice numbers highlighted can be useful in helping children select near nice numbers. Indicate a number above the line that you want to round. Discuss the marks (nice numbers) that are close.

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

- Glowla's Estimation Contraption (Uses estimation practice through addition and rounding. Some numbers may be larger than two-digit addition.)
<http://pbskids.org/cyberchase/games/ballparkestimation/index.html>
- Rounding Flash Cards (Set the Maximum Value for 2nd grade to 100. Players round to the nearest 10. Have hundreds charts, number line, etc. available to help students.)
<http://www.aplusmath.com/Flashcards/rounding.html>
- Base 10 Blocks (Use these for rounding.)
http://nlvm.usu.edu/en/nav/frames_asid_152_g_1_t_1.html?from=category_g_1_t_1.html
- SMART Board Interactive Whiteboard Lessons and Resources
<http://www.scholastic.com/interactivewhiteboards/>
- Additional SMART Notebook interactive lessons and activities can be found by browsing the site below. Teachers can browse by grade level, subject, or curriculum standard(s).
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>.

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. Have the students work in pairs. Give the class a number such as 43. Ask them to work together to decide which two multiples of 10 it was between and then which one was it closer to. When they have an answer, ask them what strategy they used to find the answer. Let all groups share their strategy. Ask: Did you hear a strategy that was different from yours that you might like to try? Ask if they need any clarification of the strategy. Encourage them to ask questions of their classmates. Give them another number to round. Let them work together to come up with the answer. Again, ask them what strategy they used. Keep a "Strategy for Rounding" poster up and write down ones that the class agrees should go on the poster. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module. The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

2-2.7: Generate strategies to add and subtract pairs of two-digit whole numbers with regrouping. (B6)

The objective of this indicator is to generate, which is in the "create conceptual" cell of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples; therefore students should generate several strategies to add and subtract pairs of two-digit numbers using a variety of examples.

The learning progression to **generate** requires students to recall basic addition facts through $9 + 9$ and corresponding subtraction facts and to add and subtract 2-digit numbers without regrouping. Students will generate conjectures and exchange mathematical ideas when working with 2-digit numbers that involve regrouping. (2-1.2) Students explain and justify their ideas using multiple informal and concrete and pictorial representations to convey mathematical ideas. (2-1.3, 2-1.8)

2-2.9: Generate strategies to round numbers through 90 to the nearest 10.
(B6)

The objective of this indicator is to generate, which is in the “create conceptual” cell of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples: therefore students should generate several strategies to round numbers through 90 to the nearest 10. The learning progression to **generate** requires students to identify the place value of two-digit numbers. Students compare two-digit numbers to the benchmark multiples of 10. For example, 54 compared to 50 and 60. Students generate conjectures and exchange mathematical ideas for rounding numbers to the nearest 10. (2-1.2) students should explain and justify their thinking. (2-1.)

Assessment item 1 adapted from Prekindergarten – Grade 2 Mathematics Assessment Sampler, DeAnn Huinker, Editor. National Council of Teachers of Mathematics, 2006. page 29.

1. Jaimie and Kendra both had tickets to the play. Jaimie had seat number 25, and Kendra had seat number 43. Both seats are in the same row. How far apart are the seats? Explain your reasoning.
2. Jason read 19 pages on Monday, 33 pages on Tuesday, and 28 pages on Wednesday. How many pages has he read in his book?
3. There are 87 students in the second grade. Eighteen students were absent today. How many second grade students came to school today?
4. Matthew had some candy. He gave sixteen pieces to his friends. Now he has 38 pieces of candy left. How many pieces of candy did he begin with?
5. Round the number of students in each grade to the nearest ten.
(Use the table and number line to answer the question.)

| Grade Level | Number of Students |
|-------------|--------------------|
| First | 75 |
| Second | 72 |
| Third | 77 |
| Fourth | 73 |
| Fifth | 78 |

