

## SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE

Content Area	2 <sup>nd</sup> Grade Math
Recommended Days of Instruction	1 <sup>st</sup> Nine Weeks
<p><b>Standard 2-2:</b> 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><b>2-2.1:</b> Generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects. (B6)</p> <p><b>2-2.2:</b> Represent quantities in word form through <i>twenty</i>. (A2)</p> <p><b>2-2.3:</b> Represent multiples of ten in word form through <i>ninety</i>. (A3)</p> <p><b>2-2.4:</b> Compare whole-number quantities through 999 by using the terms <i>is less than</i>, <i>is greater than</i>, and <i>is equal to</i> and the symbols <math>&lt;</math>, <math>&gt;</math>, and <math>=</math>. (B2)</p> <p><b>2-2.8:</b> Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20. (B6)</p> <p><b>2-2.10:</b> Analyze the magnitude of digits through 9,999 on the basis of their place values. (B4)</p> <p><b>Standard 2-5:</b> 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><b>2-5.3:</b> 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><b>2-5.7:</b> 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><b>2-5.8:</b> Match <i>a.m.</i> and <i>p.m.</i> to familiar situations. (A2)</p> <p><b>Standard 2-6:</b> The student will demonstrate through the mathematical processes an understanding of creating questions to collect data, organizing data, describing trends of a data set, and making predictions based on data.</p> <p><b>2-6.1:</b> Create survey questions to collect data. (B6)</p> <p><b>2-6.2:</b> Organize data in charts, pictographs, and tables. (B4)</p>	

\* These indicators are covered in the following 3 Modules for this Nine Weeks Period.  
Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.

**Module 1-1 Year Long Mathematics Indicators**

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)	<b>STANDARD SUPPORT DOCUMENT</b> <a href="http://www.ed.sc.gov/apps/aso/standards">http://www.ed.sc.gov/apps/aso/standards</a>  NCTM's Online Illuminations <a href="http://illuminations.nctm.org">http://illuminations.nctm.org</a>  NCTM's Navigations Series	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 and Fahrenheit	Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle  NCTM's <u>Principals and Standards for School</u>	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>

<p>thermometers. (C3)</p> <p><b>2-5.7</b> 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>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>
<b>Module 1-2 Data</b>			
<b>Indicator</b>	<b>Recommended Resources</b>	<b>Suggested Instructional Strategies</b>	<b>Assessment Guidelines</b>

<p>Module 1-2 Lesson A</p> <p>2-6.1: Create survey questions to collect data. (B6)</p> <p>2-6.2: Organize data in charts, pictographs, and tables. (B4)</p>	<p><b>STANDARD SUPPORT DOCUMENT</b>  <a href="http://www.ed.sc.gov/apps/aso/standards">http://www.ed.sc.gov/apps/aso/standards</a></p> <p>NCTM's Online Illuminations  <a href="http://illuminations.nctm.org">http://illuminations.nctm.org</a></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 1-2 Introductory Lesson A</p> <p>See Instructional Planning Guide Module 1-2, Lesson A <u>Additional Instructional Strategies</u></p>	<p>See Instructional Planning Guide Module 1-2 <u>Lesson A Assessing the Lesson</u></p>
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**Module 1-3 Number Sense**

Indicator	Recommended Resources	Suggested Instructional Strategies	Assessment Guidelines
Module 1-3 Lesson A  2-2.1 Generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects. (B6)	<b>STANDARD SUPPORT DOCUMENT</b> <a href="http://www.ed.sc.gov/apps/aso/standards">http://www.ed.sc.gov/apps/aso/standards</a>  NCTM's Online Illuminations <a href="http://illuminations.nctm.org">http://illuminations.nctm.org</a>  NCTM's Navigations Series	See Instructional Planning Guide Module 1-3 <u>Introductory Lesson A</u>	See Instructional Planning Guide Module 1-3 <u>Lesson A Assessing the Lesson</u>
Module 1-3 Lesson B  2-2.2 Represent quantities in word form through <i>twenty</i> . (A2)	NCTM's Navigations Series  <u>Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition</u> , John Van de Walle	See Instructional Planning Guide Module 1-3 <u>Introductory Lesson B</u>	See Instructional Planning Guide Module 1-3 <u>Lesson B Assessing the Lesson</u>

<p>Module 1-3 Lesson C</p> <p>2-2.3 Represent multiples of ten in word form through <i>ninety</i>. (A3)</p>	<p>NCTM's <u>Principals and Standards for School Mathematics</u> (PSSM)</p>	<p>See Instructional Planning Guide Module 1-3 <u>Introductory Lesson C</u></p>	<p>See Instructional Planning Guide Module 1-3 <u>Lesson C Assessing the Lesson</u></p>
<p>Module 1-3 Lesson D</p> <p>2-2.4 Compare whole-number quantities through 999 by using the terms <i>is less than</i>, <i>is greater than</i>, and <i>is equal to</i> and the symbols <math>&lt;</math>, <math>&gt;</math>, and <math>=</math>. (B2)</p>		<p>See Instructional Planning Guide Module 1-3 <u>Introductory Lesson D</u></p> <p>See Instructional Planning Guide Module 1-3, Lesson D <u>Additional Instructional Strategies</u></p>	<p>See Instructional Planning Guide Module 1-3 <u>Lesson D Assessing the Lesson</u></p>
<p>Module 1-3 Lesson E</p> <p>2-2.8 Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20. (B6)</p>		<p>See Instructional Planning Guide Module 1-3 <u>Introductory Lesson E</u></p>	<p>See Instructional Planning Guide Module 1-3 <u>Lesson E Assessing the Lesson</u></p>

# MODULE

# 1-1

## 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)

This module contains 3 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**

**2-2.10** 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	

## II. Teaching the Lesson (s)

### 1. Teaching Lesson 1-1A Magnitude of Digits Through Thousands Place

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

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

- Analyze and break apart a whole number into its parts and make the connection that place value of numbers is based on Ten. Ten units/ones is needed to make a ten, ten tens is needed to make a hundred, ten hundreds is needed to make a thousand.
- To write numbers in expanded form and standard form.
- Recognize equivalent representations by composing (ex. putting a number together from parts, standard form) and decomposing (ex. breaking apart a number, expanded form) whole numbers.

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

- Analyze the magnitude of digits up to ten thousand.

#### a. Indicators with Taxonomy

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

*Cognitive Process Dimension: Analyze*

*Knowledge Dimension: Conceptual Knowledge*

#### b. Introductory Lesson (s)

##### **Materials Needed:**

Jars that are the same (2 per group of 3 children)\*

\*Plastic zip-lock bags can be used in place of jars

Cubes or other items to count (don't use rice...too small)

100s charts (for larger numbers, tape together several 100s charts)

1 crayon per group

sticky notes – two different colors

##### **Suggested Literature Connection:**

*The King's Commissioners* (Friedman, 1994)

*Twenty-Three Cats, Forty-Five Mice, and One Hundred Sixteen Spiders* (Chalmers, 1986)

**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 this Module, 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.

Students in first grade began to develop a sense of relative magnitude by estimating the number of objects in a set of from 20 to 100 objects. They learned how to make an estimate without having to pull a number out of the air when asked: "About how many footprints? Will it be closer to 5 footprints or closer to 20 footprints? About how many blocks will the apple weigh? Will the apple weigh closer to 10 blocks or closer to 30 blocks?" (Van de Walle, 2004). These questions provide students with a format to learn what "about" means and then use it.

Second grade students should continue to use concrete and pictorial materials to represent the magnitude of a number since they are expected to be able to analyze or break apart a whole number into its parts and make the connection that place value of numbers is a pattern based on 10. In other words, it takes 10 ones to make a 10; it takes 10 tens to make 100; and it takes 10 hundreds to make 1,000. Students should be able to write the expanded form ( $800 + 50 + 3$ ) and the standard form (853). They should recognize equivalent representations for the same whole number by composing and decomposing whole numbers up through 3-digits using base ten materials flexibly and writing the matching equations for a given quantity. Numbers should be decomposed in different ways, such as  $300 = 299 + 1$ , or  $100 + 100 + 100$ , or  $199 + 101$  to develop additional fluency with larger numbers.

Introductory lesson: Students will be working with numbers less than 100. This activity can be used as a basic template throughout the year. The teacher needs to increase the number over the course of the school year to reach 1,000 in order to fulfill the standard.

As students work in groups of 3, each group will have baggies (jars) containing the same number of cubes/counters (less than 100). Each group will estimate how many they think are in the bag and record on a sticky note. All groups will record their estimate on the same color sticky notes.

One group at a time, students will bring their estimates up to the front board and will be asked to place their number in sequential order along a line drawn on the board. The first group places the number on the board then the second group does the same. Before each group places it, the teacher will ask, "Is this number more than or less than the first one?" The teacher will continue to ask them questions in order to help them place the number in the correct sequential order. This continues until all the groups' estimates have been placed on the board in order.

Students remove the contents of the bag in order to determine the exact number of objects. Each student will have a different role to play in their group, but all members will use the same number to complete their role. Using the cubes/counters, one student will skip count by a given number assigned by the teacher (2,5, or 10) and place the pieces into another same-sized bag. While doing this, another child will record the skip counting on the 100's chart (shading in the count as they go), and the third child will use the calculator to add-on the given addend. All three should have the same set of numbers (ex. 2,4,6,8...) and eventual sum by the end of the activity.

Halfway through the activity, the teacher will ask the class, "Does any group want to change their estimate?" If so, students will record their new estimates on a new different-colored sticky note and place it on the board on the current number line. The teacher again will ask, "Is this number more than or less than..." as they determine the correct sequential order of their newly revised estimates.

### **Culminating Activity:**

When reaching the number 1,000, give students multiple copies of blank 100s charts. Assign groups of three students to create a 1-to-1,000 chart by taping 100 charts together into a long strip. Hopefully, throughout the year, students will have begun to develop a sense of magnitude of number and will have the beginning ability to visualize what 1,000 objects may look like. But, if students continue to struggle with the "largeness" of number, students should experience this activity many times.

### **c. *Misconceptions/Common Errors***

The tendency is to infer that students understand the magnitude of number and that they understand the base-ten number system because they can merely count. However, rote counting is no more than an indicator of memorization. Classroom learning opportunities should be structured so that students provide evidence of their understanding of magnitude and the structure of the base-ten system.

#### **d. Additional Instructional Strategies/Differentiation Variations**

- Use multiple names for place value to give the learner a visual image of the number. Example: units/ones, tens/rods, hundreds/flats. Students should continue to use concrete and pictorial materials to represent the magnitude of numbers.
- The teacher will provide 4 or 5 numbers for the children to select from prior to the students doing the activity. These can be written on the chalk board or overhead. The numbers should represent a range of answers. Students need to be able to justify why they selected the answer they did as well as why the other answers were not acceptable estimates.
- The teacher brings in 3 different sized jars (small, medium and large). The smallest jar is filled with objects (un-popped popcorn works well) of which the teacher knows the exact count of the objects. Tell the students the answer, then begin a conversation about how many of the same objects (un-popped popcorn) the medium and large jar could hold. The teacher should ask that students be able to justify their thinking.

#### **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

- Place Value Illustrations: [http://www.321know.com/g12ea\\_x1.htm](http://www.321know.com/g12ea_x1.htm)  
This illustration derives from [http://www.321know.com/g2\\_12ex2.htm](http://www.321know.com/g2_12ex2.htm) (AAA Math)
- Place Value practice and games: [http://www.321know.com/g2\\_12dx1.htm](http://www.321know.com/g2_12dx1.htm) (AAA Math)
- Place Value Puzzler (practices place value recognition at different levels): <http://www.funbrain.com/tens/index.html>
- More Place Value Games (Preview and play these games first. Levels need to be set correctly for the indicator that 2<sup>nd</sup> graders only work up to 9,999.) <http://www.gamequarium.com/placevalue.html>
- Place Value to Thousands Interactive Game: <http://www.toonuniversity.com/flash.asp?err=496&engine=9>

- Number Sense (Create numbers larger than the computer.)  
<http://pbskids.org/cyberchase/games/numbersense/index.html>
- Place Value Party (Students trade candles from one birthday cake to another. Shows place value and numbers in expanded form.)  
<http://www.mathcats.com/explore/age/placevalueparty.html>
- Really Big Numbers (Students can type in any number. Practice saying the number and then click to find out the word form. Also has a box for rounding. Although 2<sup>nd</sup> graders only work through 20 in word form and then multiples of ten, this will provide opportunities for further number exploration. Using a Smart Board or other tool, teachers can input certain numbers for students to practice.)  
<http://www.mathcats.com/explore/reallybignumbers.html>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)  
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>
- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>

**f. *Assessing the Lesson***

Formative assessment is embedded within the lesson through questions and observation. Are students able to re-evaluate their estimates after they begin counting? Are students able to determine if a number is more than/less than when sequencing? Student responses to these questions should be used to guide future instruction. However, other formative assessment strategies should be used.

**2. *Teaching Lesson 1-1B Time and Temperature***

**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.

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

- identify appropriate measuring tools to use for a given situation
- know how to measure objects to a whole unit
- measure temperature using thermometers that progress by increments of one
- measure liquid volume using cups, quarts, gallons
- measure weight using ounces and pounds
- measure length using feet, yards, and centimeters

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

- convert units of measurement
- measure to fractional parts of units

**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.

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

- recognize and name numbers 1-60, using skip counting by fives
- write the numbers 1-60
- count by fives and ones
- identify locations of the minute hand at quarter hours and five minute intervals

It is **not essential** for students to:

- tell time to the nearest minute
- write the time in words

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

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

- Understand the time frame represented by a.m.
- Understand the time frame represented by p.m.
- Relate a.m. and p.m. to familiar situations

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

- None noted

**a. Indicators with Taxonomy**

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)

Cognitive Process Dimension: Apply

Knowledge Dimension: Procedural

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)

Cognitive Process Dimension: Apply

Knowledge Dimension: Procedural Knowledge

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

Cognitive Process Dimension: Understand

Knowledge Dimension: Factual Knowledge

**b. Introductory Lesson****Materials Needed:**

analog clock

digital clock

magnetic money

Fahrenheit thermometer

Celsius thermometer

calendar

Teacher Note: With regard to measurement of time, students should use a calendar to identify specific dates, and to determine past and future days of the week. In previous grades students told and recorded time to the nearest hour and then half hour. Second grade builds on that knowledge by telling and recording time to the nearest quarter hour and to the nearest five-minute interval.

For the first time the concepts of *a.m.* and *p.m.* are introduced. In second grade, students need simply to relate those to familiar situations. For example, "I come to school in the *a.m.* and I go home in the *p.m.*" Students should have experience with both the *a.m.* / *p.m.* and the *A.M.* and *P.M.* forms of the abbreviations.

Set up a "Morning Math" board. On this board include an analog and digital clock; a calendar, Celsius and Fahrenheit thermometers; and money. Each day the teacher should initiate the "Morning Math" board discussion covering certain second grade standards. Both the analog and digital clocks should be set to a different 15 minute interval each day because second grade students are required to tell time to the nearest quarter hour. The teacher should ask a student, "What time does the analog clock say?" "What time does the digital clock say?" Ask a student to write the time on the board or overhead to the



nearest quarter hour of both the analog and digital clock. Ask the students to note A.M. or P.M. The teacher should return to this section of the "Morning Math" board throughout the day, including P.M. to denote activities that occur in the P.M. This will give experience with both A.M. and P.M. activities. Questions such as, "Do you go to bed in the A.M. or P.M.? Do you eat breakfast in the A.M. or P.M.?" Then the teacher should ask questions about the calendar. "When was last Friday?" "What day is two weeks from today?" "What day was yesterday?" "On what day is the 25<sup>th</sup>?" Have two thermometers displayed. The temperatures on the thermometers should change daily. Have a student read the temperature on the Celsius thermometer and then have another child read the temperature on the Fahrenheit thermometer.

Finally, display a certain amount of money on the board (magnetic money). Have a child determine the total value of the collection of coins. Then have a student make change up to a dollar by counting up. Then have students convert money and make money exchanges. As noted in the beginning narrative, 2<sup>nd</sup> grade is the first time students are introduced to using a quarter. They simply identified the quarter in first grade.

These activities should occur daily and should not take more than 15 minutes.

**c. *Misconceptions/Common Errors***

- Students confuse midnight as 12:00 p.m. instead of a.m. because it is nighttime
- Students think a.m. always refers to daytime and p.m. as nighttime.
- Students often write five minutes past the hour as a one digit number instead of a two digit number. Example 7:5 instead of 7:05

**d. *Additional Instructional Strategies/Differentiation***

Students should have lots of experiences using student clocks to show/illustrate time to five minute intervals and quarter hours before proceeding to the use of pictorial models of clocks. The following suggestions can help students understand and read analog clocks.

- Begin with a one-handed clock. A clock with only an hour hand can be read with reasonable accuracy. Use lots of approximate language. "It's about 7 o'clock." " It's a little past 9 o'clock." " It's halfway between 2 o'clock and 3 o'clock."
- Discuss what happens to the big hand as the little hand goes from one hour to the next. When the big hand is at 12, the hour hand is pointing exactly to a number. If the hour hand is about

halfway between numbers, about where would the minute hand be? If the hour hand is a little past or before an hour ( 10 to 15 minutes) about where would the minute hand be?

- Use two real clocks, one with only an hour hand and one with two hands. ( Break off the minute hand from an old clock.) Cover the two-handed clock. Periodically during the day, direct attention to the one-handed clock. Discuss the time in approximate language. Have students predict where the minute hand should be. Uncover the other clock and check.
- Teach time after the hour in 5-minute intervals. After step 3 has begun, count by fives going around the clock. Instead of predicting that the minute hand is pointing at the 4, encourage students to say it is about 20 minutes after the hour. As skills develop, suggest that students always look first at the little or hour hand to learn approximately what time it is and then focus on the minute hand for precision.
- Predict the reading on a digital clock when shown an analog clock, and vice versa; set an analog clock when shown a digital clock. This can be done with both one-handed and two-handed clocks.
- Second grade is the first time the concepts of a.m. and p.m. are introduced. Students need to relate these to familiar situations. (2-5.8) Students should have experience with both the a.m. and p.m. and the A.M. and P.M. forms of the abbreviations. Students need lots of practice relating a.m. and p.m. to familiar situations.
- Having students keep a 24 hour timeline can help students gain an understanding of this concept.
- Talk with students about familiar a.m. and p.m. situations, such as the sun comes up in the morning(a.m.) and sets in the evening(p.m.); we eat breakfast in the morning(a.m.) and eat dinner in the evening(p.m.).
- Have discussions about noon as the beginning of p.m.; if you have lunch before noon (12:00 p.m.), it is a.m., if you eat at noon or after noon, it is p.m.

#### **e. Technology**

- TIME: This website allows students to stop the clock, type in the time and also work on deciding if it is AM or PM.  
[http://www.bgfl.org/bgfl/custom/resources\\_ftp/client\\_ftp/ks2/maths/time/index.htm](http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/time/index.htm)
- AM or PM? (Enter site as guest.)  
<http://www.ixl.com/math/practice/grade-2-am-pm>
- Telling Time: Willie the Watchdog (Students play this game in pairs. Practices setting a clock to the hour and  $\frac{1}{2}$  hour.)  
<http://www.harcourtschool.com/activity/willy/willy.html>

- TIME: Stop the Clock (Students match digital times to their corresponding analog clock at 15 minute intervals.)  
<http://www.oswego.org/ocsd-web/games/StopTheClock/sthec2.html>
- Stop the Clock (Same as above but set at 30 minute intervals.)  
<http://www.oswego.org/ocsd-web/games/StopTheClock/sthec1.html>
- Stop the Clock (Same as two above but set at 5 minute intervals.)  
<http://www.oswego.org/ocsd-web/games/StopTheClock/sthec3.html>
- Class Clock (Can be used by teachers to have students tell time. Can also be set to show current time. Also addresses AM and PM.)  
<http://www.oswego.org/ocsd-web/games/ClassClock/clockres.html>
- Calendar Activity from Just in Time:  
<http://www.fi.edu/time/Journey/JustInTime/calendar/calendar1.html>
- What Time Is It? From Primary Games.com:  
<http://www.primarygames.com/time/start.htm>
- A Matter of Time (from Just in Time...lessons and games telling time):  
<http://www.fi.edu/time/Journey/JustInTime/contents.html>
- Choose time and AM or PM:  
<http://www.pitara.com/activities/math/time/time.asp?QNum=3>
- Interactive lesson to help students choose between AM and PM:  
<http://www.321know.com/meak&amp;.htm>
- Measure It! Level 2 (This game uses a magnified ruler showing centimeters measuring to the nearest  $\frac{1}{2}$  centimeter or whole.)  
<http://www.funbrain.com/cgi-bin/meas.cgi?A1=s&A2=1&A3=1&COBR=2>
- Measure It! Inches Level 1 (to the nearest  $\frac{1}{2}$  or whole inch):  
<http://www.funbrain.com/cgi-bin/meas.cgi?A1=s&A2=0&A3=0>
- Measure the Bear (in units):  
<http://www.apples4theteacher.com/measure.html>
- The Ruler Game (inches): <http://www.rickyspears.com/rulergame/>
- Mr. Pips Fruit Balance (Students can use to determine which fruit is heaviest, lightest, which fruits equal each other, how many of one fruit equals what other fruits, etc.)  
<http://www.crickweb.co.uk/assets/resources/flash.php?&file=fruitbalance3>
- Time to Move (measure fish in units):  
[http://www.pbs.org/parents/earlymath/grades\\_games\\_timetomove.html](http://www.pbs.org/parents/earlymath/grades_games_timetomove.html)

- National Library of Virtual Manipulatives: [http://nlvm.usu.edu/en/nav/topic\\_t\\_4.html](http://nlvm.usu.edu/en/nav/topic_t_4.html)
- Explore Weather (Gives real-world data for temperature collection around the world.) <http://www.mathcats.com/explore/weather.html>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) <http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>
- SMART Board Interactive Whiteboard Lessons and Resources <http://www.scholastic.com/interactivewhiteboards/>

**f. Assessing the Lesson**

Formative assessment is embedded within the lesson through questions and observation. During the daily lessons, teachers should have an organized system to make sure that all students are given equal opportunities to answer and demonstrate responses. Student responses to these questions should help guide future instruction. However, other formative assessment strategies should be used.

**3. Teaching Lesson 1-1C Measurement; Length, Mass, Capacity**

**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.

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

- identify appropriate measuring tools to use for a given situation
- know how to measure objects to a whole unit
- measure temperature using thermometers that progress by increments of one
- measure liquid volume using cups, quarts, gallons
- measure weight using ounces and pounds
- measure length using feet, yards, and centimeters

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

- convert units of measurement
- measure to fractional parts of units

### **a. Indicators with Taxonomy**

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)

*Cognitive Process Dimension: Apply*

*Knowledge Dimension: Procedural Knowledge*

### **b. Introductory Lesson**

#### **Materials Needed:**

tape measures                      rulers                      yard sticks  
 balance scale  
 measuring devices (cup, quart, gallon, liter)  
 Various classroom items to measure (paper clips, pencils, etc.)

#### **Suggested Literature Connections:**

- [Hershey's Milk Chocolate Weights and Measures](#) by Jerry Pallotta. This book discusses units of measurement for length, weight, and capacity. Tools for measuring are also introduced. The book measures different types of Hershey's candies that would be familiar to students.
- [Measuring Penny](#) by Loreen Leedy. This book explores measuring length, weight, capacity, and temperature through a story about caring for a pet dog.

#### **Introductory Lesson:**

Teacher Note: With regard to measurement in general, second grade students should be able to distinguish between length, capacity, weight (mass), perimeter, area, time, and temperature. For example, if a student wants to measure how much a math book weighs, he/she should know he/she has to find the weight, not the length. In addition, the student should know what instrument is needed for measuring length, volume, weight/mass, area and temperature and assign the appropriate unit after measuring.

Begin the lesson by asking students to estimate length of various classroom objects using nonstandard units. For example: About how many paperclips long is your pencil? About how many hands long is the teacher's desk? (NOTE: Students worked with nonstandard units in 1<sup>st</sup> grade, so this should be a quick review). Have students make estimates before actually measuring (nonstandard). Check estimates by using nonstandard measurements. Let the students share with the class.

Introduce the instruments to measure length. Show students how to use these instruments. Ask the students, "What instrument would you use to measure the length of your pencil? your classroom? the distance to your house?" Allow the students to give examples. Have the students measure the length of five items. Have the students write down their estimates before actually measuring. Then have the students measure the items they selected. Be sure to include measuring devices marked in inches and centimeters. Have the students report to the class. Always require students to include the appropriate unit – in both written and oral work.

Introduce the concept of capacity by using nonstandard units. Have several different types of containers (paper cups, bowls, soda can, etc.) to show students. Tell the students you are making a cake. "Mary uses 4 paper cups of oil to make her cake. Bill uses 1 soda can of oil to make his cake. Why is it important to have a standard unit?" Show the students the actual measuring devices for measuring capacity. Show the students an actual cup, quart, and gallon. Leave the clearly marked containers in the classroom as a visual aid. From time to time, remove the containers and ask the students comparison type questions. Be sure to include student work that requires comparison from pictures labeled "quart", "cup", etc. so students develop a mental benchmark rather than relying solely on the physical objects. Always require students to include the appropriate unit – in both written and oral work.

Introduce the concept of mass to the students. Show the students how to use the measuring device (balance and/or scale) to find the mass of an object. Allow the students to select items. Have the students estimate the mass. Use nonstandard units (paperclips, pennies, etc) to find the mass. Have the students share their observations with the class. Then introduce the customary units of ounces and pounds to the students. Have the students then find the mass of their objects by using standard units. Allow the students to share with the class. Always require students to include the appropriate unit – in both written and oral work.

**c. Misconceptions/Common Errors**

- Students may think that all objects measured with a ruler must be lined up with the end of the ruler on the 1 rather than at the 0.
- Students may confuse centimeters and inches thinking these are equivalent.
- Students may focus on the end number when measuring an object rather than the number of units. Example: broken ruler
- Measurement should not be taught in isolation. It is introduced here at the beginning of the year and should be revisited all year long. Weekly estimations, plant growth, student growth, milk in lunch cartons, etc. can be observed, measured and discussed every day.
- When measuring length, it is the spaces between the marks that are counted. Have students measure starting at a mark other than zero and count the spaces to the end of the item.

**d. Additional Instructional Strategies/Differentiation**

Second grade is the first time students are introduced to the metric system. Sufficient practice and varied experiences with metric rulers marked in whole centimeter units, customary rulers, and yardsticks will be needed for conceptual understanding of centimeters, feet, and yards. Also, lots of varied experiences measuring weight and temperature with scales and thermometers are necessary as well. Students should have lots of "hands on" experiences measuring with cups, quarts, and gallons. These experiences are needed for conceptual development before moving on to identifying measurements using picture models.

Measure the temperature inside and outside daily and keep a record of the daily temperatures. Have the students predict what the temperature will be each day. This is a connection to data analysis and science. Compare temperatures in your area to other areas in SC, in another state or region of the US.

**Measuring Penny – Additional Lesson Plan****Materials**

Measuring Penny by Loreen Leedy

Materials used in introductory lesson 1-1C Measurement; Length, Mass, Capacity  
copies of the provided graphic organizer

\*This lesson should last several days. Read the story, Measuring Penny by Loreen Leedy. This book deals with measurement using comparisons, standard, and nonstandard units. After reading the book, discuss how Lisa completed her Measuring Homework assignment. As a class, fill in the graphic organizer using the information Lisa collected from Penny to complete her assignment.

Length	Weight	Volume	Time	Temperature	Money
Standard Units	Standard Units	Standard Units	Standard Units	Standard Units	Standard Units
Nonstandard Units	Nonstandard Units	Nonstandard Units	Nonstandard Units	Nonstandard Units	Nonstandard Units
Comparisons	Comparisons	Comparisons	Comparisons	Comparisons	Comparisons

After reading and discussing the book, quickly assess student understanding of nonstandard measurement by posing questions such as: About how many paperclips long is your pencil? About how many hands long is the teacher's desk? (NOTE: Students worked with nonstandard units in 1<sup>st</sup> grade, so this should be a quick review). Have students make estimates before actually measuring (nonstandard). Check estimates by using nonstandard measurements. Let the students share with the class. Then allow students to use measurement tools to find actual measurements for comparisons.

**e. Technology**

- See measurement games/activities from Lesson B
- Inch by Inch (This lesson incorporates estimation and measurement through math, language arts, and art.) <http://ericir.syr.edu/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0201.html>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard



correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)

<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>

- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>

#### ***f. Assessing the Lesson***

Formative assessment is embedded within the lesson through questions and observation. Student responses from questions posed through the lesson, student discussions about measurements in small groups, and recorded measurements should be used to guide future instruction. 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.

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

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 the magnitude of digits on the basis of their place value. The learning progression to **analyze** requires students to recall the value of the digits, and apply that understanding to larger numbers. Students should be able to compare the magnitude of digits on the basis of their place value. Students explain and justify their thinking and use

multiple informal representations to convey their mathematical understanding of this idea. (2-1.3, 2-1.8) For example, 9 rods = 90.

**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.

The objective in this indicator is to use which is in the “apply procedural knowledge” cell of the Revised Taxonomy table. Procedural knowledge is bound by specific examples, therefore, students should be able to use appropriate tools to measure objects to the nearest whole unit. The learning progression to **use** requires students to recognize the appropriate tools for measuring length, liquid volume, weight, and temperature and to explain and justify their reasoning. (2-1.3) Students will then use the appropriate tools to measure objects to the nearest whole unit making real world connections (2-1.7).

**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.

The objective of this indicator is to use which is in the “apply procedural knowledge” cell of the Revised Taxonomy table. Procedural knowledge is bound by specific examples, therefore students tell and record time to the nearest quarter hour and five minute intervals using analog and digital clocks. The learning progression to **apply** requires that students recognize time to the hour and half hour and recall skip counting by 5’s. Students also analyze patterns on the analog clock ( 2-1.4) and generalize connections in mathematics between skip counting and telling time. (2-1.7) Students use multiple representations to convey time (2-1.8). For example, 2:15 is also quarter past 2 or 15 minutes after 2.

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

The objective of this indicator is to match which is in the “factual understand” cell of the Revised Taxonomy table. Factual knowledge is bound by specific examples. Students should match a.m. and p.m. to familiar situations. The learning progression to **match** requires students to interpret differences between a.m. and p.m. Students will apply this knowledge to familiar situations and explain and justify their answers. (2-1.3)

1. Explain why the following is equal to 6, 128.

5 thousands 11 hundreds 1 ten 18 ones

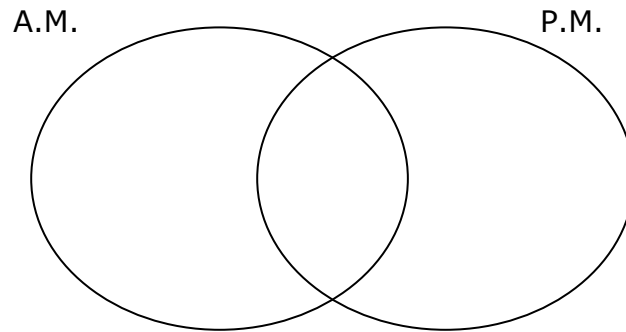
2. There were 4,248 people at the zoo on Saturday. Last Saturday, there were 100 fewer people at the zoo. How many people were at the zoo last Saturday?

3. Complete the chart.

<b>Item to be measured</b>	<b>Tool you will need to use</b>	<b>Best unit of measurement to use</b>	<b>Estimated measurement</b>
Width of door	Yardstick		
Weight of math book		pounds	
Length of crayon			4 _____
Height of water bottle		centimeters	
Amount of milk in your lunch milk carton	Measuring cups		

4. Would the event (A – E) happen in the A.M. or P.M.? Write it in the correct place in the Venn diagram.

- A. eat breakfast
- B. be at school
- C. get ready for bed
- D. sleep
- E. ride the bus home from school



5. Add an event of your own to the Venn diagram in #4 to describe something you would do in the A.M.

# MODULE

## 1-2

### *Data*

**This module addresses the following indicators:**

**2-6.1:** Create survey questions to collect data. (B6)

**2-6.2:** Organize data in charts, pictographs, and tables. (B4)

This module contains 1 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**

- **2-6.1** Create survey questions to collect data. (B6)

- In first grade, students used survey questions to collect data. (1-6.1)
- In second grade, students create survey questions to collect data. (2-6.1)
- In fourth grade, students compare how data-collection method impact survey results. (4-6.1)

- **2-6.2** Organize data in charts, pictographs, and tables.

- In kindergarten, students organized data in graphic displays in the form of drawings and displays (K-6.1). In first grade, students organized data in picture graphs, bar graphs, and tables (1-6.2).
- In second grade, students organize data in charts, pictographs, and tables. (2-6.2)
- In third grade, students organize data in tables, bar graphs, and dot plots. (3-6.2)

- **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.

- \* survey
- \* data
- \* organize
- \* data set
- \* charts
- \* pictographs
- \* value
- \* tables
- frequency

## II. Teaching the Lesson(s)

### 1. Teaching Lesson 1-2A Data: Surveys, Data Organization

**2-6.1** Create survey questions to collect data.

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

- create survey questions to collect data.

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

- None noted

**2-6.2** Organize data in charts, pictographs, and tables.

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

- organize data in charts, pictographs, and tables.
- Identify which data sets are best represented by different graph types

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

- organize data in bar graphs and dot plots.
- use scales greater than one on a pictograph.

### **a. Indicators with Taxonomy**

**2-6.1:** Create survey questions to collect data. (B6)

*Cognitive Process Dimension: Understand*

*Knowledge Dimension: Conceptual Knowledge*

**2-6.2:** Organize data in charts, pictographs, and tables. (B4)

*Cognitive Process Dimension: Analyze*

*Knowledge Dimension: Conceptual Knowledge*

### **b. Introductory Lesson (s)**

Materials Needed :

Class list

Materials for displaying data (paper, sticky notes, linking cubes, etc)

**Teacher Notes:** Second grade is the introductory year for creating survey questions, and organizing data in charts and pictographs. A chart is "a diagram that gives information in a tabular form"(Webster's Dictionary). In other words, it is a table that may have words, diagrams, and/or numbers. A table is an arrangement of rows and columns. A pictograph is similar to a picture graph but it uses one type of picture to show and compare data. At the bottom of the pictograph is a key that indicates the value of each picture.

For example, if smiley(s) were used in a pictograph, each one would represent a particular quantity. Students would have to consider the data collected to decide what value to assign to the smiley. In the pictograph below, eight students chose corndogs, while only 6 chose chicken nuggets. If an odd number of students chose the nuggets, half of the smiley face would be removed to represent only 1 vote in that cell instead of 2. The teacher must model the reasoning behind

choosing the value for the picture in the pictograph. In other words, if most of the votes were odd numbers, and the data set was small, the value of the smiley should be 1 instead of 2. The larger the data set is, the smiley should be a larger value so the pictures will fit in the pictograph. The teacher must model the steps in creating a survey question, and then provide time for students create their own questions and collect their data. Second grade students should be writing questions to interpret the data as introduced in first grade. These more sophisticated questions should reflect the use of the terms *is less than*, *is more than*, and *is equal to* and the symbols  $<$ ,  $>$ , and  $=$  to compare whole-number quantities through 999.

It is imperative that teachers review the graphs introduced in first grade, and that data collection and analysis be a frequent activity throughout the school year.

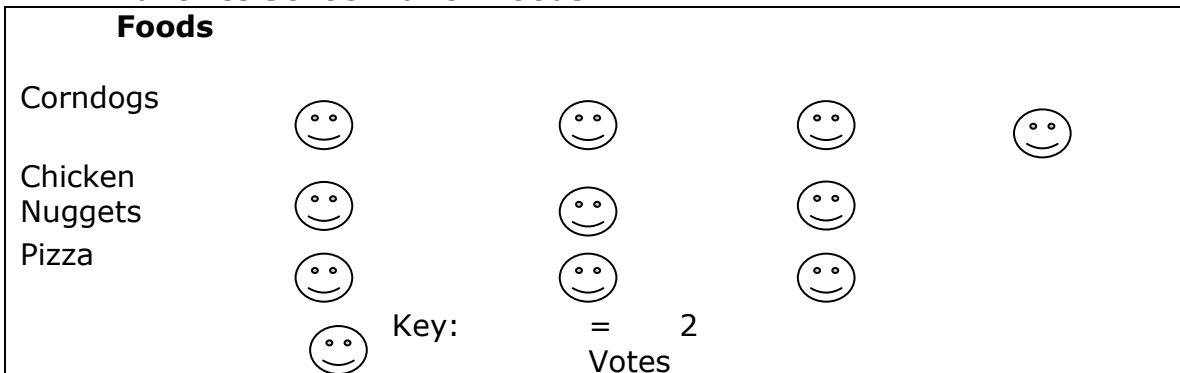
**Survey Question:** What is your favorite school lunch food—corndogs, chicken nuggets, or pizza?

#### Favorite School Lunch Foods

Food	Number of Votes
Corndogs	8
Chicken Nuggets	6
Pizza	6

The data from the chart is organized into a pictograph.

#### Favorite School Lunch Foods



**Teacher Note:** While students may informally use a scale greater than one as is noted in the smiley face example above, this should be done informally and is not a requirement of second grade students.

Discuss with the class what pets are and the different kind of pets there are. Ask students to predict how many pets each person in the class has. Talk about what might be a reasonable guess and why. Ask "How might we find out how many pets each person actually has?"



Provide them with the opportunity to use blank paper, graph paper, sticky notes, linking cubes, chain links, or crayons. Then have them work in pairs to find out [by polling the students in the class](#). Ask them what they learned from collecting this data. Tell them that the principal wants to know what they discovered by doing this survey. Ask them to make a display of the data they collected in a way that the principal would be able to tell how many pets each person has. When they have finished, place them where everyone can see them.

Ask: What does this display tell us?

Which display do you think is easiest to read?

What might you do next time to make your display better?

These questions are designed to help them see that there are many different ways to display data. Some are easier to read and understand. We learn by doing and we can always learn from what we do and from what other people do.

**c. *Misconceptions/Common Errors***

[While students will informally use a scale greater than one with their pictographs, students will often interpret the partial picture as one-half rather than a whole number.](#)

While it would be easier and quicker for the teacher to tell the students how to display the data, it does not allow the students to think about what would look best. When students are permitted to decide how best to organize and display data, it is often quite varied. This allows the students to become more familiar with their data and with numerical relationships.

**d. *Additional Instructional Strategies/Differentiation***

[The teacher must model the steps in creating a survey question, and then provide time for students to create their own questions and collect their data. Students should be writing questions that could be used to interpret the data as introduced in first grade. When students formulate the questions they want to ask, the data becomes more and more meaningful. They then have a purpose for organizing the data.](#)

[A chart is a table that may have words, diagrams, and/or numbers. A table is an arrangement of rows and columns. A pictograph is similar to a picture graph, but it uses one type of picture to show and compare data. At the bottom of the pictograph is a key that indicates the value of the picture. The teacher must model the reasoning behind choosing the value for the picture in the pictograph. If most of the votes were odd numbers, and the data set was small, the value of the picture should be 1 instead of 2. The larger the data set, the picture should be a larger value so a reasonable number of pictures will fit the pictograph. While students may \*informally\* use a scale larger than one it is not a requirement of second grade students. The concept of scales greater than one is introduced in fourth grade. It is imperative that](#)

teachers review the graphs introduced in first grade in order to make certain that learning experiences build on that prior knowledge and is not a repeat of prior knowledge. Data collection and analysis should be a frequent activity throughout the school year.

Collecting data and displaying it should be done all year long. Each student can be represented on clothes pins or a magnet. When they come in the morning, they can answer a question that is on the board or displayed by simply moving their clothes pin or magnet to the correct answer. The day can then start with a discussion of what the data tells us and how it could best be displayed.

### **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.

- Second Grade Math Websites: This website features many activities and games for representing data graphically.  
<http://www.allentownsd.org/EETT/secondgrade.htm#E. Data Analysis and Probability>
- Explore Learning: Students answer survey questions and display data using a pictograph.  
<http://www.explorescience.com/index.cfm?method=cResource.dspDetail&ResourceID=1029>
- Interpret Pictographs (enter site as guest):  
<http://www.ixl.com/math/practice/grade-2-interpret-pictographs>
- Collect and Organize Data in ELab (Students will need a recording sheet.):  
<http://www.harcourtschool.com/activity/elab2004/gr3/25.html>
- Let's Graph (Students create graphs and answer questions)  
[http://www.harcourtschool.com/activity/lets\\_graph/](http://www.harcourtschool.com/activity/lets_graph/)
- Counting Objects  
[http://www.harcourtschool.com/activity/counting\\_objects/](http://www.harcourtschool.com/activity/counting_objects/)

- Explore Graphing  
[http://www.harcourtschool.com/activity/olivia\\_octagon/activity6/a6Shell\\_6.html](http://www.harcourtschool.com/activity/olivia_octagon/activity6/a6Shell_6.html)
- Promethean Board Lesson by April Phillips: This lesson integrates math and social studies; list of SC indicators addressed are included.  
<http://www.lessonplanspage.com/MathSSInterpretingRealWorldBarGraphs2.htm>
- Survey Questions and Secret Rules (This series of investigations leads students through sorting, creating survey questions, collecting data, and organizing data into a graph. Although the lesson says 1<sup>st</sup> grade, there are 2<sup>nd</sup> grade SC indicators that are met through some of these investigations.)  
<http://www.pflugervilleisd.net/curriculum/math/documents/SurveyandQuestionsandSecretRules.pdf>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)  
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>
- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>

**f. Assessing the Lesson**

Formative assessment is embedded within the lesson through questions and observation. Teacher observations as students create survey questions and display the data should be used to gauge student understanding and to determine needs for follow-up lessons. However, other formative assessment strategies can and 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.

### 2-6.1 Create survey questions to collect data.

The objective of this indicator is to create, which is in the “create conceptual” knowledge of the Revised Taxonomy table. Conceptual knowledge is not bound by specific examples; therefore, students create survey questions to collect data.

The learning progression to **create** requires students to understand the reasonableness of a good survey question. For example, “Did you drive to school today?” is not an appropriate survey question for second graders. Students generate conjectures (survey questions) and exchange mathematical ideas as to the reasonableness of their questions (2-1.2). Students generalize connections among mathematics, the environment, and other subjects (2-1.7).

### 2-6.2 Organize data in charts, pictographs, and tables.

The objective of this indicator is to organize, which is in the “analyze conceptual” knowledge of the Revised Taxonomy table. To organize is to determine how elements (data) fit or function within a structure (charts, pictographs, and tables). The learning progression to **organize** requires students to recall and understand the structure of charts, pictographs and tables. Students analyze data that they have collect or have been given to generalize connections (2-1.7) among the data. They use these connections to determine how to best organize the data. Students explain and justify their answers (2-1.3) to their classmates and teacher using a variety of form of communication (2-1.6).

The Assessment task is adapted from **PreK-Grade 2 Mathematics Assessment Sampler**, an NCTM publication.

#### **TASK**

1. **Pose a question:** What is your favorite \_\_\_\_\_?” What are 4 different ways you could finish your question? Choose one that is interesting to you.
2. **Think about possible answers:** What do you think will be the most popular answers to your question? Choose five.
3. **Collect data:** Ask your classmates how they would answer the question, given the five choices you have provided. Keep a record of their answers.
4. **Organize the data:** Organize the answers in a chart, table, pictograph, or bar graph.
5. **Interpret the data:** What does your display tell you about the results? Write 2

# MODULE

# 1-3

## *Number Sense*

**This module addresses the following indicators:**

- 2-2.1:** Generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects. (B6)
- 2-2.2:** Represent quantities in word form through *twenty*. (A2)
- 2-2.3:** Represent multiples of ten in word form through *ninety*. (A3)
- 2-2.4:** Compare whole-number quantities through 999 by using the terms *is less than*, *is greater than*, and *is equal to* and the symbols  $<$ ,  $>$ , and  $=$ . (B2)
- 2-2.8:** Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20. (B6)

This module contains 5 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**

**2-2.1** Generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects.

- In first grade, students used estimation to determine the approximate number of objects in a set of 20 to 100 objects. (1-2.2)
- In second grade, students generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects. (2-2.1)
- Students analyze the magnitude of digits through 9,999 on the basis of their place value. (2-2.1)
- In third grade, students will compare whole-number quantities through 999,999 by using the terms *is less than*, *is greater than*, and *is equal to* and the symbols  $<$ ,  $>$  and  $=$ . (3-2.1)

**2-2.2** Represent quantities in word form through twenty.

- In kindergarten, students translate between numeral and quantity through 31.(K-2.2)
- In first grade, students represent quantities in word form through ten. (1-2.3)
- In second grade, students represent quantities in word form through twenty. (2-2.2), and represent multiples of ten in word form through ninety. (2-2.3)
- In third grade, students will represent in word form whole numbers through nine hundred ninety-nine thousand. (3-2.2)

**2-2.3** Represent multiples of ten in word form through ninety.

- In first grade, students represented quantities in word form up to ten. (1-2.3)
- Second grade students will represent quantities in word form up to twenty. (2-2.2) and represent the multiples of ten in word form through ninety. (2-2.3)
- In third grade, students will represent in word form whole numbers through nine hundred ninety-nine thousand. (3-2.2)

**2-2.4** Compare whole number quantities through 9,999 by using the terms *is less than*, *is greater than*, and *is equal to* and the symbols  $<$ ,  $>$ , and  $=$ .

- In first grade, compare whole-number quantities through 100 by using the terms *is greater than*, *is less than*, and *is equal to*. (1- 2.5) Students will analyze the magnitude of digits through 999 on the basis of their place value. ( 1-2.9)
- In second grade, students compare whole-number quantities through 9,999 by using the terms *is greater than*, *is less than*, and *is equal to* and the symbols  $<$ ,  $>$ , and  $=$  ( 2-2.4) Students will analyze the magnitude of digits through 9,999 on the basis of their place value. (2- 2.10)
- In third grade, students compare whole number quantities through 999,999 by using the terms *is less than*, *is greater than*, and *is equal to* and the symbols  $<$ ,  $>$ , and  $=$ . ( 3- 2.1) Students will also analyze the magnitude of digits through 999,999 on the basis of their place value. (3-2.12)

**2-2.8** Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20.

- In second grade, students generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20.

- **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.

- |                        |                                |
|------------------------|--------------------------------|
| • *Estimate/estimation | • *Seventy                     |
| • *Object/set          | • *Eighty                      |
| • *thousand            | • *Ninety                      |
| • *Ten                 | • *Compare                     |
| • *Eleven              | • *Is greater than             |
| • *Twelve              | • *Is less than                |
| • *Thirteen            | • *Is equal to                 |
| • *Fourteen            | • *Place value                 |
| • *Fifteen             | • *Addends                     |
| • *Sixteen             | • *Subtrahends                 |
| • *Seventeen           | • *Combinations                |
| • *Eighteen            | • *equals                      |
| • *Nineteen            | • sequence                     |
| • *Twenty              | * <u>Math Notation/Symbols</u> |
| • *Thirty              | • $<$                          |
| • *Forty               | • $>$                          |
| • *Fifty               | • $=$                          |
| • *Sixty               |                                |

## **II. Teaching the Lesson(s)**

### **1. Teaching Lesson 1-3A Estimation Strategies (Up to 1,000)**

#### **a. Indicators with Taxonomy**

**2-2.1:** Generate estimation strategies to determine the approximate number of objects in a set of no more than 1,000 objects. (B6)

*Cognitive Process Dimension: Create*

*Knowledge Dimension: Conceptual Knowledge*

#### **b. Introductory Lesson**

##### **Materials:**

A small package of candies for each child (M & M's, skittles)

Sticky notes

Color tiles, unifix cubes, color cubes, or/and any material that can be used to represent the candy.

A class number line

Teacher Notes: In second grade, "Generate estimation strategies" indicates this is the first year students will create their own strategies to estimate the approximate number of objects in a set of no more than 1,000 objects. The teacher should review the formats used in first grade, then organize measurement opportunities for students to estimate an amount prior to measuring its length, weight, and capacity. Since the size of the set is increased to 1,000, second grade students should be given choices from which to make the estimation, and the choices should be varied enough that a reasonable estimate is possible if students have a sense of magnitude. Finally, second graders must be able to estimate the number of objects in a set of up to 1,000 items. A potential area of difficulty is that students may not understand the relative size of an object compared to its container when the problem is presented in picture form. In order to help eliminate this potential problem the students should first have opportunities to select an estimate when the actual container is in front of them. Then when pictures are observed, the children will have some benchmark for comparison. Those benchmarks are critical for students as they *generate estimation strategies* and explain their reasoning in selecting an estimate. A student tendency is to count the number of objects that can be seen and to totally disregard the remaining objects in the container. In order to correct this misunderstanding, the students should have opportunities to count the



number of objects in a container, discuss how many were “hidden”, and determine a method for making a reasonable estimate.

**Lesson:**

A variety of estimation opportunities should be given to the students. Once the students have had several experiences in the classroom, the students can take turns filling a class estimation jar and having the rest of the class estimate how many? The types and sizes of the objects being estimated should also vary.

Have each student guess how many pieces of candy are in their package and write their prediction on sticky notes. Discuss their guesses and why they chose that number.

Using a class number line, have them mark their guess on the number line. Point out the lowest guess and the highest guess.

Ask the students to find the actual amount in their package. How close was their guess? What is their difference? Put the actual amount on a sticky note and place on the class number line. What do they notice about the new data compared to their estimates? What was the most common amount found in the packs of candy? What was the least? The most?

Working in pairs, have the students represent the class data with manipulatives or on paper. Discuss the representations and why they chose to represent the data this way.

Now ask them what their prediction would be if they did this again?

This activity can be extended by having them sort the candy by color and chart their data. Compare the colors in what group to the colors and amounts in another group.

**c. Misconceptions/Common Errors**

Students have a tendency to count the number of objects that can be seen and totally disregard the remaining objects in the container.

Students should have opportunities to count the number of objects in a container and discuss how many were hidden.

**d. Additional Instructional Strategies/Differentiation**

- Students are to generate the strategies rather than the teacher giving suggestions. Teachers ask guiding questions to mediate the student’s thinking as they move through the process of generating a strategy. “Often you can present a problem and have students suggest solutions or strategies. These suggestions will not solve the

problem for others because students must still work out the solution an explanation...brainstorming will likely produce a variety of approaches, resulting in more profitable solutions by more students." Van De Walle 2006 p 43

- Teachers should provide multiple "hands on" experiences with "real world" containers and objects to help students make the connections that large objects take up more space and would have a lower estimation, and smaller objects would take up less space and have a higher estimation.
- Students have opportunities to select an estimate when the actual container is in front of them, to create benchmarks and then move to pictures of containers.
- <http://www.learningbox.com/base10/Estimation.html>  
The students must estimate the value of a set of base 10 materials and indicate on an interactive number line. The sets displayed range from 100 to 1000.  
It is an appropriate whole group tool for tutorial as well as practice on individual computers. Since there is a timer and the program keeps score for the player, it may be used as a competitive game with students. The teacher can look at the screen and determine which estimates are in range and out of range. Since students must calculate the value of the base ten materials, skip counting by hundreds, tens, and ones as well as mental computation is reinforced.
- A meaningful connection exists between estimation/magnitude of number and place value. For example, in small groups, students are asked to estimate the number of objects in a large jar. They may dump out the jar and count the objects inside by using a place value organization of tens, hundreds, and thousands on the floor or table. The objects may be counted and placed into piles of tens until there are 10 tens, at which point those objects may be combined into a pile of one hundred. The objects continue to be counted until the group finishes. Students should represent their thinking by writing and drawing diagrams in math journals about each strategy used to count and group the objects and the value of each digit in the actual amount.

**e. Technology**

- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)

<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>

- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>
  - Sweet Story: Max's Math Adventures  
<http://teacher.scholastic.com/max/candy/index.htm>
- Estimator (Estimate the number of objects in a set.)  
<http://www.shodor.org/interactivate/activities/Estimator/>

#### **f. Assessing the Lesson**

Formative assessment is embedded within the lesson through questions and observations of students organized data and predictions. Teachers should use this information to determine strategies for future lessons. However, other formative assessment strategies should be used.

## **2. Teaching Lesson 1-3B Quantities in Word Form (Through Twenty)**

### **a. Indicators with Taxonomy**

- 2-2.2:** Represent quantities in word form through *twenty*. (A2)  
*Cognitive Process Dimension: Understand*  
*Knowledge Dimension: Factual Knowledge*

### **b. Introductory Lesson**

#### **Materials Needed:**

Number pattern plates up to twenty- these can be made out of small paper plates and dots. Using dots, place them on the plates in different common patterns to make the numbers 1-20. Make several different plates for each number. Ex: 5 can be made with 5 dots like on a die, or 4 of one color and one of another color, 3 dots in a triangle and 2 dots of another color.

Word cards one-twenty – one set for each child

Teacher Notes: While first grade students represented quantities in word form up to *ten*, second grade students will represent quantities in word form up to *twenty* (one, two, three. . . fifteen, sixteen, seventeen. . .) and represent the multiples of ten in word form through *ninety* (ten, twenty, thirty, forty. . .)

**Lesson:**

Hold up a number pattern plate for 3-5 seconds

The students hold up the word card that represents the number of dots on the plate. Students not only start to see numbers as a combination of other numbers but also see the number words as representing a quantity, not just something abstract.

Ask them how they saw the card and knew what number it was?

After this is introduced whole group, this can be done in small groups having one student hold up the pattern plates and the other students hold up the number cards.

**c. Misconceptions/Common Errors**

- Students often confuse twelve and twenty
- "In first and second grade, children need to connect the base ten concepts with the oral names they have used many times. They know the words but have not thought of them in terms of tens and ones. ...Use base ten language paired with standard language. Emphasize the teens as exceptions. Acknowledge that they are formed "backward" and do not fit the pattern." For example: 17..71.(Van De Walle 2004 p188)

**d. Additional Instructional Strategies/Differentiation**

- Connect place value... one ten and one = 11 = eleven
- One ten and two = 12 = twelve

**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.

- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and

the website will find correlated activities for the standard you choose.)

<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>

- Numbers and Words (A short tutorial is shown first for numbers one through twenty. Scroll down to get to the games and practice. Students are given the number and have to find the word form.) [http://www.aaaknow.com/g1\\_k2jx1.htm](http://www.aaaknow.com/g1_k2jx1.htm)
- Words and Numbers (A short tutorial is shown first for numbers one through twenty. Scroll down to get to the games and practice. Students are given the word and have to find the number in standard form.) [http://www.aaaknow.com/g1\\_k2ix1.htm](http://www.aaaknow.com/g1_k2ix1.htm)
- Cookie Dough (There are two ways to play. A number will show on the check and students have to type out the word form. OR the word form will appear and students have to type the correct standard form. Levels can be chosen to better meet the indicator.) <http://www.funbrain.com/numwords/index.html>
- Numbers (Students type in a number, say the number to themselves, and click enter to see how it is spelled. Any number can be entered.) <http://www.mathcats.com/explore/reallybignumbers.html>
- Writing Numbers in Words Practice (Sign in as guest.) <http://www.ixl.com/math/practice/grade-1-writing-numbers-in-words>

**f. Assessing the Lesson**

Formative assessment is embedded within the lesson through questions and observation. Students' ability to match the number to word is observed through group and partner interactions. However, other formative assessment strategies should be used.

**3. Teaching Lesson 1-3C Multiples of 10 (Word Form Through Ninety)**

**a. Indicators with Taxonomy**

**2-2.3:** Represent multiples of ten in word form through *ninety*. (A3)

*Cognitive Process Dimension: Apply*

*Knowledge Dimension: Factual Knowledge*

**b. Introductory Lesson****Materials:**

Base Ten blocks- ten rods

Word cards – Ten through Ninety- one set per child or pair of students

Teacher Note: In first grade, students used concrete materials to construct the quantities to 100 and then compared using the terms *is greater than*, *is less than*, and *is equal to*. In second grade, the quantities are extended to 999 and the symbols  $<$ ,  $>$ , and  $=$  are used for comparisons.

**Lesson:**

Introduce the number cards by having the class read along as you move through the cards, "Ten, Twenty, Thirty, etc." Then ask students to volunteer to come to the front to use base ten blocks or rods to represent "ten". Have another volunteer come and represent "twenty". Give each student or pair of students a set of word cards.

Have the students order the cards from least to greatest.

Under each card, have them represent the number with the base ten blocks or rods.

Extension- Have them represent the number in several different ways using rods and units.

**c. Misconceptions/Common Errors**

No typical student misconceptions noted at this time.

**d. Additional Instructional Strategies/Differentiation**

- Use a 10 X 10 array of dots on the overhead projector. Cover up all but two rows. How many tens? Two tens is called twenty. Show another row. Three tens is called thirty. Four tens is called forty. Five tens should have been called fivety rather than fifty. Continue the process until you reach ninety. Slide the cover up and down and continue asking how many tens and the name for each. (taken from Van De Walle K-3)

**e. Technology**

- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-

created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)

<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>

- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>
- <http://www.mathcats.com/explore/reallybignumbers.html>  
This site encourages students to learn about the structure of the base ten system symbolically to read large numbers. The student or teacher puts in a numeral and the student reads the number aloud. The button is clicked and the computer shows how to write the numeral in words.  
It may be used as a whole group tutorial and practice tool with the students modeling the numeral with base 10 blocks at their desks as the program generates the correct reading and writing of the number in words.

#### ***f. Assessing the Lesson***

Formative assessment is embedded within the lesson through questions and observation. Teachers should monitor the students/groups and ask them to share how they ordered their words/numbers from least to greatest. However, other formative assessment strategies can be used.

### **4. Teaching Lesson 1-3D**

#### ***Compare Numbers Through 999 Using <, >, =***

##### ***a. Indicators with Taxonomy***

**2-2.4:** Compare whole-number quantities through 999 by using the terms *is less than*, *is greater than*, and *is equal to* and the symbols <, >, and =. (B2)

*Cognitive Process Dimension: Understand*  
*Knowledge Dimension: Conceptual Knowledge*

##### ***b. Introductory Lesson***

###### **Materials:**

Base ten blocks  
Paper plates  
Paper, pencil

**Lesson:**

Since this is the first time the students are introduced to the symbols  $<$ ,  $>$ , and  $=$ , make sure that you connect them with the words “is less than, is greater than, and equals to” and use them together.

Give each student 3 small paper plates. Have them draw the less than, greater than, and equal to symbol on one side of each plate. Have them write the words on the back, as a reminder if they need to refer to it. Create various representations of quantities on two opposite sides of the board/front of the room. Ask students to come to the front of the room and demonstrate which symbol they would use to compare the two sets. Ask them to explain why they chose the symbol. Do this several times to allow students to see all symbols used repeatedly. Clarify any questions about the symbols before moving ahead. Then, working in pairs, have the students create a sculpture out of base ten blocks using flats, rods and units. Then have them find the value of their sculpture and write it on paper. Have each pair of students join with another pair to make a group of four. Have them first predict which sculpture has a higher value. Ask them what strategies they used to determine this. They should find the value of the other pairs sculpture and write it down next to their value. Then the group can discuss their findings, decide which one is greater and represent their findings by writing an inequality sentence.

**c. Misconceptions/Common Errors**

Though the concept of less is logically equivalent to the concept of more, the word less proves to be more difficult for children than more. A possible explanation is that children have many opportunities to use the word more but have limited exposure to the word less. To help children with the concept of less, frequently pair it with the word more and make a conscious effort to ask “which is less?” questions as well as “which is more?” (Van De Walle 2006)

**d. Additional Instructional Strategies/Differentiation**

Additional Lesson Plan:

**Materials:**

Number cards 0-9 for each pair of students  
 Symbol cards-  $<$   $>$   $=$  for each pair of students  
 Paper, pencil

Students work in pairs. Each child draws 4 lines on their paper like this  
 \_ \_ \_ \_ to place the cards on when they draw them. Next, they take turns drawing a card. They decide where to place that number on their place value lines. Once they place it, they can't change it. When they have all of their places filled, they read the number, decide which one



is greater and then chose the appropriate symbol card to place between the numbers.

- National Library of Virtual Manipulatives
- Play Compare with partners using base ten pieces, a cube with the words unit- rod- flat on the faces and a number cube. Roll the 2 cubes, set out the collection and then compare. Write a number sentence to match the collection.
- Create a sheet with three columns, number cards 0 – 9 or number cubes. Draw 3 cards or roll the cube 3 times and make the largest number possible or the smallest number.

**e. Technology**

- Whole Number Comparison (Choose which level students will play. “Greater, Lesser, Equal” are shown with the symbols to help students.) <http://www.ezscool.com/Games/Compare.html>
- Comparing Number Values (Choose the level in which students will play. The first screen has both the sign and word; however, once the game has started, only the symbol is shown.) <http://www.toonuniversity.com/flash.asp?err=509&engine=9>
- Number Machine (Students are given a starting number first. With the second number they are given, they have to decide if they can use those numbers to create a number larger than the original. If so, they click on the numbers in the order they should appear in the machine. If the number cannot be larger, then they click “can’t be bigger.”) <http://pbskids.org/cyberchase/games/numbersense/machine.html>
- One False Move (You are stuck in a haunted house. Your goal is to find the door to get out. Choose whether you wish to order numbers from lowest to highest or highest to lowest. Also choose Easy, Medium, or Hard.) <http://www.funbrain.com/ofm/index.html>
- Alligator’s Lunch (Learn how to use the greater than and less than symbols with Allie the Alligator.) <http://www.beaconlearningcenter.com/WebLessons/AlligatorLunch/default.htm#page1>
- Number Compare (Compare using the greater than and less than symbols. Choose from numbers to 100, numbers to 1,000, and numbers to 10,000.)

<http://www.crickweb.co.uk/assets/resources/flash.php?&file=ncmenu>

- Greater than Less than with crocodile (Students click on the crocodile to make him turn around and show the correct symbol for the numbers using his mouth.)  
[http://www.innovationslearning.co.uk/subjects/maths/activities/year4/greater\\_than/start.htm](http://www.innovationslearning.co.uk/subjects/maths/activities/year4/greater_than/start.htm)
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.)  
<http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>
- SMART Board Interactive Whiteboard Lessons and Resources  
<http://www.scholastic.com/interactivewhiteboards/>
- Lesson on inequalities from Illuminations  
<http://illuminations.nctm.org/LessonDetail.aspx?id=U183>

#### ***f. Assessing the Lesson***

Formative assessment is embedded within the lesson through questions and observation. Teachers should monitor pairs and ask questions throughout the activity to determine student understanding. However, other formative assessment strategies should be used.

### **5. Teaching Lesson 1-3E Adding and Subtracting Through 20**

#### ***a. Indicators with Taxonomy***

**2-2.8:** Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20. (B6)

*Cognitive Process Dimension: Create*

*Knowledge Dimension: conceptual Knowledge*

**b. Introductory Lesson**

This indicator is one where students “generate strategies”. Students should be given lots of opportunities to create their own strategies to solve these problems. When introducing this concept to the students, a variety of word problems should be used with the students using manipulatives to solve the problems. They should transfer their work with manipulatives to representing their findings on paper. When discussing the strategies and solutions, show the connection with what they did and the addition or subtraction equation that best represents their work. Math journals should be used for the students to record their strategies for solving the problems.

There are four basic structures for addition and subtraction story problems, join, separate, part-part-whole and compare. It is important that students be exposed to all forms within these structures. (Van de Walle)

- Word problem ex:
  - **Join: result unknown**- Susie had 3 cookies. Linda gave her 5 more. How many cookies did Susie have altogether?
  - **Join: change unknown**- Susie had 3 cookies. Linda gave her some more. Now, Susie has 8 cookies. How many cookies did Linda give her?
  - **Join: initial unknown**- Susie had some cookies. Linda gave her 5 more. Now, Susie has 8 cookies. How many cookies did Susie start with?
  - **Separate: result unknown**-Susie had 8 cookies. She gave 5 to Linda. How many cookies does she have now?
  - **Separate: change unknown**- Susie has 8 cookies. She gave some to Linda. Now, she has 3 cookies. How many did she give to Linda?
  - **Separate: Initial unknown**- Susie had some cookies. She gave 5 to Linda. Now she has 3 left. How many cookies did she start with?
  - **Part-part-whole: whole unknown**- Teresa has 6 green jelly beans and 8 red jelly beans. How many jellybeans does she have?
  - **Part-part-whole: part unknown**- Teresa has 14 jelly beans. 6 of them are green and the rest are red. How many are red?
  - **Compare: difference unknown**- Susie has 6 jellybeans and Teresa has 8 jellybeans. How many more jellybeans does Teresa have than Susie?
  - **Compare: Larger Unknown**- Teresa has 2 more jellybeans than Susie. Susie has 6 jellybeans. How many jellybeans does Teresa have?

- **Compare: Smaller Unknown-** Teresa has 2 more jellybeans than Susie. Teresa has 8 jellybeans. How many jellybeans does Susie have?

**c. Misconceptions/Common Errors**

Students see the equal sign to mean “perform an operation” rather than a sign of equivalence between two parts of an equation. As a result, when presented with a problem such as  $4 + \underline{\quad} = 7$ , students use the numbers to perform an operation rather than focusing on what should be added to 4 to equal 7.

**d. Additional Instructional Strategies/Differentiation**

Students must be very flexible with addition and subtraction up to 20 and be able to demonstrate inverse relationships. To do so, they should have experiences using concrete and pictorial models and connect the models to writing in numerical sentences, and then finding missing addends and subtrahends in combinations to 20. A number balance is a visual and hands-on tool that demonstrates concretely strategies to figure out the missing parts in an equation by manipulating the masses on the balance’s pegs. Being able to generate strategies to find missing addends sets the stage for students understanding of the concept of equivalence.

**e. Technology**

- Busy Bees (Students use bees to find the missing addend.)  
[http://www.hbschool.com/activity/busy\\_bees/index.html](http://www.hbschool.com/activity/busy_bees/index.html)
- At the Movies (Printable game to find missing addends. It would be a good idea to have counters or some other manipulative available during the game to help students find the missing addend.)  
[http://www.theeducationcenter.com/Images/dlr\\_images/pdf/sample/tec61133\\_sample.pdf](http://www.theeducationcenter.com/Images/dlr_images/pdf/sample/tec61133_sample.pdf)
- Number Pyramid (Students find the missing addend, subtrahend, or solution. Choose medium level for second graders. Choose a higher level for those who need the extra challenge. There is no “easy” level.)  
<http://www.bbc.co.uk/schools/ks1bitesize/numeracy/numbers/index.shtml>
- Math Baseball (There are many options for this game. To cover this indicator, choose either addition or subtraction. Set algebra at “yes” for students to find the missing addend or subtrahend. The “easy” level is more appropriate for this indicator; however, some students may be ready for the “medium” challenge. Have

manipulatives available.)

<http://www.funbrain.com/math/index.html>

- Complete the addition sentence (Sign in as guest. Have manipulatives available.) <http://www.ixl.com/math/practice/grade-2-complete-the-addition-sentence>
- Complete the subtraction sentence (Sign in as guest. Have manipulatives available.) <http://www.ixl.com/math/practice/grade-2-subtraction-one-digit-complete-sentence>
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) <http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm>
- SMART Board Interactive Whiteboard Lessons and Resources <http://www.scholastic.com/interactivewhiteboards/>

#### ***f. Assessing the Lesson***

Formative assessment is embedded within the lesson through questions and observation. Teachers should also use student responses to the questions in the lesson recorded in notebooks to guide future instruction. 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.

**2-2.4** Compare whole number quantities through 9,999 by using the terms is less than, is greater than, and is equal to and the symbols  $<$ ,  $>$ , and  $=$ .

The objective of this indicator is to compare, which is the “understand conceptual” knowledge cell of the Revised Taxonomy Table. Conceptual knowledge is not bound by specific examples; therefore students should compare hundreds to hundreds, tens to tens, ones to ones and combinations of hundreds, tens, and ones

The learning progression to **compare** requires students to recognize the place value of digits through 9,999, compare the place value of digits through 9,999, recognize mathematical symbols  $<$ ,  $>$ , and  $=$  and their meanings. Throughout the learning experience, students analyze place value patterns (2-1.4) and generate conjectures and exchange mathematical ideas about which symbol is appropriate.(2-1.2). For example: 4 flats  $>$  4 rods  $>$  4 units or 4 tens  $>$  4 ones. Students use a variety of forms of mathematical communication such as words, symbols, numbers, and pictures. (2-1.6)

**2-2.8** Generate addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20.

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 addition and subtraction strategies to find missing addends and subtrahends in number combinations through 20.

The learning progression to **generate** requires students to recall basic addition facts through  $9 + 9$  and their corresponding subtraction facts. Students will generate conjectures and exchange mathematical ideas to find missing addends and subtrahends in number combinations through 20. (2-1.2) For example, using a number balance. Students explain and justify their ideas using multiple informal concrete and pictorial representations to convey mathematical ideas. (2-1.8)

**2-2.2** Represent quantities in word form through twenty.

The objective of this indicator is to represent, which is the “understand factual” cell of the Revised Taxonomy table. Factual knowledge is bound by specific examples; therefore students should recognize the vocabulary and be able to represent quantities in word form. The learning progression to **represent** through twenty requires that they recognize quantities through ten and explain their reasoning (2-1.3).

**2-2.3** Represent multiples of ten in word form through ninety.

The objective of this indicator is to represent, which is the “understand factual” cell of the Revised Taxonomy table. Factual knowledge is bound by specific examples. Therefore, students should represent multiples of ten in word form through ninety. The learning progression to **represent** requires that students recognize the word form and connect the quantity to the word form and explain their reasoning. (2-1.3)

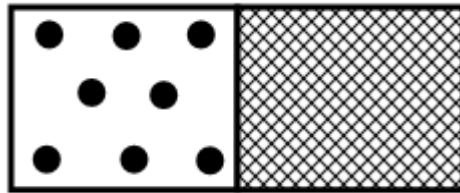
1. Use  $>$ ,  $<$  or  $=$  inside the  to compare each set of numbers.

A.  $400 + 50 + 3$   435

B. 7 hundreds 6 tens 14 ones  774

2. Molly is making bead bracelets. She has already made 9 bracelets. She needs to make 17 bracelets altogether. How many more bracelets does she need to make?

3. Mrs. Smith showed this dot picture to the class.



Mrs. Smith told the class that the card had a total of 15 dots. How many dots were behind the shaded part of the card?

4. Mark had seventeen baseball cards. Andy had seventy cards. Who had the most cards? Explain your reason.

5. Shelia waited at the bus stop for fifty minutes. Jackie waited for fifteen minutes. Who waited the least amount of time? Draw base ten blocks to prove your answer.