

# DATA: Making Connections and Meeting the Common Core K-3

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## Bibliography:

- Group Solutions, Too: More Cooperative Logic Activities for Grades K-4 by Jan Goodman and Jaine Kopp
- *Progressions for the Common Core State Standards in Mathematics: K-3 Categorical Data; Grades 2-5 Measurement Data*, The Common Core Standards Writing Team, 20 June, 2011 <http://ime.math.arizona.edu/progressions/>
- *Unpacking the Standards: Mathematics, Grade 2*, Public Schools of North Carolina, <http://www.ncpublicschools.org/acre/standards/common-core-tools/>

## Some Other Data and Graphing Resources:

- *Super Graphs, Venns, and Glyphs*, Honi Bamberger and Patricia Hughes, Scholastic 1995
- *Teaching Student-Centered Mathematics K-3*, John Van de Walle and LouAnn Lovin, Pearson Education 2006
- *Navigating Through Data Analysis and Probability in Grades 3-5*, Suzanne Chapin, et al, NCTM 2002



Tallies

## Data Collection Ideas for K-3

Picto-Graph

Straw "Poll"

Bottle Graphs

Clothespin Preferences



## CCSS-M Represent and Interpret Data K-3

Standards for Kindergarten	Standards for 1 <sup>st</sup> Grade	Standards for 2 <sup>nd</sup> Grade	Standards for 3 <sup>rd</sup> Grade
<p><b>Describe and compare measurable attributes.</b> K.MD.2. Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. <i>For example, directly compare the heights of two children and describe one child as taller/shorter.</i></p> <p><b>Classify objects and count the number of objects in each category.</b> K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.3 (category counts equal or less than 10)</p>	<p><b>Represent and interpret data.</b> 1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</p>	<p><b>Represent and interpret data.</b> 2.MD.9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.</p> <p>2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems<sup>4</sup> using information presented in a bar graph.</p>	<p><b>Represent and interpret data.</b> 3.MD.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i></p> <p>3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.</p>
	Changes K to 1	Changes 1 to 2	Changes 2 to 3



# What's Your Favorite Ice Cream Flavor?



K	1st	2nd	3rd

## Grade 1 – Operations and Algebraic Thinking

### Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

### Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add and subtract. *Examples: If  $8 + 3 = 11$  is known, then  $3 + 8 = 11$  is also known. (Commutative property of addition.) To add  $2 + 6 + 4$ , the second two numbers can be added to make a ten, so  $2 + 4 = 2 + 10 = 12$ . (Associative property of addition.)*

4. Understand subtraction as an unknown-addend problem. *For example, subtract  $10 - 8$  by finding the number that makes 10 when added to 8.*

### Add and subtract within 20.

5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g.,  $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$ ); decomposing a number leading to a ten (e.g.,  $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$ ); using the relationship between addition and subtraction (e.g., knowing that  $8 + 4 = 12$ , one knows  $12 - 8 = 4$ ); and creating equivalent but easier or known sums (e.g., adding  $6 + 7$  by creating the known equivalent  $6 + 6 + 1 = 12 + 1 = 13$ ).

### Work with addition and subtraction equations.

7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false?  $6 = 6$ ,  $7 = 8 - 1$ ,  $5 + 2 = 2 + 5$ ,  $4 + 1 = 5 + 2$ .*

8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations  $8 + ? = 11$ ,  $5 = \quad - 3$ ,  $6 + 6 = \quad$ .*

What first grade standards could you use the graph on the slide to support?

Table 1: Some notable connections to K–5 data work

Grade	Standard	Notable Connections
<i>Categorical data</i>		
K	K.MD.3. Classify objects into given categories, count the number of objects in each category and sort <sup>1</sup> the categories by count. <i>Limit category counts to be less than or equal to 10.</i>	<ul style="list-style-type: none"> <li>• K.CC. Counting to tell the number of objects</li> <li>• K.CC. Comparing numbers</li> </ul>
1	1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	<ul style="list-style-type: none"> <li>• 1.OA. Problems involving addition and subtraction                             <ul style="list-style-type: none"> <li>◦ put-together, take-apart, compare</li> <li>◦ problems that call for addition of three whole numbers</li> </ul> </li> </ul>
2	2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	<ul style="list-style-type: none"> <li>• 2.OA. Problems involving addition and subtraction                             <ul style="list-style-type: none"> <li>◦ put-together, take-apart, compare</li> </ul> </li> </ul>
3	3.MD.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i>	<ul style="list-style-type: none"> <li>• 3.OA.3. Problems involving multiplication</li> <li>• 3.OA.8 Two-step problems using the four operations</li> <li>• 3.G.1 Categories of shapes</li> </ul>
<i>Measurement data</i>		
2	2.MD.9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.	<ul style="list-style-type: none"> <li>• 1.MD.2. Length measurement</li> <li>• 2.MD.6. Number line</li> </ul>
3	3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	<ul style="list-style-type: none"> <li>• 3.NF.2. Fractions on a number line</li> </ul>
4	4.MD.4. Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{1}{8}$ ). Solve problems involving addition and subtraction of fractions by using information presented in line plots. <i>For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</i>	<ul style="list-style-type: none"> <li>• 4.NF.3.4. Problems involving fraction arithmetic</li> </ul>
5	5.MD.2. Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{1}{8}$ ). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.</i>	<ul style="list-style-type: none"> <li>• 5.NF.1,2,4,6,7. Problems involving fraction arithmetic</li> </ul>

<sup>1</sup> Here, "sort the categories" means "order the categories," i.e., show the categories in order according to their respective counts.

Draft, 6/20/2011, comment at [commoncoretools.wordpress.com](http://commoncoretools.wordpress.com).

From *Progressions for the Common Core State Standards in Mathematics: K-3 Categorical Data; Grades 2-5 Measurement Data*, The Common Core Standards Writing Team, 20 June, 2011 <http://ime.math.arizona.edu/progressions/>



## **Unpacking the Standards for Mathematical Practice in Second Grade**

from North Carolina Department of Public Instruction

<http://www.ncpublicschools.org/acre/standards/common-core-tools/#unmath>

*The Common Core State Standards for Mathematical Practice are practices expected to be integrated into every mathematics lesson for all students Grades K-12. Below are a few examples of how these Practices may be integrated into tasks that Grade 2 students complete.*

### **1) Make Sense and Persevere in Solving Problems.**

Mathematically proficient students in Second Grade examine problems and tasks, can make sense of the meaning of the task and find an entry point or a way to start the task. Second Grade students also develop a foundation for problem solving strategies and become independently proficient on using those strategies to solve new tasks. In Second Grade, students' work continues to use concrete manipulatives and pictorial representations as well as mental mathematics. Second Grade students also are expected to persevere while solving tasks; that is, if students reach a point in which they are stuck, they can reexamine the task in a different way and continue to solve the task. Lastly, mathematically proficient students complete a task by asking themselves the question, "Does my answer make sense?"

### **2) Reason abstractly and quantitatively.**

Mathematically proficient students in Second Grade make sense of quantities and relationships while solving tasks. This involves two processes- decontextualizing and contextualizing. In Second Grade, students represent situations by decontextualizing tasks into numbers and symbols. For example, in the task, "There are 25 children in the cafeteria and they are joined by 17 more children. How many students are in the cafeteria?" Second Grade students translate that situation into an equation, such as:  $25 + 17 = \underline{\quad}$  and then solve the problem. Students also contextualize situations during the problem solving process. For example, while solving the task above, students can refer to the context of the task to determine that they need to subtract 19 since 19 children leave. The processes of reasoning also impact other areas of mathematics such as determining the length of quantities when measuring with standard units.

### **3) Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students in Second Grade accurately use definitions and previously established solutions to construct viable arguments about mathematics. During discussions about problem solving strategies, students constructively critique the strategies and reasoning of their classmates. For example, while solving  $74 - 18$ , students may use a variety of strategies, and after working on the task, can discuss and critique each others' reasoning and strategies, citing similarities and differences between strategies.

### **4) Model with mathematics.**

Mathematically proficient students in Second Grade model real-life mathematical situations with a number sentence or an equation, and check to make sure that their equation accurately matches the problem context. Second Grade students use concrete manipulatives and pictorial representations to provide further explanation of the equation. Likewise, Second Grade students are able to create an appropriate problem situation from an equation. For example, students are expected to create a story problem for the equation  $43 + 17 = \underline{\quad}$  such as "There were 43 gumballs in the machine. Tom poured in 17 more gumballs. How many gumballs are now in the machine?"

(continued on the back)

## **5) Use appropriate tools strategically.**

Mathematically proficient students in Second Grade have access to and use tools appropriately. These tools may include snap cubes, place value (base ten) blocks, hundreds number boards, number lines, rulers, and concrete geometric shapes (e.g., pattern blocks, 3-d solids). Students also have experiences with educational technologies, such as calculators and virtual manipulatives, which support conceptual understanding and higher-order thinking skills. During classroom instruction, students have access to various mathematical tools as well as paper, and determine which tools are the most appropriate to use. For example, while measuring the length of the hallway, students can explain why a yardstick is more appropriate to use than a ruler.

## **6) Attend to precision.**

Mathematically proficient students in Second Grade are precise in their communication, calculations, and measurements. In all mathematical tasks, students in Second Grade communicate clearly, using grade-level appropriate vocabulary accurately as well as giving precise explanations and reasoning regarding their process of finding solutions. For example, while measuring an object, care is taken to line up the tool correctly in order to get an accurate measurement. During tasks involving number sense, students consider if their answer is reasonable and check their work to ensure the accuracy of solutions.

## **7) Look for and make use of structure.**

Mathematically proficient students in Second Grade carefully look for patterns and structures in the number system and other areas of mathematics. For example, students notice number patterns within the tens place as they connect skip count by 10s off the decade to the corresponding numbers on a 100s chart. While working in the Numbers in Base Ten domain, students work with the idea that 10 ones equals a ten, and 10 tens equals 1 hundred. In addition, Second Grade students also make use of structure when they work with subtraction as missing addend problems, such as  $50 - 33 = \underline{\quad}$  can be written as  $33 + \underline{\quad} = 50$  and can be thought of as, "How much more do I need to add to 33 to get to 50?"

## **8) Look for and express regularity in repeated reasoning.**

Mathematically proficient students in Second Grade begin to look for regularity in problem structures when solving mathematical tasks. For example, after solving two digit addition problems by decomposing numbers ( $33 + 25 = 30 + 20 + 3 + 5$ ), students may begin to generalize and frequently apply that strategy independently on future tasks. Further, students begin to look for strategies to be more efficient in computations, including doubles strategies and making a ten. Lastly, while solving all tasks, Second Grade students accurately check for the reasonableness of their solutions during and after completing the task.

# Data Collection Topics

## Getting to Know You

Gender, Eye color, Hair color or texture  
Pets (number or kind), people or children in house  
How get to school  
Birth month or date-range or season  
Left or right-handed  
Bedtime or Wake-up time  
Ethnicity or Languages you speak  
Teeth have you lost or cavities  
Home heating: gas, electric, solar, wood, other  
Oldest/youngest/middle/only child in your family  
More boys or more girls in your family

## Clothing

Types, patterns, shoe size, watch (yes or no),  
predominant color, # of Pockets or buttons

## Preferences

Foods, drinks, sports, weekend activities, writing  
utensils, subject/class, mode of transportation,  
weather, book titles, character

## Favorites

What Ice Cream Flavor do you Favor?, color,  
Foods, holidays, gifts, careers, day of the week,  
season, jelly bean flavor

## Holidays

Preferred holiday candy, what ate for Thanksgiving,  
how traveling for vacation, where ate (home, other  
house, restaurant)

## Science/Social Studies

Which do you know most about?, Sink or float,  
number of nails magnet will hold, sort seeds, weather  
predictions for the week or month or afternoon  
Predict election results, why do you think your  
teacher is absent today?

## Large Amounts of Data

Lightswitches  
Number of each coin type in parents' pocket  
Number of each crayon color in student desks  
Make a class question and have each child ask 5  
people and combine the data.

## Number Play

(Age x 3) - last digit of phone number (intervals of 10)

### **Birthday:**

- Single or double digit
- Is the tens digit a 0, 1, 2, or 3

### **Phone Number:**

- How many even numbers?
- Sum of last four numerals,
- largest number you can make
- Subtract greatest digit from largest digit
- Add first 3 digits to last 3 digits

### **Names/Spelling word:**

- Number of letters
- Give a value to each letter (A=1, B=2, C=3) and  
sum the value of your name, street, etc (intervals  
of 5 for first name, 10 for both);
- vowels get 2 points, consonants get 5 points add  
the value of your name (intervals of 10);
- fraction of name that is vowels (0-1/2,  $\frac{1}{2}$ .  
Greater than  $\frac{1}{2}$ )
- number of letters in first name and number of  
letters in last name: subtract lesser amount from  
the greater amount
- Number of letters in your name doubled and then  
add five (intervals of 12)

## Measurements

Feet, arms, height, pencil length  
Waist and head circumference  
Number of cubes that fit in a tracing of your hand  
Footsteps from class to principal or lav  
Weather or temperature  
Number of x in one minute  
Time traveling to school, time on homework  
Time slept last night  
Coin grab (# or value)  
Each button is a dime and each pocket is a nickel(25  
cent ranges)  
Estimate number of objects in a jar or number of  
scoops needed to fill a jar (then test) (range or more  
than/less than)

# Notes!