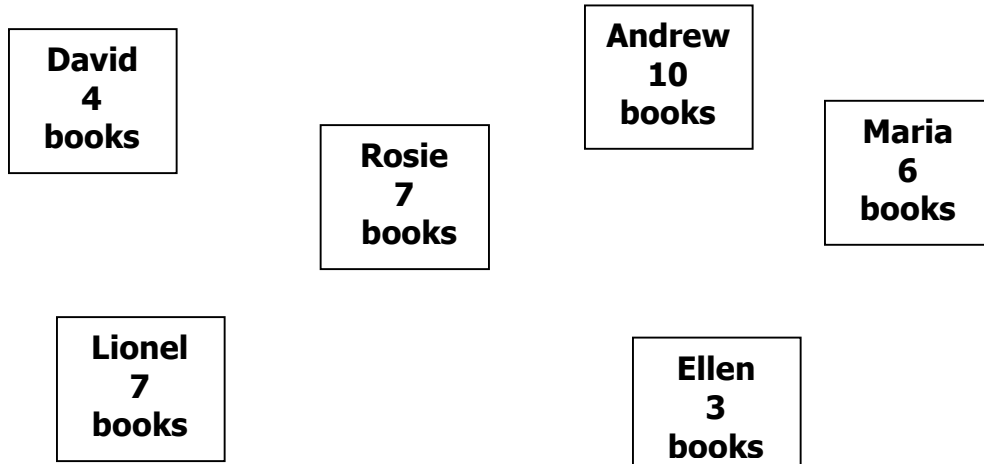


2nd grade**Task 3****Reading Books**

Student Task	2 nd graders are reading books. The information must be collected and organized to answer questions and explain the answers.
Core Idea 5 Data Analysis	Students collect, organize, display, and interpret data about themselves and their surroundings <ul style="list-style-type: none">• Represent the same data in more than one way• Represent and interpret data using graphs or other representations• Describe and compare data using quantitative measures• Communicate reasoning using words, numbers, or pictures
Core Idea 2 Number Operations	Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently <ul style="list-style-type: none">• Demonstrate fluency in adding and subtracting whole numbers• Communicate reasoning using pictures, numbers and/or words.

Reading Books

The students at Horace Mann Elementary School are reading books. This group of students recorded the number of books they read this week. Here are the results.



1. Show all the results in this frequency chart.

Student	Number of books read
Andrew	10
David	4
Ellen	
Lionel	
Maria	
Rosie	

2. Now show the same results on this bar graph below.

Books Read In A Week

10						
9						
8						
7						
6						
5						
4						
3						
2						
1						
	Andrew	David	Ellen	Lionel	Maria	Rosie

Students

3. How many books were read by David, Ellen, and Maria? _____
Show how you figured it out.

4. How many more books did Rosie read than Ellen? _____
Show how you figured it out.

5. How many books in all were read by the students? _____
Show how you figured it out.

Reading Books		Grade 2		Rubric	
The core elements of the performance required by this task are: <ul style="list-style-type: none"> • Represents the same data in more than one way. • Represent and interpret data using graphs or other representation • Describe and compare data using qualitative and quantitative measures. • Communicate reasoning using words, numbers or pictures. 					
Based on these credit for specific aspects of performance should be assigned as follows				points	section points
1	Gives correct answer as Ellen – 3 Lionel - 7 Maria – 6 Rosie – 7 Four or three correct answers	1	1		
2	Fills in the bars above David – 4 bars, Ellen – 3 bars, Maria – 6 bars.	1 x 3	3		
3	Gives correct answer as: 13 Shows work such as: $4 + 3 + 6 = 13$ Or explains what they counted or added to get the answer of 13	1 ft 1	2		
4	Gives correct answer as 4 Shows work such as: $7 - 3 = 4$ Or explains what they counted, added or subtracted to get the answer of 4	1 ft 1	2		
5	Gives correct answer as: 37 Shows work such as: $10 + 4 + 3 + 7 + 6 + 7 = 37$ Or explains what they counted or added to get the answer of 37	1 ft 1	2		
Total Points					10

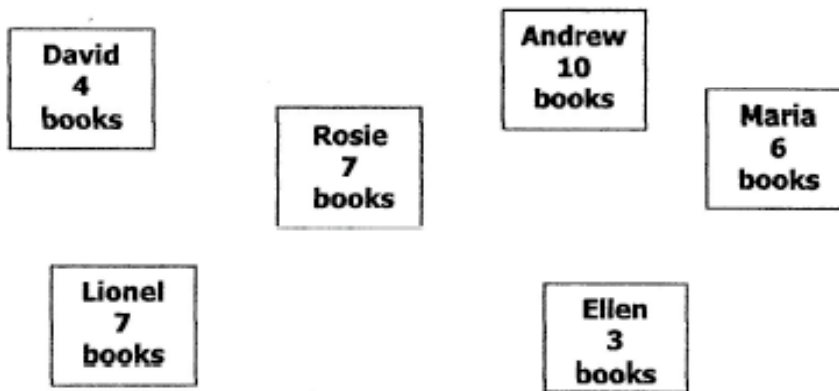
Looking At Student Work – Reading Books:

The papers of Students A through F show strong understandings of displaying and interpreting data. Interestingly, a little over 98% of all students were able to successfully complete the frequency table on the first page of this task. Student A gives a straightforward description of the data used to answer the interpretation questions and is correct in each. Student A successfully compared the two pieces of data for question four by using addition. In questions three and five, Student A is using a notation different than the standard vertical notation seen in text books but it makes sense to this child and the child has arrived at the correct answer.

Student A

Reading Books

The students at Horace Mann Elementary School are reading books. This group of students recorded the number of books they read this week. Here are the results.

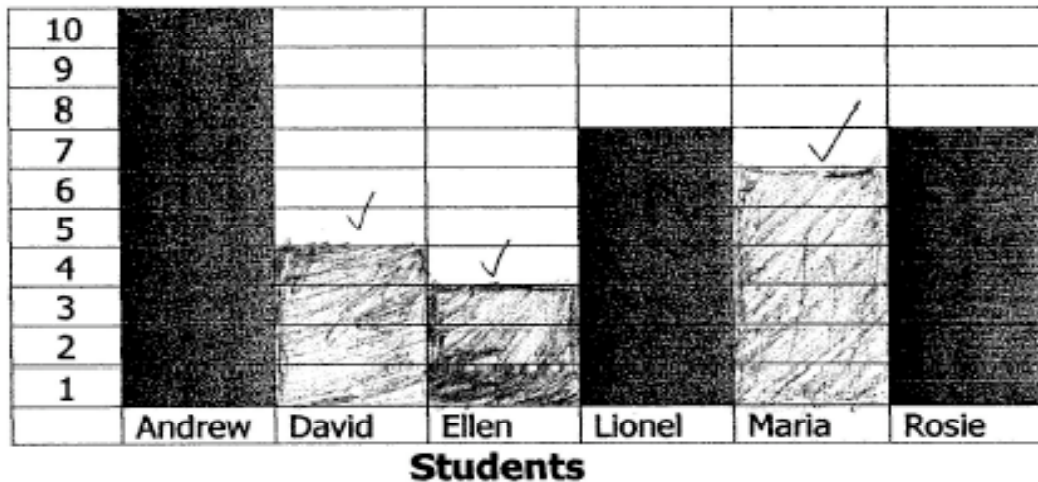


1. Show all the results in this frequency chart.

Student	Number of books read
Andrew	10
David	4
Ellen	3 ✓
Lionel	7 ✓
Maria	6 ✓
Rosie	7 ✓

2. Now show the same results on this bar graph below.

Books Read In A Week



3. How many books were read by David, Ellen, and Maria? 13 ✓
Show how you figured it out.

$$\begin{array}{r} 4 \\ +3 \\ +6 \\ \hline 13 \end{array} \checkmark$$

4. How many more books did Rosie read than Ellen? 4 ✓
Show how you figured it out.

$$\begin{array}{r} 3 \\ +4 \\ \hline 7 \end{array} \checkmark$$

5. How many books in all were read by the students? 37 ✓
Show how you figured it out.

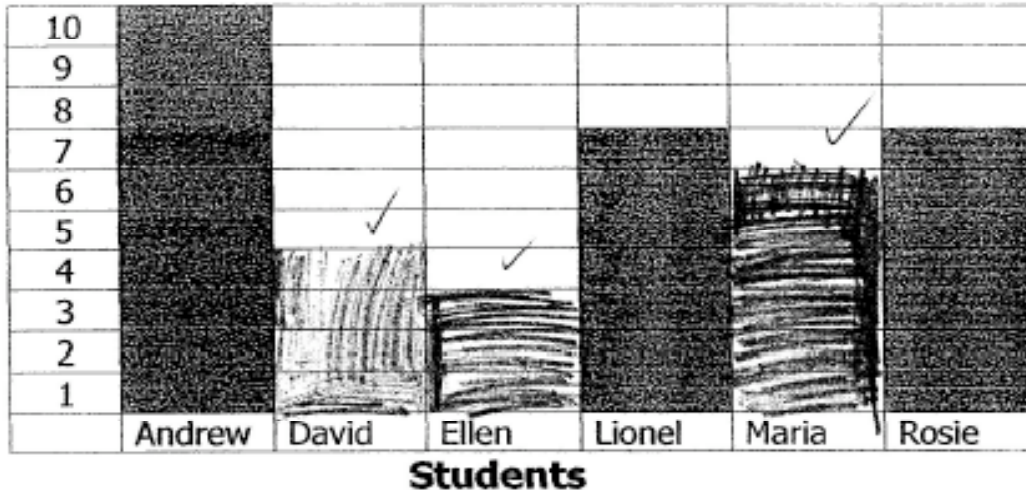
$$\begin{array}{r} 10 \\ +4 \\ +3 \\ +7 \\ +6 \\ +7 \\ \hline 37 \end{array} \checkmark$$

Student B has found the total of all books read by the students by adding the first three pieces of data and then the last three pieces. The partial sums were then added together to find the correct total. The use of partial sums to get to a total was a successful strategy used by most of our students.

Student B

2. Now show the same results on this bar graph below.

Books Read In A Week



3. How many books were read by David, Ellen, and Maria? 13 ✓
Show how you figured it out.

$$4 + 3 + 6 = 13 \quad \checkmark$$

4. How many more books did Rosie read than Ellen? four ✓
Show how you figured it out.

$$7 - 3 = 4 \quad \checkmark$$

5. How many books in all were read by the students? 37 ✓
Show how you figured it out.

$$10 + 4 + 3 + 7 + 6 + 7 =$$

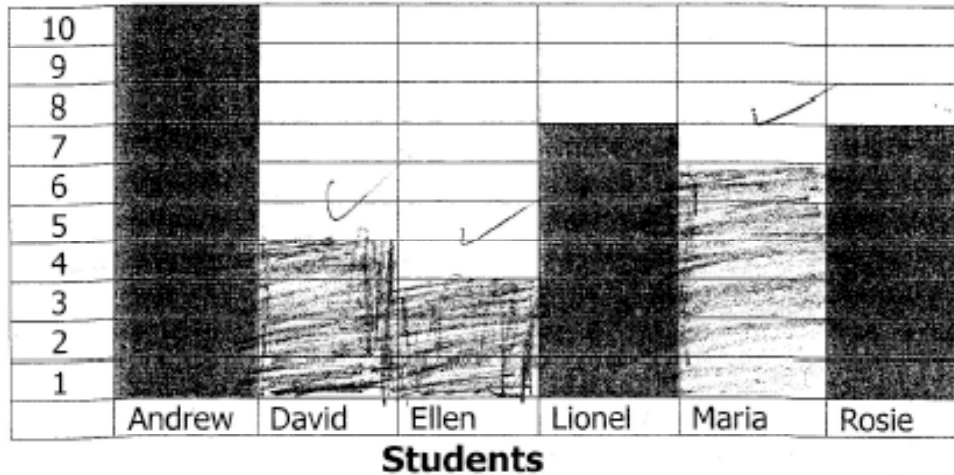
$$\underbrace{10 + 4 + 3}_{17} + \underbrace{7 + 6 + 7}_{20} = 37 \quad \checkmark$$

Student C found the total of books read by starting with the first data entry on the left and adding each to the previous total. This was also a successful means to find the total of books read. The comparison question, question four, was solved by moving the two data pieces next to one another and using a visual to match and find the difference.

Student C

2. Now show the same results on this bar graph below .

Books Read In A Week



3. How many books were read by David, Ellen, and Maria? 13 ✓
Show how you figured it out.

$$\begin{array}{r} 4 \\ + 3 \\ \hline 7 \end{array} \quad \begin{array}{r} 7 \\ + 6 \\ \hline 13 \end{array}$$

4. How many more books did Rosie read than Ellen? 4 ✓
Show how you figured it out.



5. How many books in all were read by the students? 37 ✓
Show how you figured it out.

$$\begin{array}{r} 10 \\ + 4 \\ \hline 14 \end{array} \quad \begin{array}{r} 14 \\ + 3 \\ \hline 17 \end{array} \quad \begin{array}{r} 17 \\ + 7 \\ \hline 24 \end{array} \quad \begin{array}{r} 24 \\ + 6 \\ \hline 30 \end{array} \quad \begin{array}{r} 30 \\ + 7 \\ \hline 37 \end{array}$$

To find a total for question 5 – how many books were read by all the students, Student D organized the six pieces of data into the “dark ones” and the “light ones”. The “dark ones” were those that were on the task to begin with and the “light” ones were those that the student completed.

Student D

5. How many books in all were read by the students? 37 ✓
 Show how you figured it out.

24 is the dark ones
 13 is the light ones

$$\begin{array}{r} 24 \\ + 13 \\ \hline 37 \end{array} \checkmark$$

Student E may have been counting by ones to find the totals requested in each of the three interpretation questions. He was successful with this strategy.

Student E

3. How many books were read by David, Ellen, and Maria? 13 ✓
 Show how you figured it out.

$$|||| + ||| + ||||| = 13 \checkmark$$

4. How many more books did Rosie read than Ellen? 4 ✓
 Show how you figured it out.



5. How many books in all were read by the students? 37 ✓
 Show how you figured it out.

$$\begin{array}{cccccc} 10 & 4 & 3 & & & \\ ||||| & + & ||| & + & || & + & ||||| & + & ||||| & + & ||||| & + & ||||| \\ ||||| & = & 37 & \checkmark & & & & & & & & & \end{array}$$

Student F has also correctly answered all the demands of this task. She is, however, representative of many of our students in this grade and in other grades. In showing her work, she has given inequality statements that we must acknowledge and correct. The equations would be correct if written in consecutive sentences such as these:

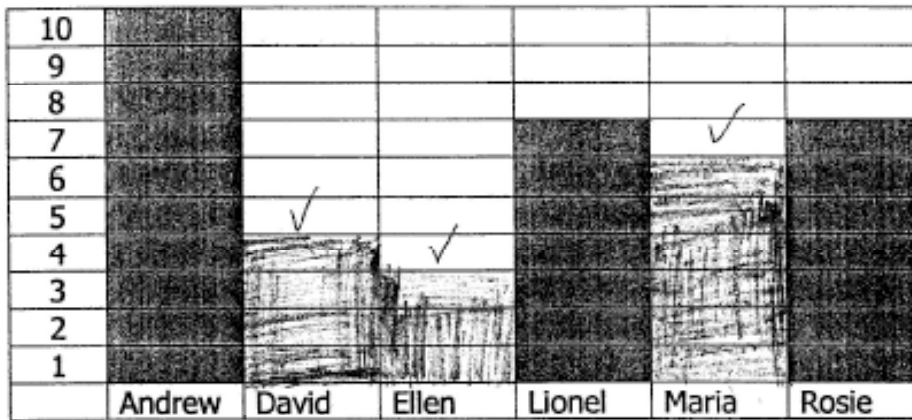
$$6 + 4 = 10$$

$$10 + 3 = 13$$

This is one way to scribe these partial sums. Most importantly, we will need to emphasize that the equal sign denotes that each side “is the same as” and that the amounts on each side are equal.

Student F

Books Read In A Week



Students

3. How many books were read by David, Ellen, and Maria? 13 books ✓
Show how you figured it out.

$$6 + 4 = 10 + 3 = 13 \text{ Eq}$$

4. How many more books did Rosie read than Ellen? 4 more books ✓
Show how you figured it out.

$$7 - 3 = 4 \text{ ✓}$$

5. How many books in all were read by the students? 37 books ✓
Show how you figured it out.

$$10 + 7 = 17 + 7 = 24 + 6 = 30 + 4 = 34 + 3 = 37 \text{ Eq}$$

Students G, H, and I have incorrect calculations for various different reasons and are representative of the types of calculation errors that were made by the students. Student G has lined up the addends incorrectly and added most of the single digits as tens. It is difficult to imagine that the answer of 280 would be considered reasonable if we had the chance to actually ask it of the student.

Student G

5. How many books in all were read by the students? 280
 Show how you figured it out.

$$\begin{array}{r}
 +10 \\
 +4 \\
 +3 \\
 +7 \\
 +6 \\
 \hline
 280
 \end{array}$$

Student H's work is an example of those in which a piece of data was read of the chart incorrectly and/or written incorrectly.

Student H

5. How many books in all were read by the students? 36
 Show how you figured it out.

$$\begin{array}{r}
 17 \\
 + 7 \\
 \hline
 24 + 5 = 19 \\
 + 16 \\
 \hline
 29 + 3 = 32 \\
 + 4 \\
 \hline
 36
 \end{array}$$

Student I found all the partial sums in the ones column correctly – 11, 10, and 6 but to the right of that notation added 11, 0 and 6. Instead of carrying two tens as he should have, he carried over only one ten.

Student I

5. How many books in all were read by the students?

Show how you figured it out.

Ellen + Lionel = Andrew
 Maria + David = Andrew

27 ~~xx~~

10	11	11
3	10	+ 0
2	6	+ 2
6	6	11
+ 7		
27		

Page 17

Approximately 38% of the students incorrectly answered the comparison questions. The following pieces of student work are examples of the kinds of errors made. Students J and K unfortunately compared the wrong two pieces of data. Student J compared Rosie with Maria rather than Ellen. Student K may have compared Ellen with Maria but we can not be certain without an explanation or labeling.

Student J

4. How many more books did Rosie read than Ellen?

Show how you figured it out.

$\frac{7}{1}$ ~~7~~ ~~1~~

7 ~~7~~ ~~1~~

1 ~~1~~ ~~7~~

7 ~~7~~ ~~1~~

1 ~~1~~ ~~7~~

Student K

4. How many more books did Rosie read than Ellen?

Show how you figured it out.

3 + 3x = 6

About 10% of our students used addition to find how many “more”. They added the numbers of books read by the two children to find the total rather than finding the difference between the two amounts. This is seen in the work of Student L. Student M subtracted the difference rather than subtracting the compared piece of data. It would be interesting to find out if that was due to knowing the fact family of 3, 4 and 7 or if the procedure were so rote that attention wasn’t paid to having the answer make sense.

Student L

4. How many more books did Rosie read than Ellen?
Show how you figured it out.

10

$$\begin{array}{r} 7 \\ + 3 \\ \hline 10 \end{array}$$

Student M

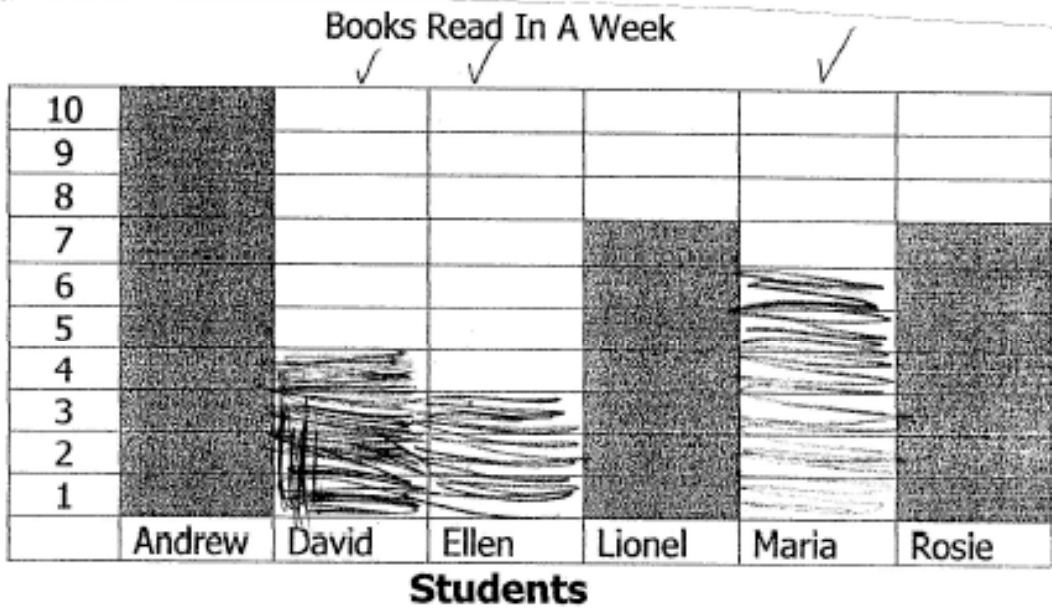
4. How many more books did Rosie read than Ellen?
Show how you figured it out.

3 x

$$\begin{array}{r} 7 \\ - 4 \\ \hline 3 \end{array}$$

Many times, students were able to find some, if not all of the answers to the interpretation questions 3 – 5. Student N did not choose to show how the answers were figured out. Student O gave an explanation but the explanations were incomplete or unclear.

Student N



3. How many books were read by David, Ellen, and Maria? 13 ✓
Show how you figured it out.

X

4. How many more books did Rosie read than Ellen? 3 X
Show how you figured it out.

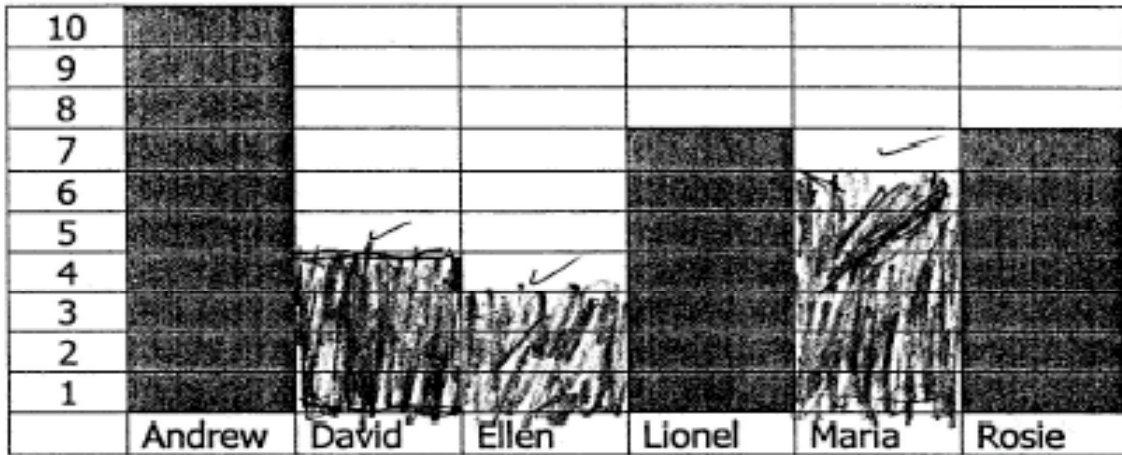
X

5. How many books in all were read by the students? 22 X
Show how you figured it out.

X

Student O

Books Read In A Week



Students

3. How many books were read by David, Ellen, and Maria?
Show how you figured it out.

13 ✓

I started with the bigger number x

4. How many more books did Rosie read than Ellen?
Show how you figured it out.

1 x

I looked at the chart x

5. How many books in all were read by the students?
Show how you figured it out.

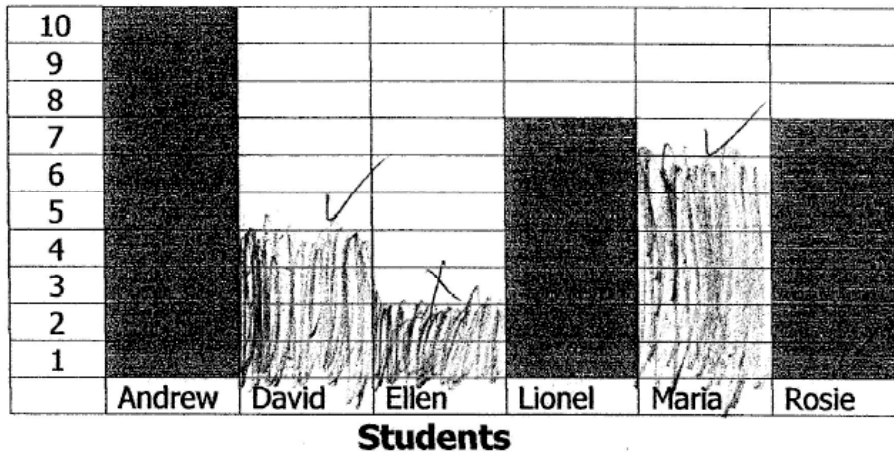
37 ✓

I added Andrew 1st

Errors in completing the graph and in reading from the graph as well as inefficient means of finding answers kept students from meeting the standards of this task. The papers of Student P and Student Q are examples of some of the issues that kept the 5% of our students from meeting these standards. Both students made errors in completing the graphs. Student P has compared the data in error with an amount not represented on the graph. His strategy for finding the total number of books read by all students is inefficient and cumbersome. Student Q seems to have recreated some of the information from the graph as incorrect solutions to the questions asked.

Student P

Books Read In A Week



3. How many books were read by David, Ellen, and Maria? 12x
 Show how you figured it out.

Handwritten work for question 3:

$$\begin{array}{r} 2 \\ 6 \\ +4 \\ \hline 12 \end{array}$$

4. How many more books did Rosie read than Ellen? 4x
 Show how you figured it out.

Handwritten work for question 4:

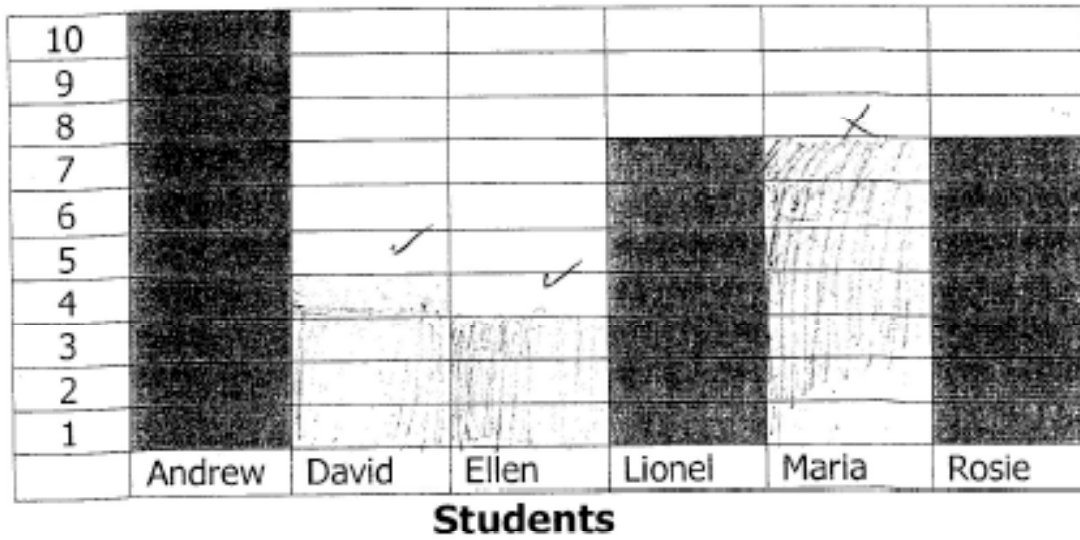
$$\begin{array}{r} 2 \\ +9 \\ \hline 11 \end{array}$$

5. How many books in all were read by the students? 36x
 Show how you figured it out.

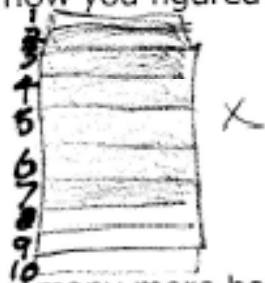
Handwritten work for question 5: A large, messy scribble of vertical lines and numbers, with some numbers like 10, 4, 3, 7, 6, 7 visible but mostly obscured by the scribbles.

Student Q

Books Read In A Week



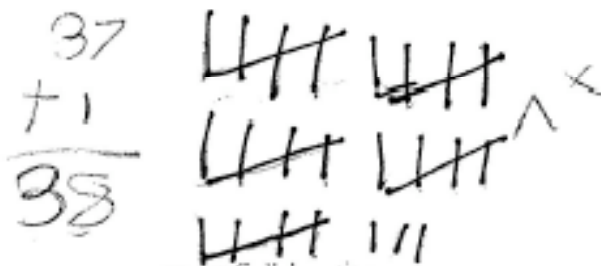
3. How many books were read by David, Ellen, and Maria? 7x
 Show how you figured it out.



4. How many more books did Rosie read than Ellen? 3x
 Show how you figured it out.



5. How many books in all were read by the students? ~~38~~
 Show how you figured it out.

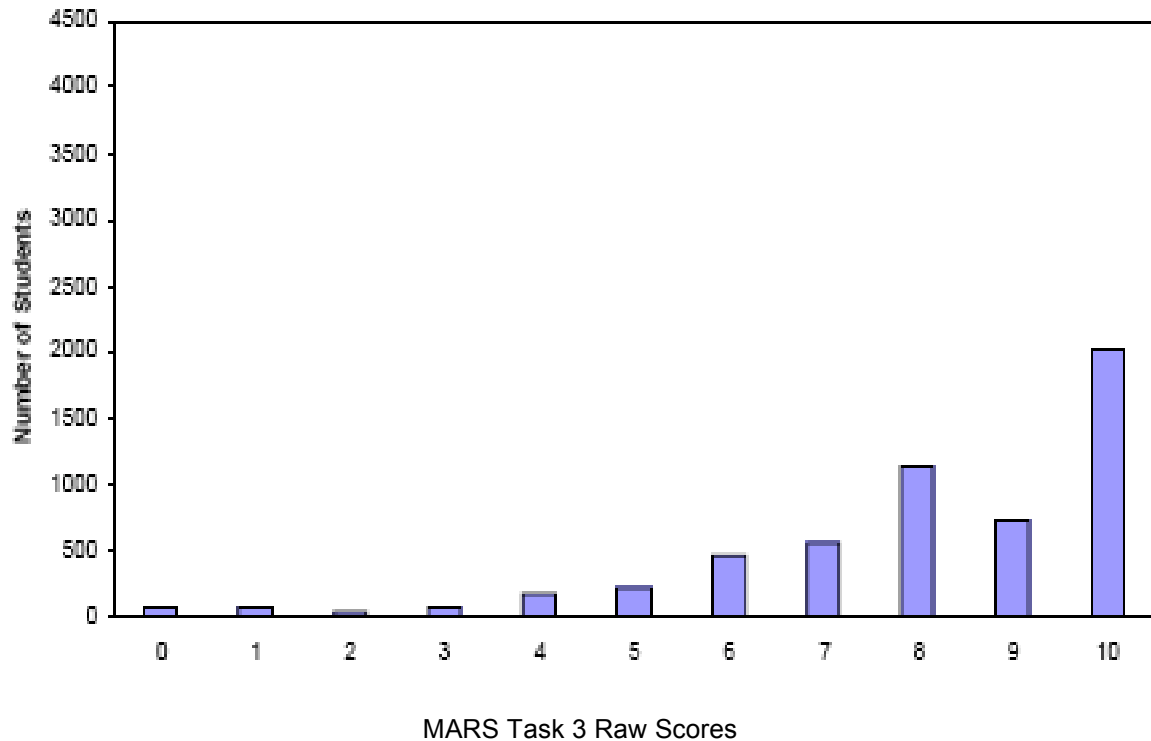


Teacher Notes:

Frequency Distribution for Task 3 – Grade 2 – Reading Books

Reading Books

Mean: 8.07 StdDev: 2.19



Score:	0	1	2	3	4	5	6	7	8	9	10
Student Count	61	74	41	65	174	225	451	563	1142	738	2026
% < =	1.1%	2.4%	3.2%	4.3%	7.5%	11.5%	19.6%	29.7%	50.3%	63.6%	100.0%
% > =	100.0%	98.9%	97.6%	96.8%	95.7%	92.5%	88.5%	80.4%	70.3%	49.7%	36.4%

The maximum score available for this task is 10 points.
The cut score for a level 3 response is 4 points.

A little over 95% of the students could meet the essential demands of the task. 98% could correctly complete all entries in the frequency chart. 95% successfully entered the three remaining pieces of data into the bar graph. 62% of the students found a way to successfully show the comparison between two points of data. 36.4% of the students were able to meet all demands of the task including showing how they knew that they had correct answers for each of the interpretation questions. Approximately 1% of the students scored a zero on this task. All students attempted to solve this problem.

Reading Books

Points	Understandings	Misunderstandings
0 - 2	All students attempted this problem. Students were able to complete the frequency graph.	Approximately 5% of all students were unable to enter the three of the remaining data pieces into the bar graph.
3	These students were able to fill in all of the frequency chart and two out of the three remaining data pieces into the bar graph.	These students had incorrect or incomplete work for the interpretation questions 3 – 5. Many students did not show any work.
4	Most students could complete both forms of graphic representations.	No work or incomplete work was shown for the interpretation questions. Students had trouble in correctly finding the difference between two pieces of data. Common errors included comparing the wrong two pieces of data, simply naming the data that was “more” or adding the two pieces of data together.
5 - 7	Students were able to answer some if not all of the questions asking them to interpret the data in the graphs. Many were able to answer the comparison question.	Errors were made in placing the remaining data pieces correctly into the bar graph. Calculation errors lead to incorrect answers for the three interpretation questions. Incomplete responses were given when asked to show work.
8 - 9		Calculation mistakes were made when attempting to find the sum of 6 addends at once. Data points were occasionally entered incorrectly resulting in incorrect answers.
10	Successful students had clear and accurate work shown to support correct answers. Many students showed strategies for addition such as partial sum addition, groupings of tens and extras and using derived facts.	In writing partial sums addition sentences, students made equality errors.

Based on teacher observations, this is what second grade students seemed to know and be able to do:

Areas of difficulty for second graders, students struggled with:

- Adding up one column of 6 addends
- Explaining how they found the answers
- Finding the difference between the numbers of books read by two different people

Strategies used by successful students:

- added partial sums to get to a grand total
- added doubles or facts to ten for more efficient solutions
- could read the graph
- counted all the data points to get a total
- used fact families to find the missing part in comparison
- were careful in reading what the questions asked

Questions for Reflection on Reading Books:

- What opportunities do students have to be the “gatherers” of information?
- What strategies have students developed for organizing the gathered information?
- Do students have the opportunity to make decisions about how to organize data?
- Are students involving in discussing ways to organize items and information?
- Do students build real graphs? Do they have the opportunity to transfer the data from real graphs into class graphs?
- Are students involved in deciding how to represent data?
- What opportunities do students have to discuss the value of different representations?
- What opportunities do student have to answer descriptive questions around the data?
- What strategies do students use to make comparisons among data points?
Between similar sets of data?
- How often are students encouraged to display the same data in different formats?
The same data across different populations? The same data across time?
- What norms exist for discussion around data?

Look at your student work. What strategies did students use to compare Rosie and Ellen’s data?

Found a difference of 4 between Rosie's 7 and Ellen's 3	Added $7 + 3$	Named Rosie's 7 as "more"	Compared the wrong 2 pieces of data	Other

- Do your students have the opportunity to problem solve and share strategies?
- Are students given a variety of problem types?
- What activities and questions might encourage students to compare and reflect on issues around data?
-

Teacher Notes:

Implications for Instruction:

In order to become more discerning citizens, students at all levels need experience in collecting, displaying, and analyzing data. As a result, the topic of statistics now appears in school curriculums as early as kindergarten. Primary aged children collect data by sorting, counting, and measuring and they learn how to represent the data in graphs, charts, pictures, and tables. In collecting and organizing numerical data, students need a logical way to count and keep track of the data. Knowing whom you counted and whom you still need to count is basic to any data collection activity. Students need the opportunity to develop systems for collecting and representing information in an organized manner. These activities directly prepare students to analyze things in their world, formulate questions, and do data analysis. Students need to be actively involved in gathering and presenting relevant information for graphs and charts as well as completing existing graphs and charts supplied by others. In presented graphs of their own construction, children become personally invested in the data and they learn how a graph conveys information. Young children can be guided to gather information to describe and interpret data representations. They are quite naturally drawn to the mode as well as the data points with the highest and the least. More difficult for students to interpret are questions around comparisons. A very informative question to ask about numerical data is "How many more than...?" This comparison subtraction question requires students to take several steps to answer. First, they must find out how many for each and then determine the "more than". It is quite a different kind of subtraction than "take away". As such, a student may have strategies other than subtraction for finding "How many more than...?". Students need to be exposed to a variety of problem types in

order to gain flexibility in their thinking. Graphing is a natural way to solve these different types of problems, especially the comparison subtraction problems, through data questioning. Students should be regularly asked to explain how they got their answers. Our expectation should be that saying “I counted” or “I added them all” is not specific enough. Whenever possible, encourage number sentences that demonstrate what they did to get an answer or a pictorial or verbal description about why they picked a given number operation to complete their proof of answer.

Teacher Notes:
