Grade 2 Mathematics, Quarter 4, Unit 4.1

Representing and Interpreting Data Using a Variety of Graphs

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Measure lengths of several objects to the nearest whole unit to generate measurement data.
- Generate data by using repeated measurements of the same object.
- Represent the measurements by making a line plot (whole number units).
- Represent a data set with up to four categories by drawing a picture graph and a bar graph.
- Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Mathematical practices to be integrated

Model with mathematics.

- Map their relationships using such tools as diagrams, two-way tables, and graphs.
- Analyze relationships mathematically to draw conclusions.
- Routinely interpret their results.

Use appropriate tools strategically.

- Consider available tools when solving a mathematical problem.
- Select appropriate tools to measure length of objects.

Essential questions

- How could you represent the class's measurement data (e.g., recorded results from bunny hop jumps) by the use of a line plot?
- How could you represent the class's measurement data (e.g., recorded results from frog jumps) by the use of a bar graph?
- How could you represent the class's measurement data (e.g., recorded results from student jumps using student pictures) by the use of a pictograph?
- How many more _____(Category 1) are there than _____ (Category 2)?

Written Curriculum

Common Core State Standards for Mathematical Content

Measurement and Data	2.MD

Represent and interpret data.

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.

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[4] using information presented in a bar graph.

[4] See Glossary, Table 1.

Common Core Standards for Mathematical Practice

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Clarifying the Standards

Prior Learning

In grade 1, students organized, represented, and interpreted data with up to three categories. Students asked and answered 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.

Current Learning

Earlier in the year, students measure and compare lengths of objects. In this unit, students apply those concepts learned in unit 2.2 to generate measurement data by measuring lengths of objects to the nearest whole unit and show the measurement by making a line plot. Second graders draw picture graphs and bar graphs to represent a data set with up to four categories. Students solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Future Learning

In grade 3, students will draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. They will solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. Third graders will generate measurements with rulers marked with halves and fourths of an inch. Students will show the data where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Additional Findings

Principles and Standards in School Mathematics states, "Students should learn through multiple experiences that how data are gathered and organized depends on the questions they are trying to answer … Through their data investigations, young students should develop the idea that data, charts, and graphs give information. When data are displayed in an organized manner, class discussions should focus on what the graph or other representation conveys and whether the data help answer the specific questions that were posed." (pp. 110, 113)

Grade 2 Mathematics, Quarter 4, Unit 4.2

Partitioning Shapes into Equal Shares

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Understand that circles and rectangles can be partitioned into two, three, or four equal shares.
- Recognize that equal shares need not have the same shape,
- Describe the shares using the words halves, thirds, half of, a third of, etc.
- Describe the whole as two halves, three thirds, or four fourths.

Mathematical practices to be integrated

Model with mathematics.

- Use geometric models to describe a situation.
- Apply understanding of equal shares to everyday life.
- Analyze the relationship of the shares to the whole.
- Identify important quantities in a practical situation.
- Use identical wholes to demonstrate that equal shares need not have the same shape.

Essential questions

- How do you know that each person has equal shares?
- How could you partition the shape into _____ equal shares?
- How can you describe the equal shares using mathematical language?
- Why are the two shares equal, but not the same shape?

Written Curriculum

Common Core State Standards for Mathematical Content

Geometry	**2.G**

Reason with shapes and their attributes.

2.G.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves, thirds, half of, a third of*, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Common Core Standards for Mathematical Practice

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Clarifying the Standards

Prior Learning

In grade 1, students partitioned circles and rectangles into two and four equal shares; used the words halves, fourths and quarters, and the phrases half of, fourth of and quarter of. They described the whole as two of and four of the shares. Students understood that decomposing into more equal shares creates smaller shares.

Current Learning

In grade 2, students partition circles and rectangles. These shapes are used to gain an understanding of partitioning shapes and to recognize that equal shares of identical circles and/or rectangles can look different. Students use the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, or four fourths.

Future Learning

In grade 3, students will partition shapes into parts with equal areas. They will express the area of each part as a unit fraction of the whole.

Additional Findings

Principles and Standards for School Mathematics states, "Geometry offers students an aspect of mathematical thinking that is different from but connected to the world of numbers … Building on these strengths fosters enthusiasm for mathematics and provides a context in which to develop number and other mathematical concepts" (p. 97)

Also, "In addition to work with whole numbers, young students should also have some experience with simple fractions to every day situations in meaningful problems, starting with the common fractions, expressed in the language they bring to the classroom, such as half … at this level, it is more important for students to recognize when things are divided into equal parts than to focus of fraction notation." (p. 82)

Grade 2 Mathematics, Quarter 4, Unit 4.3

Measuring and Recording Time to the Nearest 5 Minutes

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Tell time to the nearest five minutes using digital and analog clocks using a.m. and p.m.
- Write time to the nearest five minutes using digital and analog clocks using a.m. and p.m.

Mathematical practices to be integrated

Attend to precision.

- Communicate the time accurately to others.
- Use precision to tell time to the nearest five minutes.

Look for and make use of structure.

- Find patterns using the clock for intervals of 5 minutes, 15 minutes, 30 minutes, etc.
- Relate the analog clock to skip counting by fives.

Essential questions

- How can you tell and write the following times to the nearest five minutes using analog/digital clocks?
- How do you tell and write time using a.m. and p.m.? (e.g., tell and write the time Sarah is having breakfast using a.m. or p.m.)
- Why would you use a.m. or p.m. to describe a time?

Written Curriculum

Common Core State Standards for Mathematical Content

Measurement and Data	2.MD

Work with time and money.

2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

Common Core Standards for Mathematical Practice

6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Clarifying the Standards

Prior Learning

In grade 1, students told and wrote time in hours and half-hours using analog and digital clocks.

Current Learning

In grade 2, students tell and write time from analog and digital clocks to the nearest 5 minutes while using a.m. and p.m.

Future Learning

In grade 3, students will tell and write time to the nearest minute and measure time intervals in minutes. They will solve word problems involving addition and subtraction of time intervals in minutes.

Additional Findings

Principles and Standards for Mathematics states, "Another emphasis on this level should be on the development of time and the way it is measured. As teachers call attention to the clock, many young students will learn to tell time. However this is less important than their understanding patterns of minutes, hours, days, weeks, and months." (p. 104)

Grade 2 Mathematics, Quarter 4, Unit 4.4

Fluently Adding and Subtracting Within 100

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Fluently add and subtract within 100.
- Add and subtract using strategies based on place value, properties of operations, and the relationship between addition and subtraction.
- Add up to four 2-digit numbers.
- Use concrete models or drawing and strategies to add and subtract within 1,000.
- Relate strategies to a written method.
- Understand that, in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones.
- Recognize that when adding and subtracting, it is sometimes necessary to compose or decompose tens or hundreds.

Mathematical practices to be integrated

Reason abstractly and quantitatively.

- Students make sense of quantities and their relationships in problem situations.
- Create a coherent representation of a problem.
- Use different properties of operations and objects.

Use appropriate tools strategically.

- Consider the available tools when solving a mathematical problem.
- Use manipulatives and drawings to solve addition and subtraction problems.
- Connect a written method to a strategy used to add or subtract.

Essential questions

- What strategies could you use to add these four 2-digit numbers? (e.g., 48 + 32 + 17 + 10 = ?)
- What are the sums and differences of these numbers? (fact test)
- When adding/subtracting why must you add/subtract hundreds and hundreds (tens and tens, ones and ones)?
- How can you check your work?
- When is it necessary to compose tens or hundreds when adding?
- When is it necessary to decompose tens or hundreds when subtracting?

Written Curriculum

Common Core State Standards for Mathematical Content

Number and Operations in Base Ten	2.NBT

Use place value understanding and properties of operations to add and subtract.

2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.

Common Core Standards for Mathematical Practice

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Clarifying the Standards

Prior Learning

Students fluently added and subtracted within 10. They related counting to addition and subtraction and used strategies to add and subtract within 20. Students added within 100 using concrete models or drawings, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10. Given a two-digit number, students mentally found 10 more or 10 less than the number, without having to count. Students subtracted multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90.

Current Learning

In grade 2, students add up to four two-digit numbers using strategies based on place value and properties of operations. Students fluently add and subtract within 100 using strategies based on place value and properties of operations. Students use concrete models or drawing and strategies to add and subtract within 1,000 and relate strategies to a written method. They understand that, in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones and they recognize that, when adding and subtracting, it is sometimes necessary to compose or decompose tens or hundreds (regrouping).

Future Learning

In grade 3, students will fluently add and subtract within 1,000 using strategies based on place value, properties of operations and/or the relationship between addition and subtraction. Students will also multiply one-digit whole numbers by multiples of ten in the range of 10–90.

Additional Findings

Principles and Standards for School Mathematics states "As a result to regular experiences with problems that develop place value concepts, second grade students should be counting into the hundreds discovering patterns in the numeration system related to place value, and create and composing (creating through different combinations) and decomposing (breaking apart in different ways) two and three digit numbers" (p. 82)

Also, "It is absolutely essential that students develop a solid understanding of the base 10 numeration system and place value concepts by the end of grade two." (p. 81)