Overview for Families

Mathematics in Context unit: **Picturing Numbers**

Mathematical strand: **Data Analysis and Probability**

The following pages will help you to understand the mathematics that your child is currently studying as well as the type of problems (s)he will solve in this unit.

Each page is divided into three parts:

- *Section Focus*
  Identifies the mathematical content of each section.

- *Learning Lines*
  Describes the mathematical flow of each section.

- *Learning Outcomes*
  Outlines what students should know and be able to do at the end of each section.

"From the very beginning of his education, the child should experience the joy of discovery."

Alfred North Whitehead

Picturing Numbers

Section A   Using Bar Graphs

Section Focus

Students review and expand their knowledge of the use of tables and bar graphs to represent a data set. In this section, only two-dimensional bar graphs with the horizontal axis representing the categories of the collected data and the vertical axis representing the frequencies are used. Students are encouraged to start a collection of different graphs they find in magazines and newspapers and try "to tell the story" these graphs represent. The activity "standing on one foot with your eyes closed" is used to sample data which is then used to create a number line plot. The investigation leads to the informal introduction of measures of central tendency to describe the distribution. Sample questions include the following: *Which times seem to be the most common? Which times seem to be really long, really short, and so on?*

Learning Lines

Using Data

In this section, students begin to understand how data can be presented to answer questions. By arranging the bars in a bar graph from largest to shortest, it is easier to see who delivered the most flyers and who was next. Students collect their own data and find how grouping this data set before creating a graph is sometimes needed.

Sampling

Collecting data is the beginning of the process that renders statistics. In this section, as well as throughout the unit, an informal introduction towards sampling and collecting data is provided by having students reason about the conclusions that can be drawn from a small sample (students in one class) as compared to a larger group (students in the whole school).

Sampling is revisited and more formalized in the units *Dealing with Data, Insights into Data*, and *Great Predictions*.

Organizing and Representing Data

In this section, students start to think about ways to organize data in tables and graphs. Graphs can also be used to make sense of data; they give a visual picture. Students argue which representation—a table, a bar graph or a number line plot—best describes the data. They are informally introduced to measures of central tendency, though no formal mathematical terms are used yet.

Learning Outcomes

By the end of this section, students
• understand that tables and (bar) graphs can be used to summarize data in a way that makes it easier to read;
• can create and interpret a bar graph, labeling the axes correctly, and can understand why a (bar) graph needs a title;
• can explain why it is sometimes impossible to use a bar graph to represent data;
• can create a number line plot and, if necessary, group the information; and
• can describe the advantages and the disadvantages of different representations.

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Section B   A Piece of the Pie

Section Focus

In this section, pie charts (or circle graphs), bar graphs, and stacked bar graphs are used to represent categorical data. Students compare these representations and are asked whether bar graphs and pie graphs can represent the same data or "tell the same story in different ways." They use fractions and percents to estimate numerical information as presented in the graph. The students use a survey to collect their own data, which will be used in a variety of ways throughout the unit.

Learning Lines

Using Data
Students collect their own data and organize and use this data set to compare the results with a given data set. They use data to solve problems like deciding whether or not a bus company will change its route. For each problem, they compare and contrast their own data set with a given data set.

Sampling
Students learn the meaning of choosing a *random* group.

Organizing and Representing Data
In this section, students are introduced to the pie graph as a way to represent data. The importance of adding a legend or labeling each "piece of the pie" is emphasized. When creating these pie graphs, "empty" pie graphs divided in different-sized pieces are provided.

Students use benchmark fractions and percents to describe the data presented in a pie graph. They argue which representation best describes the data. A stacked bar graph as used in this section has bars that represent the entire amount.

Learning Outcomes

By the end of this section, students
• read, interpret, and create pie graphs using benchmark fractions and percents;
• label and provide legends for graphs;
• use stacked bar graphs and compare them to pie graphs;
• compare a variety of graphical representations of data; and
• express in their own words the advantages and disadvantages of different representations.

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Section C   A Picture Is Worth a Thousand Words

Section Focus

Section C introduces compensation strategies and the standard rule for determining the average, or mean, of a data set. Students start using the compensation strategy by comparing pictographs of the number of babies in the litters of cats and mice. A bar graph showing noontime temperatures during one September in a popular tourist resort is used to show the compensation strategy in another way. The formal rule to calculate the mean of a data set is also used, but understanding the concept is more important than being able to apply a rule. The class data about Our Favorite Kind of Music is then used to show how the mean cannot always be used to describe and summarize a data set; for this type of data, the mode is more appropriate. Within the context of a dart competition, students use the compensation rule "in reverse." The mean is known, and students need to find missing points that are needed for the next throws in order to reach this mean.

Learning Lines

Using Statistics to Represent Data

Data sets can be represented using numbers that summarize them; these are called *statistics*. Students are informally introduced to the measures of central tendency in this unit. The mean is one of the one-number summaries of a data set. In this section, the number line plot is reviewed in order to re-address the distribution of data (range or spread) and to describe clusters of data.

Learning Outcomes

By the end of this section, students

• read, interpret, and create pictographs and understand why adding a key is essential;

• use the compensation strategy as well as the formal rule to find the average (or mean) of a data set;

• understand why in categorical data sets the mean cannot be calculated; and

• use the distribution of the numbers to solve problems.

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Section D   Bar or Lines—Get the Picture?

Section Focus

Line graphs are introduced in this section as a tool to represent change over time, as in the measurement of temperature or the amount of rainfall over different periods. Students think of the advantages for using line graphs instead of other representations. Line graphs and bar graphs are combined into one graph to compare the weather on two different islands. By the end of the section, students read and interpret a variety of graphs as they might see in newspapers and magazines. As students continue to engage in the interpretation of less familiar graphs, they will gain confidence in interpreting information from new representations often presented in mass media.

Learning Lines

Representing Data

A line graph is often used to show a trend in data that are not continuous but change over time, like temperature measured each hour. Line segments connect the dots that represent measurements. Students should understand at an informal level that these line segments are used to show a trend and help to make estimations in between two measurements (interpolation) as well as estimating beyond the end of the data set (extrapolation).

Using Statistics to Represent Data

Students use maximum, minimum, and range to describe a data set. The concept of average, or mean, is reviewed when students study a table of "typical average temperatures."

Learning Outcomes

By the end of this section, students

• read, interpret, and create line graphs;

• demonstrate their understanding of the use of line graphs to represent data and decide when line graphs are appropriate for representing data;

• compare growth in data sets using line graphs;

• are informally introduced to the concepts of interpolation and extrapolation (although these formal terms are not stressed); and

• read and interpret graphs in unfamiliar forms.