

## ► Grade 3 Topic 7: Represent and Interpret Data

**Big Conceptual Idea:** [Measurement and Data \(Data Part\)](#) (pp. 7-8)

Prior to instruction, view the *Topic 7 Professional Development Video* located in Pearson Realize online. Read the *Teacher's Edition (TE): Cluster Overview/Math Background* (pp. 355A-355F), the *Topic Planner* (pp. 355I-355J), all 5 lessons, and the *Topic Performance Assessment* (pp. 399-400A).

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| <p><b>Mathematical Background:</b><br/>Read Topic 7 Cluster Overview/Math Background (TE, pp. 355A-355F)</p> | <p><b>Topic Essential Question:</b><br/>How can data be represented, interpreted and analyzed?</p> <p><i>Reference Answering the Topic Essential Question (TE, pp. 395-396) for key elements of answers to the Essential Question.</i></p> |
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| <p><b>Topics 7</b><br/><b>Represent and Interpret Data</b></p> |
| <p>Number of Lessons: <b>5</b></p>                             |
| <p>A/D/E: <b>2 days</b></p>                                    |
| <p><b>NVACS Focus:</b><br/>MD.B</p>                            |
| <p><b>Total Days:</b> ~7</p>                                   |

**The lesson map for this topic is as follows:**

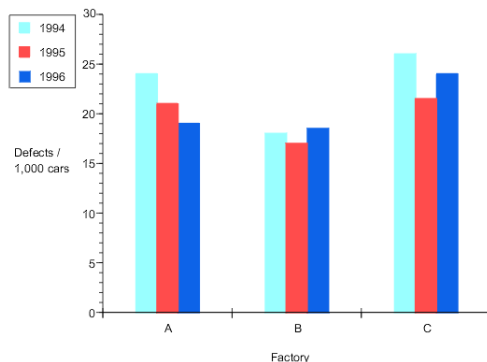
|     |     |     |     |     |            |
|-----|-----|-----|-----|-----|------------|
| 7-1 | 7-2 | 7-3 | 7-4 | 7-5 | Assessment |
|-----|-----|-----|-----|-----|------------|

2 A/D/E days used strategically throughout the topic

[3<sup>rd</sup> Grade Curriculum Pacing Framework:](#)  
[Balanced Calendar](#)

### Instructional note:

In this topic, students explore and create picture graphs and bar graphs as a means to interpret categorical data. Categorical data is data that can be grouped by category or attribute. As a result, **an important misrepresentation to look for and address is having the bars touch.** In bar graphs, the bars should not be touching unless we have grouped categories of a main category. See image 1 for an example of this type of bar graph. Students do not encounter scenarios such as this in grade 3. For those interested in deepening their own content knowledge consider this resource from NC State University (<https://www.ncsu.edu/labwrite/res/gh/gh-bargraph.html>).



An important idea students will be exploring is scaling. This builds on the work that has been done so far this year in multiplication. Students will be using scaled graphs to interpret the data represented. Students will determine the most appropriate scale for representing data shown in a frequency table that will be transferred to either a picture graph or a bar graph.

The [K-5, Measurement and Data \(Data Part\)](#) progression document states that, “They (students) can solve one- and two-step ‘how many more’ and ‘how many less’ problems using information present in scaled bar graphs” (p.7). Students will have an opportunity to work with several different problem types, some that may prove challenging. When working with contextual problems avoid connecting specific words to a specific operation, often referred to as “keyword strategies.” In the article *13 Rules that Expire*, Karp, Bush, and Dougherty (2014) state:

Using keywords often encourages students to strip numbers from the problem and use them to perform a computation outside of the problem context. Unfortunately, many keywords are common English words that can be used in many different ways...reducing the meaning of an entire problem to a simple scan for key words has inherent challenges. Keywords become particularly troublesome when students begin to explore multistep word problems because they must decide which keywords work with which component of the problem (Clement & Bernard, 2005, p. 21).

Finally, the [Measurement and Data \(Data Part\)](#) progression document states that students can collect their own data in the context of other content areas that can be communicated through either a picture graph or bar graph. The *Math and Science Project* for this topic does provide the opportunity for students to collect and represent data. This may be a good extension for students that are ready for this activity. It is important to note that the progression document also states that, “The standards in grades 1 through 3 do not require students to gather categorical data” (p. 7).

### Focus Math Practice 6: Attend to precision

Focus on opportunities for students to develop Mathematical Practice 6 behaviors, as this is the focus of the Math Practices and Problem Solving lesson 7-5. Reference the *Teacher's Edition* (TE, pp. F26 - F26A) and the Nevada Academic Content Standards (NVACS) for Mathematical Practice (p. 7).

Looking ahead to the Topic Performance Assessment, students will be expected to solve problems from data presented in scaled bar and picture graphs that use comparative language found in the compare problem types for NVACS Math p. 88-89. Students will also be expected to self-select from a variety of options the most appropriate scale and create a picture graph based on a provided set of

data. Throughout instruction, to support students' development of selecting an appropriate scale for a graph based on data, consider frequently discussing with students the reason why the scales were chosen in the graphs. While developing the thinking habits that allow students to engage in this problem type are highly beneficial, you may need to scaffold working with the Topic Performance Assessment.

| <b>Essential Academic Vocabulary</b><br>Use these words consistently during instruction. |  |
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| <b>New Academic Vocabulary:</b><br>(First time explicitly taught)                        | <b>Review Academic Vocabulary:</b><br>(Vocabulary explicitly taught in prior grades or topics) |
| data<br>scaled picture graph<br>key<br>scaled bar graph<br>frequency table<br>survey     | tally<br>multiplication<br>equal groups<br>number line<br>multiples<br>scale<br>graph          |

*Additional terminology that students may need support with: information, symbol, conclusion, analyze, record*

**Collaborative Team Conversations (CTC)**

Consider using *one* of the following as part of the formative assessment process at the lesson level to **collect student work** to analyze for **evidence of mathematical understanding**:

**Guiding question:** "Are students able to represent, interpret and analyze data?"

| Lesson | Evidence   | Look for   |
|--------|--|--|
| 7-1    | <b>Quick Check</b><br>(digital platform)           | Focus CTC around data analysis and collection of student workspace (scratch paper). <ul style="list-style-type: none"> <li>students analyze and interpret scaled pictures and bar graphs.</li> <li>students understand the key shows the units used.</li> </ul> Printable version available under "Teacher Resources". |
| 7-3    | <b>Solve &amp; Share</b><br>(student work samples) | Focus CTC around the big idea: <ul style="list-style-type: none"> <li>students can make, read and analyze bar graphs using information from a table.</li> </ul>  |

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| Learning Cycle Assessments (summative) | <b>Topic Assessments</b><br>SE pp. 395-400 | Use <i>Scoring Guide</i> TE pp. 395-400A |
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Standards listed in **bold** indicate a focus of the lesson.

| NVACS<br>(Content and Practices)                                       | Mathematical Development of the Big Idea  | Instructional Clarifications & Considerations   |
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| <b>Lesson 7-1: Read Picture Graphs and Bar Graphs</b>                  |   |   |
| <b>3.MD.B.3</b><br><b>3.OA.A.3</b><br><br>MP.2<br>MP.6<br>MP.7<br>MP.8 | <b>Access Prior Learning:</b><br>In Grade 2 students read and interpreted bar and picture graphs with single-unit scales.<br><br><b>Developing the Big Idea:</b><br>Students are <i>developing</i> understanding using scaled picture and bar graphs to compare data. Students develop understanding of how to interpret data in a scaled picture, using the key and that the scale for a bar graph shows the units used. | <b>Topic Opener:</b><br>Introduce the <i>Topic Essential Question</i> , "How can data be represented, interpreted, and analyzed?" (TE, p. 355).<br><br>Consider having students complete the <i>Review What You Know</i> prior to beginning instruction on topic 3 to respond to students' instructional needs using the <i>Item Analysis for Diagnosis and Intervention</i> prior to beginning the topic (TE, p. 356-358).<br><br>Consider introducing vocabulary as students encounter the academic language in the lessons rather than introducing all terms at the beginning of the lesson.<br><br><b>Solve &amp; Share:</b><br>Consider making sure, that after you pose the question, "What do you need to use to solve this problem?" (TE, p. 359) students recognize the key and demonstrate understanding of what it means for the picture graph.<br><br>Consider ensuring that the last student that shares has understanding of the structure of multiplication and can explain how they used multiplication to solve. |
| <i>-continues on next page-</i>  |   |   |

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|  |  | <p><b>Visual Learning:</b><br/>Consider pausing the <i>Visual Learning Animation</i> after the final pause when it asks, “What is another way to find how many more teams the East Falls League has than the South Falls League?” If students recognize that they can just compare the two rows and identify the difference between the two rows (e.g. there are 3 more hockey sticks in East Falls row than in South Falls row) discuss which solution method (calculating both teams amounts and subtracting or identifying the difference in rows) is more efficient. If students do not come up with the method of comparing the rows, play the animation and then discuss efficiency.</p> <p>After viewing and discussing the <i>Visual Learning Animation</i> consider asking students why using a scaled picture graph would be helpful (e.g. a scaled picture graph more easily represents larger sets of data).</p> <p><b>Another Example:</b><br/>Consider discussing the <i>Another Example!</i> as a class as students have only reasoned with scaled picture graphs. Consider asking students how the two graphs are similar (e.g. both represent data with a scale, both are useful for comparing data, both having heading, items being compared that are identified, etc.)</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b><br/>Consider assigning item 7 to provide students with distributed practice using comparative symbols.</p> <p><b>Assess and Differentiate:</b><br/>Consider using the <i>Math and Science Activity</i> as stated in the Instructional Note above or consider replacing with games from previous topics or the Fluency Practice Activity (TE, p. 389).</p> <p>Child-watch to identify students who need additional support and pull them in a small group to do the <i>Intervention Activity</i> (TE, p. 389A).</p> <p>*CTC: <i>Quick Check</i> (digital platform)</p> |
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**Lesson 7-2: Make Picture Graphs**

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| <p><b>3.MD.B.3</b><br/><b>3.OA.A.3</b></p> <p>MP.1<br/>MP.2<br/>MP.3<br/>MP.4<br/>MP.6</p> | <p><b>Access Prior Learning:</b><br/>In lesson 7-1, Grade 3, students learned about scaled picture graphs. In topic 4, Grade 3, students developed understanding of “half” as division by 2.</p> <p><b>Developing the Big Idea:</b><br/>Students further <i>develop</i> their understanding of using picture graphs to represent data by finding that the key for a picture graph determines the number of pictures needed to represent the data.</p> | <p><b>Solve &amp; Share:</b><br/>Consider posing the question from <i>Look Back!</i> while students share their solution methods and reasoning.</p> <p>After students have shared solution methods and reasoning consider asking students if there is another scale that could have worked given the data (e.g., 5 because all of the balls are multiples of 5).</p> <p><b>Convince Me:</b><br/>Consider assigning the <i>Convince Me!</i> to provide students with the opportunity to reason with representing half quantities on a picture graph.</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b><br/>Item 4 provides students the opportunity to practice reasoning with selecting an appropriate scale based on data. Consider also assigning item 7 to ensure students have sufficient opportunity to reason with selecting a scale based on a set of data and creating a picture graph. Watch to ensure that students have included all the elements of a picture graph:</p> <ul style="list-style-type: none"> <li>• Title</li> <li>• Category labels</li> <li>• Key that includes the scale</li> <li>• Accurately represent the data for each category</li> </ul> <p><b>Assess and Differentiate:</b><br/>If time permits, teach students how to play “Teamwork” (TE, p. 369A). All students should have the opportunity to play this game.</p> <p>Child-watch to identify students who need additional support and pull them in a small group to do the <i>Intervention Activity</i> (TE, p. 369A).</p> <p><b>Homework &amp; Practice:</b><br/>Consider solving item 8 <i>Common Core Assessment</i> in class. This item is designated as an <i>Advance</i> item; therefore, it is not appropriate to assign as independent work for all students. However, this would work as a <i>Solve &amp; Share</i> for creating an additional lesson, if needed.</p> <p>Consider saving item 2, to be completed independently in class, after lesson 7-3 as part of the formative assessment process to check students’ reasoning with selecting an appropriate scale based on a set of data.</p> |
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| Lesson 7-3: Make Bar Graphs  |   |   |
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| <p><b>3.MD.B.3</b><br/><b>3.OA.A.3</b></p> <p>MP.1<br/>MP.2<br/>MP.3<br/>MP.4<br/>MP.5<br/><b>MP.6</b></p>   | <p><b>Access Prior Learning:</b><br/>In lesson 7-1, Grade 3, students learned about scaled bar graphs. In topic 4, Grade 3, students developed understanding of “half” as division by 2.</p> <p><b>Developing the Big Idea:</b><br/>Students further <i>develop</i> their understanding of using bar graphs to represent data by finding that the scale determines how long each bar needs to be to represent every number in a data set.</p>   | <p><b>Math Anytime:</b><br/>To ensure sufficient opportunity for students to practice reasoning with selecting an appropriate scale based on data consider assigning item 4 in the <i>Common Core Review</i> (TE, p. 365A).</p> <p><b>Solve &amp; Share:</b><br/>Watch for and correct students that draw graphs with bars for different categories touching. For more information on this common error read the Instruction Note at the beginning of this topic.</p> <p><b>Look Back:</b><br/>To support students’ development of MP. 6 “<i>Attend to precision</i>,” when constructing a bar graph consider assigning and discussing the <i>Look Back!</i>.</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b><br/>Consider including item 6 to ensure students have sufficient opportunity to reason with selecting a scale based on a set of data and creating a bar graph. Watch to ensure that students have included all the elements of a bar graph:</p> <ul style="list-style-type: none"> <li>• Title</li> <li>• Category labels</li> <li>• Scaled quantities</li> <li>• Accurately represent the data for each category</li> </ul> <p><b>Assess and Differentiate:</b><br/>If time permits, you may consider replacing the <i>Problem-Solving Reading Mat</i> with the game “Teamwork” (TE p. 369A) or the <i>Fluency Practice Activity</i> (TE p. 389).</p> <p>Based upon child-watching, identify students who need additional support and pull them in a small group to do the <i>Intervention Activity</i> (TE p. 375A).</p> <p><b>Homework &amp; Practice:</b><br/>Consider saving item 4, to complete independently in class, after lesson 7-4 as a formative assessment on students’ reasoning with selecting an appropriate scale based on a set of data and creating a scaled bar graph.</p> <p>*CTC: <i>Solve &amp; Share</i> (student work samples)</p> |
| Lesson 7-4: Solve Word Problems Using Information in Graphs  |   |   |
| <p><b>3.MD.B.3</b><br/><b>3.OA.A.3</b><br/><b>3.OA.D.8</b></p> <p>MP.1<br/>MP.3<br/><b>MP.6</b><br/>MP.8</p> | <p><b>Access Prior Learning:</b><br/>In previous grades, students have developed understanding of the operations addition and subtraction. In topics 1 through 5, Grade 3, students have developed understanding of the operations multiplication and division. In previous lessons in this topic, students developed understanding of and created scaled picture and bar graphs.</p> <p><b>Developing the Big Idea:</b><br/>In this lesson, students further <i>develop</i> understanding of scaled picture and bar graphs by making, reading, and analyzing them to solve real-world problems using the 4 operations.</p> | <p><b>Solve &amp; Share:</b><br/>Consider asking students what they have to find (e.g. the difference of how many students prefer peanut butter more than cheese sandwiches <b>and</b> the difference of how many students prefer peanut butter more than tuna sandwiches) prior to letting students work on the problem.</p> <p><b>Look Back:</b><br/>Consider discussing the <i>Look Back!</i> as it requires that students reason with key ideas when analyzing a scaled bar graph.</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b><br/>Notice that <i>Quick Check</i> items 9 and 12 flip the axis for the numbers and categories. Watch for and support students that struggle with this change. Consider discussing with the class how this change also changes the look of the scaled bar graph (e.g., the bars are horizontal now instead of vertical).</p> <p><b>Assess and Differentiate:</b><br/>If time permits, you may consider replacing the <i>Math and Science Activity</i> with the game “Teamwork” (TE, p. 369A) or the <i>Fluency Practice Activity</i> (TE, p. 389)</p> <p>Child-watch to identify students who need additional support and pull them in a small group to do the <i>Intervention Activity</i> (TE, p. 381A).</p>  |
| Lesson 7-5: Math Practices and Problem Solving- Precision  |   |   |
| <p><b>3.MD.B.3</b><br/><b>3.OA.A.3</b></p> <p>MP.6<br/>MP.1<br/>MP.2</p>                                     | <p><b>Access Prior Learning:</b><br/>Throughout this topic, students have used precise language and symbols when analyzing scaled picture and bar graphs to solve word problems.</p>  | <p>This lesson provides an opportunity to focus on the Thinking Habits and display the behaviors associated with Math Practice 6. Refer to the <i>Math Practices and Problem Solving Handbook</i> (TE, pp. 26A-26F, 29F) for suggestions on how to develop, connect and assess this Math Practice. Also, reference the handbook in the Student Edition (SE, p. 26F).</p> <p style="text-align: center;">-continues on next page-</p>  |

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| <p>MP.4<br/>MP.7</p> | <p><b>Securing the Big Idea:</b><br/>In this lesson, students <i>secure</i> their understanding of making, reading, and analyzing scaled picture and bar graphs by focusing on accuracy (MP.6).</p> | <p><b>Solve &amp; Share:</b><br/>Consider reintroducing MP. 6, “<i>Attend to precision</i>,” (SE, p. 26F) before introducing the <i>Solve &amp; Share</i>, you may want to restate that this includes using precise mathematical language.</p> <p>Many students have a misconception that MP. 6 only refers to precise calculations. Consider using the time where students are working on the <i>Solve &amp; Share</i> as an opportunity to child-watch for behaviors associated with MP.6 that are listed in the <i>Math Practices and Problem Solving Handbook</i> (TE, p. 26A). After discussing student solution methods and reasoning, have students self-score for the behaviors associated with this math practice.</p> <p><b>Look Back:</b><br/>Consider discussing the <i>Look Back!</i> as the reasoning discussed here can then either be confirmed, clarified, or corrected during the <i>Visual Learning Animation</i>.</p> <p><b>Convince Me:</b><br/>Consider assigning the <i>Convince Me!</i> as it offers another opportunity to work with MP.6 and assess for behaviors attributed to this math practice.</p> <p><b>Assess and Differentiate:</b><br/>If time permits, you may consider replacing the Problem-Solving Reading Mat with the game “<i>Teamwork</i>” (TE, p. 369A) or the <i>Fluency Practice Activity</i> (TE, p. 389).</p> <p>Child-watch to identify students who need additional support and pull them in a small group to do the <i>Intervention Activity</i> (TE, p. 387A).</p> |
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### References

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