



San Diego Unified School District

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*Instructional Module to Enhance the Teaching of*

**H A R C O U R T**

***Math***

**California Edition**

**Grade 3**

**Module 9 – Revised**

**Data, Graphing, and Probability**

– WORK IN PROGRESS –

San Diego City Schools  
 Instruction and Curriculum Division  
GRADE 3 – MATHEMATICS CURRICULUM MAP

**MODULE 9 – DATA, GRAPHING, AND PROBABILITY**  
**Modules represent individual units of study that lead to essential learnings**

**THREADS THROUGHOUT THE YEAR:**

*The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.*

**Students will:**

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts.
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

**These are essential learnings that represent bigger ideas/concepts:**

- Students conduct simple probability experiments and make simple predictions regarding likelihood of event occurring.
- Students understand how an increase in the amount of data gathered results in experimental results that more closely approximate the theoretical results.

**These are essential questions that learners ask themselves in order to achieve the essential learnings:**

- How do I identify and predict whether a common event is certain, likely, unlikely or improbable?
- How do I organize, record and summarize the results of a probability experiment?
- How do I show the effect of increasing the number of times an experiment is repeated on the relationship between the experimental results and the expected results of a probability experiment?
- How do I decide if situations are fair or unfair?

*\* Presented in previous grades*

**Resources:** Van de Walle: Chapter 21 (pp. 405-411)

**UNIT 5: Data, Graphing, and Probability**  
Chapter 16  
1.5 Weeks of Instruction

Key Mathematical Concepts:

- Understand how to identify whether a common event is certain, likely, unlikely or improbable-
- Understand how to record the possible outcomes for a simple event such as tossing a coin -
- Understand how to organize and record and summarize the results a probability experiment-
- Recognize that the results of an experiment do not necessarily match the expected probability but the greater number of times the experiment is completed the closer the results will be to the expected probability-
- Understand that "fair" means that the outcomes are equally likely-

**Unit 5: Data Graphing and Probability:**

**Chapter 16: Probability**

- Lesson 16.1: Certain and Impossible
- Lesson 16.2: Likely and Unlikely
- Lesson 16.3: Hands On: Possible Outcomes
- Lesson 16.4: Experiments
- Lesson 16.5: Predict Outcomes
- Lesson 16.6: Problem Solving Skill: Draw  
Conclusions

## Harcourt Mathematics

## Grade 3

## Unit 5: Data, Graphing, and Probability

## Chapter 16

**MODULE 9 NOTES****Chapter 16 Recommendations:**

Actual experiences with the different experiments presented in these lessons will help students develop a deeper understanding of the mathematics of probability.

Making and using different spinners and recording the results of drawing tiles out of a bag will help students understand that the probability of an event occurring is more than “luck”.

The following lesson can be omitted if additional instructional time is needed for other concepts:

- Lesson 16.5: Predict Outcome

| <u>Day 1</u><br>CHAPTER 16<br><i>Probability</i>  | <u>Day 2</u><br>CHAPTER 16   | <u>Day 3</u><br>CHAPTER 16                        | <u>Day 4</u><br>CHAPTER 16                               | <u>Day 5</u><br>CHAPTER 16           |
|---|--|---|--|--------------------------------------|
| Lesson 16.1:<br>Certain and<br>Impossible<br>Events   | Lesson 16.2:<br>Likely and<br>Unlikely Events                                  | Lesson 16.3:<br>Hands On:<br>Possible<br>Outcomes | Lesson 16.4:<br>Predicting<br>Outcomes of<br>Experiments | *Lesson 16.5:<br>Predict<br>Outcomes |
| <u>Day 6</u><br>CHAPTER 16<br><br>Lesson 16.6:<br>Problem Solving<br>Skill: Draw<br>Conclusions | <u>Day 7</u><br>CHAPTER 16<br><br>California<br>Connections<br>Unit Assessment |   |  |                                      |

DAY 1  
Unit 5: Measurement  
Chapter 16  
LESSON 16.1, Pp. 268-269

|   |   |         |            |
|---|---|---------|------------|
| <b>MATERIALS:</b>   | 1 box or bag, 5 cubes or counters of 1 color (green) and 1 of another color (red), inch rulers  |         |            |
| <b>LESSON FOCUS:</b>  | <b>Certain and Impossible Events</b>  |         |            |
| <b>CALIFORNIA STANDARDS:</b>  | <b>Mathematical Reasoning</b><br><b>2.0:</b> Students use strategies, skills, and concepts in finding solutions.<br><b>Number Sense 2.0, 2.4, 3.0, 3.2, 3.3</b>   |         |            |
| <b>PURPOSE OF LESSON:</b>   | Identify and predict events as certain or impossible.   |         |            |
| <b>LAUNCH:</b><br>Introduce students to concepts.   | <p>Check What You Know, P. 267 #1 – 3. Discuss what is certain, impossible about the results of a spin for each of these spinners. (optional)</p> <p><b>“What’s Certain? What’s Impossible?”</b><br/>Introduction:<br/>Alternative Teaching Strategy, p. 268B. Students generate a list of events/outcomes that they believe are certain/impossible:</p> <div style="text-align: center;"> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px 20px;">Certain</td> <td style="padding: 5px 20px;">Impossible</td> </tr> </table> </div> <p>Examples of something impossible might be being able to jump 100 feet in the air, or a marshmallow turning into a computer.</p> <ul style="list-style-type: none"> <li>• Keep the chart for Lesson 16.2</li> </ul> | Certain | Impossible |
| Certain   | Impossible  |         |            |
| <b>EXPLORE:</b><br>Work with the concept. Focus on students “doing mathematics.”<br><br><i>Red/Green counters and bag or box.</i> | <p><b>An Exploration:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate by using an empty box/bag and 5 green counters. Students observe as counters are put in the box/bag.</li> <li>• Ask a student to take a <u>red</u> counter out of the box.</li> <li>• Discuss students’ responses. (Can’t do, because there are no red counters in the box/bag, etc.)</li> <li>• Ask students how they might describe that event. (impossible)</li> <li>• Ask another student to take a <u>green</u> counter out of the bag. Discuss what they how they would describe that event. (Certain)</li> <li>• Then, put other combinations of green and red cubes in the bag and discuss if it is certain, possible, or impossible to draw a particular color cube.</li> </ul>   |         |            |

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| <p><b>PRACTICE:</b><br/>Focus on Communication and Representation.</p> <p><i>*Transparency</i><br/>16.1</p> | <p><b>Check, P. 268 #1 &amp; 2.</b></p> <ul style="list-style-type: none"> <li>• Do with students. Discuss.</li> </ul> <p><b>Learn, P. 268: Way, No Way.</b></p> <ul style="list-style-type: none"> <li>• Sketch spinner and bag of marbles on board/overhead. Discuss: Alfonso &amp; Leslie's spinners, center SE P. 268.</li> </ul> <p><b>Teach, P. 268;</b> Guided Instruction questions for additional questions.</p> <p><b>Practice &amp; Problem Solving, P. 269: #7 – 10.</b></p> <ul style="list-style-type: none"> <li>• Do with students.</li> <li>• Practice &amp; Problem Solving, P. 269 # 11 – 13. Students work with partners. Discuss reasoning.</li> </ul> |
| <p><b>SUMMARIZE:</b><br/>Connect purpose to activities.</p>   | <p><b>Assess, P. 269: DISCUSS.</b></p> <p><b>Assess, P. 269: WRITE.</b></p> <ul style="list-style-type: none"> <li>• Students describe two events that are certain to happen and two that are impossible.</li> </ul>  |
| <p><b>HOMEWORK:</b></p>   | <p><b>Mixed Review and Test Prep, P. 269 #s 14-18</b></p> <ul style="list-style-type: none"> <li>• Write or draw a picture of one event that is certain to happen and one event that is impossible.</li> </ul>  |

**ROUTINES:*****How Long is an Inch?***

Students estimate and draw the following:

- 1/2-inch line
- 1-inch line
- 6-inch line
- 9-inch line

Give each student a ruler. Have them measure each line they drew and label the correct length. Students identify benchmarks for the lengths.

Discuss the differences between the estimates and actual measures.

Students put the rulers away and use the back of their papers.

Students draw and label the following:

- 1/2-inch line
- 2-inch line
- 5-inch line
- 10-inch line

Repeat. Compare estimates and measurements. Discuss results.

Discuss how having benchmarks for: 1/2 inch; 1 inch; 6 inches; 12 inches can help in estimating lengths.

DAY 2  
Unit 5: Measurement  
Chapter 16  
LESSON 16.2, Pp. 270-271

| <b>MATERIALS:</b>  | 1 box or bag and counters: 8 green, 5 blue and 3 red for each small group; Transparency of Challenge 16.2;  |          |            |          |            |  |  |  |  |  |  |  |
|--|---|----------|------------|----------|------------|--|--|--|--|--|--|--|
| <b>LESSON FOCUS:</b>   | <b>Likely and Unlikely Events</b>   |          |            |          |            |  |  |  |  |  |  |  |
| <b>CALIFORNIA STANDARDS:</b>   | <b>Statistics, Data Analysis, and Probability</b><br>1.1: Identify whether common events are certain, likely, unlikely, or improbable.<br><b>Mathematical Reasoning 2.4</b><br>2.0: Students use strategies, skills, and concepts in finding solutions.   |          |            |          |            |  |  |  |  |  |  |  |
| <b>PURPOSE OF LESSON:</b>  | Identify and predict events as likely or unlikely.  |          |            |          |            |  |  |  |  |  |  |  |
| <b>LAUNCH:</b><br>Introduce students to concepts.  | HW: Share events that are certain/impossible. (optional)  |          |            |          |            |  |  |  |  |  |  |  |
|  | <p><b>Alternative Teaching Strategy, P. 270B</b></p> <p>Refer to Chart of Certain/Impossible from Lesson 16.1</p> <ul style="list-style-type: none"> <li>• Review Certain/Impossible</li> <li>• <i>Are some events more <u>likely</u> to happen than others?</i> Add column "Likely" to Chart</li> <li>• <i>Are there some events/things that happen, but not very often?</i> These events are described as unlikely. Add column "Unlikely" to Chart.</li> <li>• Prompt students to record unlikely/likely events.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 25%;">Certain</th> <th style="width: 25%;">Likely</th> <th style="width: 25%;">Unlikely</th> <th style="width: 25%;">Impossible</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> | Certain  | Likely     | Unlikely | Impossible |  |  |  |  |  |  |  |
| Certain  | Likely  | Unlikely | Impossible |          |            |  |  |  |  |  |  |  |
|  |   |          |            |          |            |  |  |  |  |  |  |  |
|  |   |          |            |          |            |  |  |  |  |  |  |  |
| <b>EXPLORE:</b><br>Work with concept. Focus on students "doing" mathematics.<br><br><i>Bag/box and 8 green counters: 1 red counter</i> | <p><b>Demonstration:</b></p> <ul style="list-style-type: none"> <li>• Show the empty box/bag, the 8 green counters and the 1 red counter. Students watch as you put the 8 green counters and 1 red counter in the box/bag.</li> <li>• Ask students which color counter is most likely to be drawn from the bag.</li> <li>• Student volunteer takes out one counter.</li> <li>• Discuss if this color was expected and why/why not.</li> <li>• If the red counter was chosen: ask if this was more or less likely to occur and why.</li> <li>• Replace the counter and have other students repeat the activity. Discuss/chart the results.</li> <li>• If needed, use different numbers and colors of counters, and repeat the procedure.</li> </ul>  |          |            |          |            |  |  |  |  |  |  |  |

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| <p><i>1 bag with: 3 red, 5 blue and 8 green counters for each group</i></p> | <p><b>Check, P. 270:</b> Sketch bag of marbles on board/overhead. Discuss #'s 1 and 2. Use terms: likely and unlikely to explain outcomes.</p> <ul style="list-style-type: none"> <li>• Students pull counters out of the bag &amp; replace. Do this 10 times. Record results. Compile class results on continuum, record what is: impossible, unlikely, likely .</li> <li>• Student volunteer takes out one counter.</li> <li>• Discuss if this color was expected and why/why not and certain for this situation.</li> <li>• If the red counter was chosen: ask if this was more or less likely to occur and why.</li> <li>• Replace the counter and have other students repeat the activity. Discuss/chart the results.</li> <li>• If needed, use different numbers and colors of counters, and repeat the procedure.</li> <li>• If green is drawn, discuss likely as the expected outcome.</li> <li>• If the red counter was chosen, ask if this was more or less likely to occur and why. (possible but unlikely)</li> <li>• Replace the counter and have other students repeat the activity 10 times. Chart &amp; discuss results using proper terminology.</li> <li>• Repeat activity 10 more times and add results to chart. Discuss.</li> </ul> <p><b>Learn, P. 270:</b> Maybe, Maybe Not.</p> <ul style="list-style-type: none"> <li>• Read together to reinforce demonstration.</li> </ul> <p><b>Check, P. 270:</b> Discuss #'s 3 and 4.</p> <ul style="list-style-type: none"> <li>• Each group/pair receives bag with counters.</li> <li>• Ask students to predict which color counter is likely to be drawn; which is unlikely; is any color impossible or certain.</li> <li>• Replace the counter. Continue the activity 10 times. Discuss/chart the results to see if their predictions were accurate. Why/why not.</li> </ul> |
| <p><b>PRACTICE:</b><br/>Focus on Communication and Representation</p>       | <p><b>Problem Solving Practice, P. 271:</b> # 9-14. Students work with partners. Discuss #13 &amp; 14.</p>   |
| <p><b>SUMMARIZE:</b><br/>Connect purpose to activities.</p>                 | <p><b>ASSESS, P. 271: DISCUSS.</b></p> <ul style="list-style-type: none"> <li>• Students identify and discuss the four terms they have used to describe events. (Certain, Impossible, Likely, Unlikely)</li> </ul> <p><b>ASSESS, P. 271: WRITE</b></p>   |
| <p><b>HOMEWORK:</b></p>   | <p><b>Problem Solving Practice, P. 271:</b> #15</p> <ul style="list-style-type: none"> <li>• Write and/or draw a picture of a likely and an unlikely event. Label each.</li> </ul>   |

**ROUTINES:**

**Compare Measures**

Review the basic customary units of measure. Say/write one unit of measure.

Students work in groups to identify one or more equivalent measures.

Example: 1 quart: Students say 2 pints or 4 cups.

1 yard: Students say 36 inches or 3 feet.

1 inch: Students say 2 half inches.

Students explain the relationships such as 1 yard = 36 inches.



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| <p><b>EXPLORE:</b><br/>Work with the concept. Focus on students “doing mathematics.”</p>                               | <p><b>Explore, P. 272.</b> Briefly discuss with students to reinforce and connect to the activity.</p>   |
| <p><b>PRACTICE:</b><br/>Focus on Communication and Representation.<br/><br/>TR67 and crayons<br/>Transparency TR67</p> | <p><b>Alternative Teaching Strategy, P. 272B</b></p> <p><b>Connect, top SE P. 273.</b></p> <ul style="list-style-type: none"> <li>• Read &amp; discuss with students.</li> </ul> <p><b>Practice, P. 273: # 1-5:</b></p> <ul style="list-style-type: none"> <li>• Do with a partner and discuss with students.</li> </ul> |
| <p><b>SUMMARIZE:</b><br/>Connect purpose to activities.</p>  | <p><b>ASSESS, TE P. 273: DISCUSS.</b></p> <ul style="list-style-type: none"> <li>• Students discuss the relationship between possible outcomes and likely/unlikely events.</li> </ul>  |
| <p><b>HOMEWORK:</b></p>  | <p><b>Mixed Review &amp; Test Prep, P. 273: # 6-10.</b></p> <ul style="list-style-type: none"> <li>• Make a “Possible Outcomes Table” like the one on board/overhead. Toss a coin 20 times and tally results of each toss. Write 2-3 sentence that describe results.</li> </ul>  |

**ROUTINES:**

**Build 4-Digit Numbers**

Explain that you will say a number and students are to write it in the place you say.

Example: Write a 4-digit number with 5 in the hundreds place.

The digits in the other places can be any numbers students wish to use.

Students share their numbers and explain/justify response.



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| <b>HOMEWORK:</b> | <b>Mixed Review and Test Prep, P. 277 # 15-24.</b> <ul style="list-style-type: none"><li>• Draw 2 spinners: One with 4 equally likely outcomes. One with 2 more likely and 2 less likely outcomes.</li></ul> |
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**ROUTINES:**

***Performance Assessment 3.5B: Try Your Luck, Pp. PA37-38, 40-41, and 44-45 in Performance Assessment Booklet.***

Read problem with students. Make copies of page if students do not have booklets. Answer any questions. Reword any phrases; insert others as needed. Allow students adequate time to do their best work.

All students will not do the task in the same order/way. Involve students in the evaluating process.

DAY 5  
 Unit 5: Measurement  
 Chapter 16  
 LESSON 16.5, Pp. 278-279

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| <b>MATERIALS:</b>  | 14 small items - 2 different colors, such as cubes or tiles;<br>1 bag;<br>Routines: *Transparencies of student work – <i>Performance Assessment 3.5B: "Try Your Luck"</i> ; 8 tiles and 1 bag per group  |
| <b>LESSON FOCUS:</b>   | <b>Predict Outcomes</b>  |
| <b>CALIFORNIA STANDARDS:</b>   | <b>Statistics, Data Analysis, and Probability 1.1</b><br>1.3: Summarize and display the results of probability experiments in a clear and organized way.<br>1.4: Use the results of probability experiments to predict future events.<br><b>Mathematical Reasoning 2.0, 2.4</b><br><b>Number Sense 2.8</b>   |
| <b>PURPOSE OF LESSON:</b>  | <ul style="list-style-type: none"> <li>• Record all possible outcomes of experiments.</li> <li>• Understand greater amounts of data, increases accuracy of predictions.</li> <li>• Understand that gathering &amp; organizing data helps understand &amp; interpret data.</li> </ul>   |
| <p><b>LAUNCH:</b><br/>Introduce students to concept.</p> <p><i>Small bag with 10 items-<br/>2 different colors</i></p>               | <p><b>What Is Your Prediction?</b></p> <ul style="list-style-type: none"> <li>• Review what is means to predict.</li> <li>• Discuss a spinner with 4 equal sections – 2 white and 2 black.</li> <li>• Ask students if it is easy to predict if you will spin white or black with this spinner and why.</li> <li>• Then discuss another spinner with 4 equal sections, 3 white and 1 black.</li> <li>• Ask students if it is easier to predict if you will spin white or black with this spinner and why. Explain your thinking.</li> </ul> <p><b>Alternative Teaching Strategy, P. 278B:</b> Use the small items in a bag.</p> <p><b>Learn, P. 278:</b> Whether or Not.</p> <ul style="list-style-type: none"> <li>• Read with students. Discuss Activity 1 with students.</li> </ul> <p><b>See Teach, P 278:</b></p> <ul style="list-style-type: none"> <li>• Modifying Instruction for temperature data.</li> </ul> <p><b>Teach, P. 278;</b> Guided Instruction and Reasoning to guide discussion.</p> |
| <p><b>PRACTICE:</b><br/>Focus on Communication and Representation.</p> <p><i>1 bag and 8 tiles per group. Tiles of 3 colors.</i></p> | <p><b>Practice &amp; Problem Solving, P. 279 #3-6.</b></p> <ul style="list-style-type: none"> <li>• Do with students. Discuss.</li> </ul> <p><b>Practice &amp; Problem Solving, P. 279 #9 &amp; 10.</b> Discuss.</p> <ul style="list-style-type: none"> <li>• Demonstrate #10 with a bag &amp; tiles.</li> </ul>   |

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| <p><b>EXPLORE:</b></p> <p>Work with the concept. Focus on students “doing” mathematics.</p> | <p><b>An Experiment:</b></p> <ul style="list-style-type: none"> <li>• Students determine the number of each color tile to be put into the bag from 3 colors.</li> <li>• Make and record a <b>prediction</b> about the results of 10 draws.</li> </ul> <p><b>Record</b> the results of 10 draws and compare to prediction. Discuss.</p> |
| <p><b>SUMMARIZE:</b></p> <p>Connect purpose to activities.</p>                              | <p><b>ASSESS, P. 279: DISCUSS.</b></p> <ul style="list-style-type: none"> <li>• How can you use a tally table or line plot to predict outcomes of experiments.</li> </ul>  |
| <p><b>HOMEWORK:</b></p>   | <p><b>Mixed Review and Test Prep, P. 279 #s 11-15.</b></p> <ul style="list-style-type: none"> <li>• Toss a coin 20 times and tally the results. Repeat the experiment and compare the results. Make a prediction about what would happen for the next 10 tosses and explain your reasoning.</li> </ul>                                 |

**ROUTINES:**

Review of *Performance Assessment 3.5B: Try Your Luck, Pp. PA37-38, 40-41, and 44-45 in Performance Assessment Booklet.*

- Involve students in evaluating the *Performance Assessment, Try Your Luck*.
- Explain how papers are scored using rubrics. Share sample rubrics on Pp. PA44-45. Ask why students think the 3 is scored the highest. List paper's best points.
- Share the other two rubrics, one at a time, asking similar questions.
- Return papers to students. Ask how their papers are like the rubric scored 3 and how they are different.
- Talk about specific things they can do to improve their work.
- Help them edit and/or rewrite, if desired.
- Ask students what they learned from the experience. Discuss.

