

# INSTRUCTIONAL STRATEGIES

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## 10 PRACTICAL INSTRUCTIONAL STRATEGIES FOR GRADES K-8

Preparing students for the Connecticut Mastery Test (CMT) should be an ongoing process. The process requires sufficient instructional time and appropriate instructional strategies. While it is certainly appropriate to conduct some form of review, “cramming” is far less effective than an ongoing set of instructional practices that naturally and continually prepare students for the test specifically and for higher levels of understanding generally. A sound K-8 mathematics program embeds these strategies into all instructional planning.

### **Strategy 1: Asking “Why?”**

Probably the best way to implement a “thinking curriculum” – a curriculum that is language-rich, focuses on meaning and values alternative approaches – is by regularly asking students “Why?” A simple, “How do you know that?” or “Can you explain how you got your answer?” or the basic, “Can you explain to the class why you think that?” forms the basis of a mathematics curriculum that goes beyond merely correct answers. A student who can explain his or her answers often has a stronger understanding of mathematics and can help other students develop understanding. Questions like, “How did you get 17?” or “Why did you add?” give students powerful opportunities to communicate their understandings and give teachers powerful tools to assess the degree of understanding. Classrooms where students are regularly explaining how and why, both orally and in writing, are classrooms that effectively prepare students for many of the open-ended items on the CMT.

### **Strategy 2: Embed In Context, Present As A Problem**

Consider the vast difference between “Find the quotient of  $20 \div 1.79$ ” on the one hand, and “How many hamburgers, each costing \$1.79, can be purchased if you have a \$20 bill?” Both problems expect that students can divide. However, the former directs students to a single long division algorithm with a three-digit divisor that isn’t even tested on the CMT. The latter places the mathematics in a context and expects students to understand that division is an appropriate operation to use to solve a practical problem. In addition, the latter encourages estimation and raises the issue of sales tax, all of which is assessed on the CMT. Most importantly, the contextualized problem shows students that mathematics is a useful tool.

### **Strategy 3: Ongoing Cumulative Review**

One of the most effective strategies for fostering mastery and retention of critical mathematical skills is daily, cumulative review at the beginning of every lesson. Rarely does one master something new after one or two lessons and one or two homework assignments. Many teachers call this “warm-ups” or daily-math. Five to eight quick problems to keep skills sharp can be delivered orally or via visual methods. Every day teachers should present:

- a fact of the day (e.g.,  $7 \times 6$ );
- an estimate of the day (e.g., What is a rough estimate of the cost of 55 items at \$4.79 each?);
- a measure of the day (e.g., About how many meters wide is our classroom?);
- a place value problem of the day (e.g., What number is 100 more than 1,584?);
- a word problem of the day; and
- any other exercise or problem that reinforces weaker, newer or problematic skills and concepts.

This form of review, often patterned after the types of items and item formats used on the CMT, embeds review for the test in what is recognized as sound instructional practice.

### **Strategy 4: Ensure A Language-Rich Classroom**

Like all languages, mathematics must be encountered orally and in writing. Like all vocabulary, mathematical terms must be used again and again in context until they become internalized. Just as young children confuse left and right until they develop strategies and connections to distinguish between the two, older children confuse area and perimeter until they link area to *covering* and perimeter to *border*. A language-rich classroom, in which mathematical terminology is regularly used in discussions, solving problems and in writing, can make a big difference in how effectively children learn mathematics. Posting vocabulary in the room, perhaps on a word wall, is one way to ensure that mathematical terminology is used on a daily basis. While not exhaustive, the vocabulary word list found in each grade-level section of this handbook should be used to ensure that the language used and expected on the CMT is never new to students.

### **Strategy 5: Use Every Number As A Chance To Build Number Sense**

The development of number sense is one of the overarching goals of mathematics at the elementary level. Number sense is a comfort with numbers that includes estimation, mental math, numerical equivalents, a sense of order and magnitude, and a well-developed understanding of place value. The development of number sense must be an ongoing feature of all instruction. A review of CMT 4 reveals how much of the test focuses on these critical number sense understandings. A simple strategy for incorporating number sense development into all instruction is to pause regularly and, regardless of the specific mathematics being taught, ask questions such as the following:

- Which is most or greatest? How do you know?
- Which is least or smallest? How do you know?
- What else can you tell me about those numbers? For example, “they are both odd,” “all are mixed numbers,” “their product is about 18 because you can round.”
- How else can we express  $.2$  ( $2/10$ ,  $1/5$ ,  $20\%$ ,  $.20$ )?

Incorporating this strategy into daily instruction creates a mind-set that the numbers in every problem posed and in every chart or graph used can strengthen and reinforce number sense. For example, in a simple word problem that asks students to find the sum of 57 and 67, teachers can first “pluck” the numbers from the problem and ask students to list four things they can say about the two numbers. Consider how much mathematics is reviewed when students suggest findings such as the following:

- I see two two-digit numbers.
- Both numbers are odd.
- There is a difference of 10 between the numbers.
- The 67 is greater than the 57.
- The ones digit is the same and the tens digit is one apart.
- One number is prime and the other is composite.
- I see 124.

### **Strategy 6: Draw A Picture (Mental or Real)**

We say casually that “a picture is worth a thousand words” but we seldom connect mathematical concepts to their pictorial representations. A significant proportion of the CMT asks for pictorial equivalents of mathematics ideas. A powerful way to help students visualize the mathematics they are learning, or to reinforce understanding, is with mental images or pictures that students actually draw or create. Consider how infrequently we ask students to, “Show me with your hands about eight inches” or, “Use your fingers to show me an area of about 10 square inches.” Consider how important it is that students can draw pictures of fractions and mixed numbers like  $\frac{3}{4}$  or  $2\frac{1}{2}$  and of decimals like .3 and 1.2. Consider how powerful a class discussion about the different pictures for “three-quarters” can be when students show three quarters (25-cent pieces), a shaded pizza slice, a window pane, three stars out of four shapes, a ruler, a measuring cup and simply  $\frac{3}{4}$ ! Consistently embedding, “Can you draw a picture of...?” and “Can you show me what that would look like?” into instruction can pay rich benefits in both student understanding and in CMT scores.

### **Strategy 7: Build From Graphs, Charts and Tables**

Many real-world applications of mathematics arise from the data presented in graphs, charts and tables. This is why so many of the CMT items are based on data and include graphs, charts and tables. To best prepare students for these contexts, as well as develop the essential skills of making sense of data and drawing conclusions from data that is presented in graphs, charts and tables, teachers are encouraged to make far greater use of these forms of data presentation. Given a graph or table, students can be asked (similar to Strategy 5) to identify five things they see in the graph or table. In addition, students can be asked to draw two appropriate conclusions from the data and justify those conclusions. So consider “milking” the graphs and charts found in your textbook or data that students find during “data scavenger hunts” by copying the graph, chart or table for students and asking them to create five questions that could be answered by the information in the graph or table. Ask students to share their questions and generate a list of the best questions for future use.

### **Strategy 8: How Big? How Much? How Far?**

No strand of mathematics assessed on the Connecticut Mastery Test produces student scores as consistently weak as the measurement strand. Rather than leave all measurement to a single chapter that is often skipped entirely, teachers are encouraged to make measurement an ongoing part of daily instruction. First, questions like, “How big?,” “How much?,” “How far?,” “How heavy?” all help to develop measurement understanding. Second, measurements of things such as arm span, book weight, area of circles, or breath-holding times all provide great sets of data and, therefore, use measurement to gather data that is analyzed and generalized – integrating many important aspects of mathematics. Finally, more involved projects like determining the number of students that can fit in a classroom or the number of hours students have been alive are wonderful opportunities to keep measurement on the front burner of daily instruction.

### **Strategy 9: Omit What Is No Longer Important**

A significant amount of time and energy is expended by teachers and students on skills considered less important by national and state standards and not even assessed on the CMT, the Connecticut Academic Performance Test (CAPT) or the SAT. District mathematics curriculums must become more focused on what is truly valued and teachers must give themselves and each other permission to skip textbook pages that no longer serve useful purposes. In fact, the proverbial “mile-wide, inch-deep” curriculum that results in far more coverage of topics than mastery of key concepts undermines many efforts to raise student achievement. In addition, time that is no longer spent on increasingly irrelevant skills – particularly those done most often with a calculator – frees up valuable minutes and hours for increasingly important skills like estimation, algebraic reasoning and problem solving. So carefully review what is NOT assessed on the CMT – particularly complex, multidigit computation – and redirect what is taught to focus on those skills and concepts that have lasting value and that ARE assessed.

### **Strategy 10: Focus On Sense-Making As Well As Correct Answers**

One of the most powerful test-taking skills for multiple-choice items is the artful elimination of obviously absurd answers. However, identifying such “obviously absurd answers” – for example, a sales tax of \$129 dollars instead of \$1.29 on a \$20 item – requires a mind-set that mathematics makes sense. This “minds-on” approach to instruction is in sharp contrast to the rote regurgitation of rules and procedures to get correct answers to exercises that all too often comprises mathematics instruction. For example, when teaching how to convert mixed numbers to improper fractions and vice versa, it is imperative to teach why these forms are equivalent. Students who only know how to multiply and add and not why  $3\frac{3}{4}$  is equivalent to  $\frac{15}{4}$  are at a disadvantage in life and on the CMT. Focusing on the why – that is, focusing on understanding and sense-making – emerges from consistent use of many of the preceding strategies, particularly 1 and 6.

Teachers can improve instruction significantly by adopting the mind-set that good mathematics instruction begins with an answer. That is, when a student responds (for example) “17,” the next question should be something like, “How did you get that?” When the student responds “I added” or “I rounded” or “I took about half,” the next question should be something like, “Why did you do that?”

## Sample Lessons and Activities by Standard and Grade Level

The following lessons and activities can be incorporated into mathematics instruction to address the concepts and skills in each of the indicated standards. These activities have been selected for their richness and potential to develop mathematical understanding. A description of each of these lessons and web links can be found on the pages that follow.

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# Sample Lesson and Activity Descriptions

## NUMERICAL AND PROPORTIONAL REASONING

**Let's Count to 10 – Grades PreK-2** – In this unit, students make groups of zero to 10 objects, connect number names to the groups, compose and decompose numbers, and use numerals to record the size of a group. Visual, auditory and kinesthetic activities are included in each lesson. The unit is most appropriate for students learning at the kindergarten and Grade 1 levels. The NCTM Process Standards of Communication and Reasoning and Proof play a major role in these lessons.

[http://illuminations.nctm.org/index\\_o.aspx?id=147](http://illuminations.nctm.org/index_o.aspx?id=147)

**Do It with Dominoes – Grades PreK-2** – In this unit plan, students explore the four models of addition (counting, sets, number line and balanced equations) using dominoes. They also learn about the order property, the relationship between addition and subtraction, and the result of adding 0. Students will also write story problems in which the operation of addition is required, and begin to memorize the addition facts.

[http://illuminations.nctm.org/index\\_o.aspx?id=47](http://illuminations.nctm.org/index_o.aspx?id=47)

**How Many More Fish? – Grades PreK-2** – This unit plan focuses on comparative subtraction. The students use fish-shaped crackers to explore all five meanings for the operations of subtraction (counting, sets, number line, balance and inverse of addition). In these lessons, the students use reasoning, then represent and communicate their findings.

[http://illuminations.nctm.org/index\\_o.aspx?id=51](http://illuminations.nctm.org/index_o.aspx?id=51)

**Estimation – Grades 3-5** – This computer interactive lesson is designed to show students how to make estimations.

<http://www.shodor.org/interactivate/lessons/estimate.html>

**Fun With Estimation – Grades 3-5** – This activity is a timed game that allows students to practice their estimation skills while shopping for groceries. Students work in cooperative groups and are in competition with one another.

<http://www.col-ed.org/cur/math/math24.txt>

**Parking at the Mall – Grades 3-5** – In this lesson, students participate in an activity in which they develop number sense in and around the shopping mall.

[http://illuminations.nctm.org/index\\_d.aspx?id=265](http://illuminations.nctm.org/index_d.aspx?id=265)

**A Conceptual Model for Solving Percent Problems – Grades 5-8** – In this lesson, students will use a 10 x 10 grid, which is a common model for visualizing percents, to solve various types of percent problems. This model offers a means of representing the given information as well as suggesting different approaches for finding a solution.

[http://illuminations.nctm.org/index\\_d.aspx?id=249](http://illuminations.nctm.org/index_d.aspx?id=249)

**Shops at the Mall – Grades 6-8** – In this lesson, students participate in an activity in which they develop number sense in and around the shopping mall.

[http://illuminations.nctm.org/index\\_d.aspx?id=266](http://illuminations.nctm.org/index_d.aspx?id=266)

**Developing Number Sense – Grades 6-8** – In this lesson, students develop number sense through a change in approach to the teaching and learning of mathematics. This

approach focuses on students and their solution strategies rather than on a "right answer," on thinking rather than on the mechanical application of rules, and on student-generated solutions rather than on teacher-supplied answers.

[http://illuminations.nctm.org/index\\_d.aspx?id=252](http://illuminations.nctm.org/index_d.aspx?id=252)

## **GEOMETRY AND MEASUREMENT**

**Shapes in Our Lives – Grades PreK-2** – Students go on a "Shape Hunt" to identify different shapes at school and home. They make shape cookies to talk about how shapes can change and bring digital photographs of their homes to discuss the shapes seen in each one. Eighth-grade buddies help them insert shapes into PowerPoint presentations.

<http://www.microsoft.com/education/VCTShapes.aspx>

**Using Nonstandard Measurement – Grade 2** – This lesson incorporates nonstandard measurement into the classroom through the use of measurement stations for children to explore. Students will be measuring objects with their hands, feet and pinky fingers.

[http://eduref.org/cgi-](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0208.html)

[bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0208.html](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0208.html)

**Inch by Inch – Grades 2-3** – Inch by Inch is a lesson dealing with measurement and estimation. It integrates reading and art. Students will be able to calculate basic estimations and take measurements of linear objects.

[http://eduref.org/cgi-](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0201.html)  
[bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0201.html](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0201.html)

**Let's Measure! – Grades 3-5** – Through this extensive study of measurement, students will gain a better understanding of linear measurement, weight (mass) and capacity.

<http://www.coreknowledge.org/CKproto2/resrcs/lessons/398Measure.htm>

**Tree Measurement – Grades 4-6** – This activity is used to help understand the vertical and horizontal measurement of large objects.

<http://www.col-ed.org/cur/math/math32.txt>

**How Much is a Million? – Grades 4-6** – After listening to the story, *How Much is a Million?*, students work in groups to determine how long one million dollars would be, laid out end to end, and how tall a stack of one million pennies would be.

[http://eduref.org/cgi-](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0204.html)

[bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0204.html](http://eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0204.html)

**Cool to Rule: A Game of Estimation and Measurement – Grades 5-6** – This activity provides an excellent opportunity for students to review their measurement and estimation skills.

<http://eduref.org/Virtual/Lessons/Mathematics/Measurement/MEA0015.html>

**An Introduction to Area and Perimeter – Grades 6-8** – Students form rectangles by using tiles and measure area and perimeter by counting. They will also measure and record area and perimeter, describe dimensions of rectangles, and discover and apply rules for measuring area and perimeter.

<http://www.iit.edu/~smile/ma9509.html>

**An UnCOMFORTable Situation – Grades 6-8** – Students explore the relationship between the area of square units and their perimeters in a hands-on activity. Observations are recorded, and students begin to recognize that shapes with the same area sometimes can have different perimeters.

<http://www.beaconlearningcenter.com/search/details.asp?item=183>

**Circles: Diameter, Circumference, Radius and the Discovery of Pi – Grades 6-8** –

This math lesson is designed to help students identify and measure the diameter, circumference and radius of a circle. Students should discover the approximate value of pi through the relationship between the diameter and circumference.

<http://www.iit.edu/~smile/ma9709.html>

**Scavenger Hunt for Lengths – Grades 6-8** – Students will measure and estimate lengths, learn the difference between measuring and estimating, become more aware of linear measurements in the world, and communicate better about the significance of these measurements.

<http://school.discovery.com/lessonplans/programs/lengths/>

**Tessellations: Geometry and Symmetry – Grades 6-8** – This lesson allows students to examine tessellations and their geometric properties. This activity and discussions may be used to develop students' understandings of polygons and symmetry, as well as their abilities to analyze patterns and explore the role of mathematics in nature and our culture.

<http://www.shodor.org/interactivate/lessons/tessplane.html>

**Translations, Reflections and Rotations – Grades 6-8** – This interactive computer lesson is designed to introduce students to translations, reflections and rotations.

<http://www.shodor.org/interactivate/lessons/trans.html>

## WORKING WITH DATA: PROBABILITY AND STATISTICS

**Baby Weight – Grades PreK-2** – This lesson focuses on the application of mathematics to real-world situations. Students must deal with data to complete an organized chart for the purpose of transferring information to a graph or for generalizing a rule.

[http://illuminations.nctm.org/index\\_d.aspx?id=170](http://illuminations.nctm.org/index_d.aspx?id=170)

**Alphabet Soup – Grades 3-5** – In this lesson, students construct box-and-whisker plots. They use them to identify the mean, mode, median and range of the data set. Representation is the major focus of this lesson.

[http://illuminations.nctm.org/index\\_d.aspx?id=356](http://illuminations.nctm.org/index_d.aspx?id=356)

**Can You Picture It? – Grades 3-5** – Students collect data about favorite vegetables and record the data in a pictograph and interpret this representation. They also create and use legends for the pictograph.

[http://illuminations.nctm.org/index\\_d.aspx?id=352](http://illuminations.nctm.org/index_d.aspx?id=352)

**Comparing Categorical and Numerical Data – Grades 3-5** – In this series of three multiday lessons students will focus on the following NCTM Standard: Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.

[http://illuminations.nctm.org/index\\_o.aspx?id=116](http://illuminations.nctm.org/index_o.aspx?id=116)

**Every Breath You Take – Grades 3-5** – This activity focuses on collecting and analyzing data. Each student will estimate the number of breaths he or she takes each hour and make comparisons to the actual data collected from classmates.

[http://illuminations.nctm.org/index\\_d.aspx?id=243](http://illuminations.nctm.org/index_d.aspx?id=243)

**Glyphs for All Reasons – Grades 3-5** – In this lesson, students learn a powerful way to display data, the glyph. Representation, communication and problem solving are important parts of this lesson. [http://illuminations.nctm.org/index\\_d.aspx?id=357](http://illuminations.nctm.org/index_d.aspx?id=357)

**Eat Your Veggies – Grades 3-5** – In this unit, students collect and display data in a variety of ways, beginning with tallies and pictographs. Later lessons focus on representing data using bar graphs, line plots, circle graphs, box-and-whisker plots and glyphs. The students also compare graphs from two sets of data and find the range, median, mean and mode of each set. The unit highlights the NCTM Process Standards of Representation, Problem Solving, Connections and Communication.

[http://illuminations.nctm.org/index\\_o.aspx?id=114](http://illuminations.nctm.org/index_o.aspx?id=114)

**High Temperature – Grades 3-5** – This lesson focuses on the application of mathematics to real-world situations. Students must deal with data to complete an organized chart for the purpose of transferring information to a graph or for generalizing a rule.

[http://illuminations.nctm.org/index\\_d.aspx?id=171](http://illuminations.nctm.org/index_d.aspx?id=171)

**Numerical and Categorical Data – Grades 3-5** – In this series of three multiday lessons students will focus on the following NCTM Standard: Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.  
[http://illuminations.nctm.org/index\\_o.aspx?id=116](http://illuminations.nctm.org/index_o.aspx?id=116)

**Weather Watchers – Grades 3-5** – In this lesson, students collect and analyze data about the weather and learn to make a stem-and-leaf plot. Students need access to a newspaper or other sources for collecting weather data.  
[http://illuminations.nctm.org/index\\_d.aspx?id=287](http://illuminations.nctm.org/index_d.aspx?id=287)

**Skin Weight – Grades 5-6** – This lesson focuses on the application of mathematics to real-world situations. Students must deal with data to complete an organized chart for the purpose of transferring information to a graph, or for generalizing a rule.  
[http://illuminations.nctm.org/index\\_d.aspx?id=172](http://illuminations.nctm.org/index_d.aspx?id=172)

**Statistical Concepts: Measures of Central Tendency and Dispersion – Grades 5-6** – This lesson is designed for students to gain conceptual understanding. The graphing calculator is valuable for checking to see if the sets of numbers students produce satisfy specifications.  
<http://www.eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Statistics/STA0001.html>

**Analyzing Numeric and Geometric Patterns of Paper Pool – Grades 6-8** – The interactive paper pool game in this i-Math investigation provides an opportunity for students to further develop their understanding of ratio, proportion and least-common multiple.  
[http://illuminations.nctm.org/index\\_o.aspx?id=125](http://illuminations.nctm.org/index_o.aspx?id=125)

**Probability: The Study of Chance – Grades 6-8** – The purpose of this activity is to begin the process of helping students to learn the basic principles of probability.  
<http://www.eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Probability/PRB0004.html>

**Understanding Probability – Grades 6-8** – Students will learn what probability is, learn different ways to express probability numerically: as a ratio, a decimal and a percentage, and learn how to solve problems based on probability.  
<http://school.discovery.com/lessonplans/programs/probability/>

**Whale Weight – Grades 7-8** – This lesson focuses on the application of mathematics to real-world situations. Students must deal with data to complete an organized chart for the purpose of transferring information to a graph or for generalizing a rule.  
[http://illuminations.nctm.org/index\\_o.aspx?id=73](http://illuminations.nctm.org/index_o.aspx?id=73)

## ALGEBRAIC REASONING: PATTERNS and FUNCTIONS

**Balancing Act – Grades PreK-2** – This lesson will serve as an introduction to understanding equality as a balance. Students will develop an understanding of equality by comparing balanced and unbalanced pans, and will demonstrate quantitative relationships and equivalence through the use of concrete, pictorial and verbal representations.

[http://illuminations.nctm.org/index\\_d.aspx?id=166](http://illuminations.nctm.org/index_d.aspx?id=166)

**Calculating Patterns – Grades PreK-2** – In this sequence of lessons, students represent patterns in different ways. They solve problems; make, explain and defend conjectures; make generalizations; and extend and clarify their knowledge. You may adjust the length and pace of the lesson to fit the developmental needs of your students.

[http://illuminations.nctm.org/index\\_o.aspx?id=146](http://illuminations.nctm.org/index_o.aspx?id=146)

**Patterns That Grow – Grades 3-5** – In this unit plan, students use logical thinking to create, identify, extend and translate patterns. They make patterns with numbers and shapes and explore patterns in a variety of mathematical contexts. These lessons give students opportunities to create and analyze numeric and geometric patterns. Particular emphasis will be placed on growing patterns. Note that a pattern core is the unit in a pattern that repeats, and when you are presenting a pattern at least two repetitions of the core must be shown. Since growing patterns "grow" by a rule and are typically more difficult to solve than simple repeating patterns, the unit begins with the easier pattern type.

[http://illuminations.nctm.org/index\\_o.aspx?id=103](http://illuminations.nctm.org/index_o.aspx?id=103)

**The Variable Machine – Grades 3-5** – This lesson serves as an introduction to viewing variables as symbols that can be substituted for numbers. Students will express the idea of a variable as an unknown quantity by using a letter or a symbol.

[http://illuminations.nctm.org/index\\_d.aspx?id=291](http://illuminations.nctm.org/index_d.aspx?id=291)

**The "Mangoes Problem" – Grades 5-8** – This unit presents some classic problems that can be represented and solved in several ways. A variety of classroom solution attempts are described. Students work on the problems in groups to promote communication of mathematical ideas. NCTM publication-based lesson plans are adapted from NCTM's journals. This lesson plan appeared in the November-December 1994 edition of Mathematics Teaching in the Middle School.

[http://illuminations.nctm.org/index\\_d.aspx?id=264](http://illuminations.nctm.org/index_d.aspx?id=264)

**Sets and the Venn Diagram – Grades 6-8** – This lesson is designed to introduce students to the idea of a set and what it means to be contained in a set. Students will experiment with sets in conjunction with the Venn Diagram.

<http://www.shodor.org/interactivate/lessons/vd1.html>

**Bouncing Tennis Balls – Grades 6-8** – Students will develop their skills in collecting and recording data using the real-world situation of a bouncing tennis ball. They will use the data collected to formulate the relationship between the dependent and independent variable in their experiment.

[http://illuminations.nctm.org/index\\_d.aspx?id=246](http://illuminations.nctm.org/index_d.aspx?id=246)

**Printing Books – Grades 6-8** – Students will explore the relationships among lines, slopes and y-intercepts using the real-world situation of the printing of their textbook. They will use the data from tables, graphs and an equation for problem solving.

[http://illuminations.nctm.org/index\\_d.aspx?id=271](http://illuminations.nctm.org/index_d.aspx?id=271)

## **PRACTICE**

**Math Playground** is a mathematics learning site for students in Grades K-6. Practice your math skills. Play a logic game and have fun!

<http://www.mathplayground.com/index.html>

**The Math Forum's** Problems of the Week (PoWs) are designed to provide creative, non-routine challenges for students in Grades 3-12. Problem solving and mathematical communication are key elements of every problem.

<http://mathforum.org/pow/>