ICTM Parent Guide

A Parent Handbook to Mathematics, Grades K-6

This brief guide seeks to help parents and guardians understand more about their students' mathematics education in the state of Illinois including resources for the Common Core Standards as incorporated into the New Illinois Learning Standards.

A Letter to Parents

Dear Parents and Guardians,

The education of our children is one of the most important tasks facing our nation. In June of 2010 Illinois adopted the Common Core State Standards for Mathematics to provide a consistent, clear understanding of what students are expected to learn, so that teachers and parents know what they need to do to help them. The Common Core State Standards Initiative is a state-led effort to provide a single set of clear standards for Math K-12. With students, parents, and teachers all on the same page and working together for shared goals, we can ensure that students make progress each year and graduate from school prepared to succeed and build strong future for themselves and the country. The New Illinois Learning Standards are designed to be relevant to the real world, reflecting the knowledge and skills that our young people need for success in both college and work. (Realizing Illinois 2013 Illinois State Board of Education)

Parents are often frustrated by not knowing enough about their children's math programs to help them or by not understanding the New Illinois Learning Standards content that is the focus for their children's grade level. The strengths of the New Illinois Learning Standards allow parents to know what is expected of their children at each grade level. Standards give parents specific information when talking with teachers during the school year. Standards assure parents their children have access to the same high-quality education as other students in Illinois and in other parts of the country. And finally, parents will know that their child is learning skills and knowledge to be successful in the 21st century. The Illinois PTA (Parent Teacher Association) and the Illinois State Board of Education (ISBE) have co-branded the Parents' Guide to Success which is a series of brochures for each grade level designed especially for parents. They are available to download in both English and Spanish in the "Parent Resources" section on the ISBE website found at http://www.isbe.net/common_core/htmls/resources.htm.

Problem-solving skills are an important part of your child's mathematics education and include the ways in which people learn how to think about a problem using such strategies as looking for patterns, drawing a picture, working backward, working with a partner, or eliminating possibilities. When your child has a variety of strategies, this allows him/her different ways to start looking at a problem and develops the habit of persevering even when a solution is not immediately apparent. The more strategies your child has, the more confident he/she becomes and the more willing he/she is to tackle new problems. Your child will become a better problem solver and will be able to apply this talent for all of life's problems.

To help your child understand the importance of mathematics, it is necessary for parents to talk about mathematics and identify how it relates to all aspects of life at home, at work, and at play. Educators, parents and our children must understand that learning mathematics, as with all learning, takes hard work, discipline, and a commitment on the part of everyone to ensure success.

Sincerely,
Illinois Council of Teachers of Mathematics

What to Look For in a Mathematics Classroom

Mathematics is the language of the 21st century. Thinking, reading, writing, picturing, and talking about mathematics are basic skills that help us understand and explain our world.

A math classroom should provide practical experience in mathematical skills that prepare students for the real world. Mathematical skills go beyond memorization and extend into a world of problem solving and reasoning.

Help your schools to provide the best mathematics available. When you look into a classroom, you should observe the following actions by students and teachers.

Students are...

- Using math manipulatives (such as blocks, tangrams, and scales), technology (such as calculators and computers), as well as textbooks.
- Applying math to real-life problems and not just practicing isolated skills.
- Working independently, as well as interacting with other students.
- Working actively together in groups to test solutions to problems.
- Working in teams to challenge and defend possible solutions to enable students to learn from one other.
- Seeking a best solution among several solutions to a problem, explaining to others how the solutions were reached, and defending the choice of one solution over another.
- Communicating mathematical ideas to one another through examples, demonstrations, models, drawings, and logical arguments.

Teachers are...

- Developing skills, facilitating student learning, and creating real-life learning situations.
- Moving around the room to keep students engaged in productive work.
- Establishing and maintaining high expectations for the students.
- Encouraging students to gain mathematical competence and confidence by finding their own solutions.
- Guiding students in exploring multiple solutions to any problem and challenging them to think.
- Guiding students in making appropriate use of technology and math manipulatives.
- Promoting student use of creativity, inquiry, and higher levels of learning.
- Bringing a variety of learning resources into the classroom to increase learning opportunities for all students.
- Using assessment that focuses on problem solving and understanding rather than on memory and speed.
- Making mathematical connections between disciplines to show how math is a part of other subjects that students are studying.
- Helping all students to explore career opportunities that use the mathematics they are learning.

Parents are Their Child's Most Important Teacher

Dr. Mikaela Dufur of Brigham Young University and Kelly Troutman, a Ph. D. student at the University of California-Irvine, co-authored a research report on September 5, 2012 in the journal *Research in Social Stratification and Mobility* titled "Does Capital at Home Matter More than Capital at School?: Social Capital Effects on Academic Achievement" which found that parents who want their students to succeed in academics have more influence over a student's learning than the actual schools. In other words, the single most influential factor in a child's education is their parent or guardian.

Parents can help their child(ren) succeed in mathematics by . . .

- Encouraging your child to attend school every day, to be prepared, to do his/her very best, and to value education and learning.
- Being positive about your own and your child's mathematics ability.
- Showing a real interest in your child's assignments and homework and being available to assist, if necessary.
- Talking with your child about his/her mathematics learning experiences at school.
- Discussing with your child the importance of mathematics in his/her daily life and pointing out examples of how people use mathematics in daily life.
- Providing activities and objects that make mathematics interesting and fun at home.
- Encouraging your child to ask questions, solve problems, and to explain his/her solutions.
- Modeling how to solve math problems.
- Challenging your child in his/her areas of math strengths and providing support in areas of math weaknesses.
- Communicating often with your child and his/her teacher about your child's mathematical progress, and ask how you can help at home.
- Familiarizing yourself with books, games, resources, web sites, and television programs that encourage mathematics learning.
- Becoming actively involved in your child's school experiences through volunteering to help out in the classroom, by preparing necessary materials outside of the classroom, and or by helping to organize Math Fairs and/or Family Math Nights.
- Continuing to learn mathematics with your child!

Help Your Child See How Mathematics is a Part of Daily Life

Parents and other family members can influence their student's math skills. Perhaps you do not realize it, but whenever you sort objects, read maps or schedules, compare prices, make change, or use a calculator or calendar, you are a model of mathematical behavior. When you measure, weigh, work with family finances, or figure out how much wallpaper will cover a wall, you are a living textbook!

The best help you can give your student in math is simply to make your child aware of when and how to use math. Whenever possible, talk through activities with your child and encourage him/her to take part in them. Think out loud, make estimates, check them, correct mistakes, and try more than one way to solve a problem. When you do, you provide your child with important experiences in mathematical thinking.

Here are a few math activities that you can do with your child.

Estimation Activities

1. Young children can estimate by using items like pencils, crayons, or parts of their own bodies. Older children can use regular units of measurement like rulers or measuring cups and spoons.
2. Ask your child to guess the number of items in your home. Make a list. Then count them together. Examples may include pillows, windows, doors, chairs, and shoes. Then compare estimates with an actual count. Make comparisons between items to help young children understand the concepts of "more" or "less" and put them into categories.
3. Ask your child to determine how much time he/she will have to wait until his/her favorite TV program comes on.
4. Have your child estimate how many minutes or hours he/she spends watching TV each evening, weekend, or during an entire week.
5. Have your child complete his/her own height and weight charts. Begin by estimating, actually measure, and then graph the information. Keep a record over a period of time.

Traveling Activities

1. Discuss directions (north, south, east, and west) to give your child a sense of coordinates. Have child use street maps to find travel routes and addresses and estimate the time of your arrival and compare that to the actual time it took to arrive at a given destination.
2. Have competitions when traveling. Have child count red cars or see who can find the largest number formed by the numerals on a license plate.
3. Have child practice, record, and read the large number on license plates viewed. Find the largest number in a given time period of travel.
4. Have child estimate, then time how long before a street light changes. Estimate, then count how many stores are in a block.
5. Point out speed limits and distances between towns. Talk to child about the time it takes to get from one town to another when you drive at different speeds.
6. Have child practice reading the numbers on the odometer.
7. Have child check odometer in the car to determine distances on a trip - starting point and ending destination.
8. Have child find the differences between certain distances traveled. Find out how much farther you traveled on the first day than you did on the second day.

Cooking/Shopping Activities

1. Let child help with the cooking by measuring the ingredients and checking cooking times and temperatures. Older children can increase or decrease recipes.
2. Have child figure out how to cut a pizza, cake, pie, or sandwich for different numbers of people.
3. Have child determine how much or how many of a grocery item is needed for the entire family, or how much is needed for a given recipe.
4. Have child check a grocery receipt to find five items that add up to less than $1.00, $5.00, or $10.00.
5. Let child help with the shopping by checking and comparing prices, weights, and quantities. Allow him/her to use a calculator to make these comparisons as he/she also keeps track of the total cost of your purchases. If available, allow your child to use the calculator on the shopping cart to keep track of how much money is being spent on groceries while you shop.
6. Have child determine how much change you will receive once you've paid the clerk. Older children can practice writing a check for the total amount of the grocery bill.
7. Using catalogs or newspapers, have child spend a specified unit of money (figure in tax, shipping, and handling charges) and complete order forms.
8. Have child look at the sales flyer and determine how much money you could save by buying the sale items.
9. Have child determine and select the "best buys" and then prepare the shopping list (i.e., one item costs $7.50 and 2 items cost $14.00).
10. Notice large and small numbers all around in magazines and newspapers and have child practice reading the numbers (i.e., weather, cost of a new car, grocery items, price of toys, etc.).
11. Have child determine how much a single item costs that is sold by the package (i.e., a single roll of toilet tissue purchased in a four-pack, one roll of paper towels purchased in a two-pack, the price of one can of soda packaged in a box of 12 or 24, etc.).

Household Activities

1. Have child see what items in the house come in sets of two (hands, feet, shoes), sets of six (cans of soda), and sets of twelve (eggs in a carton).
2. Have child help with the laundry by matching the socks, sorting the clothing into appropriate colors, discussing clothing size according to each family member.
3. Have your child determine how much laundry soap to use.
4. Have your child graph daily chores, money earned from chores, and/or purchases.
5. Have children find pictures or items that are sold in sets (i.e., 4 batteries to a package) and have them determine how many batteries there would be in three packages.

Playing

1. Encourage child to play games that involve counting, finding patterns, using strategy, and solving patterns.
2. Allow child to use a calculator and encourage "messing around" with it to explore numbers, look for patterns, and investigate number patterns.
3. Relate sports and the stock market to mathematics. The daily newspaper is full of scores, schedules, statistics, and graphs.
4. Card games provide excellent opportunities for learning math concepts. "Go Fish" and "War" help younger children to recognize numbers and things that are alike, to group and sort, and to use strategy in discarding to win. Gin Rummy, Casino, Canasta, and Cribbage are more complex card games for older children.
5. Ask child questions that require simple mental math. Use questions such as, "What are two numbers that add up to 7? What number is two less than 17? Eighteen is twice as big as what number? Can you name two numbers that multiply to 12 at the same time they add up to 7?"
6. Play math 'Jeopardy" with your child. Give child a number and ask him/her to find a question for which the number is the answer.
7. Plan art activities that use measurement, patterns, and/or geometry.
8. Plan math scavenger hunts and have child look for lists of specific math related items (i.e., geometric shapes, number of items, etc.) in the house, yard, or in the neighborhood.
9. Have child design and make his/her own math practice games.

Reading / Literature

1. As you encourage your child to read, be sure to include books with a mathematical theme. Reading books with your child that creatively incorporates ideas about mathematics concepts is a wonderful way to advance your child's mathematical understanding. Below is a list of children's books that has been sorted by the mathematics concept(s) that they address. Search for interesting titles at your local library!
2. **SEE MATHEMATICS LITERATURE LIST** (pdf)

Parent Tips for Helping with Homework

Homework remains a hotly debated topic in education today, but regardless of where you fall in your beliefs about homework, you can support your child with the following guidelines. (For my information on what research says about homework you can view the NCTM Research Brief entitled "Homework: What the Research Says" by Harris Cooper.)

Parents can . . .

- Set aside a regularly scheduled time for your child to complete his/her homework.
- Provide a quiet environment for your child to work.
- Be positive about your child's efforts.
- Offer guidance, NOT solutions.
- Help your child explain what is being asked.
- Have your child "tell a story" that illustrates the problem.
- Point out real life applications of the problems.
- Keep lines of communication between home and school open so you are aware of mathematical concepts being discussed in class.

Questions and prompts to use to help support your child

(These have been taken from NCTM at http://www.figurethis.org/fc/family_corner.htm)

- What is the problem you're working on?
- Let's look at it.
- What do the directions say?
- What words or directions don't you understand?
- Where do you think you should begin?
- What do you already know that can help you work through the problem?
- Tell me what you've done so far.
- Where can we find help in your textbook or notes?
- Are there similar problems to look at?
- Let's try drawing a picture or making a diagram.
- What did the teacher ask you to do?
- What problems like this one have you had before?
- Tell me where you're stuck.
- Who can you call to get help?
- Let's try it using a calculator.
- Can you skip this problem and go on to another?
- What is the number for the Homework Hotline?
- Why don't we look for some help on the Internet?
- What type of partial work does your teacher accept?
- Can you go in before or after school for help from your teacher?
- Should we tackle this when you're not so tired?

Note to Parents: If you have a question or concern about your child's mathematics, you should talk to the following people in the order listed below.

1. Your child
2. Your child's teacher
3. Principal
4. Director of Curriculum and Instruction
5. Superintendent

What Role Should Technology Play in Math Education?

Calculators, computers, and other technology are driving what our students need to know. Today, students must learn when it is appropriate to use technological tools in mathematics as well as how to use them. Our students must learn to think of technology as a tool they can readily and easily access and use to supplement, reinforce, and expand their problem solving skills.

Our students will be using all types of technology as they study mathematics, and calculators often receive a good deal of emphasis in the math curriculum. Although calculators should never replace learning basic operations, they certainly make a significant contribution to student learning. The National Council of Teachers of Mathematics has identified the following ways in which calculators may assist student learning:

- To teach students to experiment with technology in order to instill creativity.
- To show students how to use calculators in everyday life.
- To reinforce addition, subtraction, multiplication, and division facts.
- To teacher students how a step-by-step process works and what the process is all about.
- To serve as a flexible, instant "answer key."
- To solve problems that previously have been too time-consuming or impractical to be done with paper and pencil.
- To formulate generalizations from patterns of numbers that are displayed.
- To increase student confidence in problem solving.

The PARCC test, which Illinois uses as a measure of whether or not students have mastered the Common Core Standards for Mathematics, gives guidance on what specifically students may or may not use a calculator for on their Evidence Statement Tables which are split by grade level. You can find these at http://www.parcconline.org/assessments/test-design/mathematics/math-test-specifications-documents by scrolling down and clicking on your child's grade level. You will be taken to a PDF with a table showing what students are expected to be able to do where the far right column indicates if they can use a calculator or not.

Why Modify the Math Curriculum

The National Council of Teachers of Mathematics (NCTM) earlier published three volumes of Standards documents – *Curriculum and Evaluation Standards for School Mathematics* (1989), *Professional Standards for Teaching Mathematics* (1991), and *Assessment Standards for School Mathematics* (1995). These documents greatly influenced the way we think about teaching mathematics. The later release of the *Principles and Standards for School Mathematics* (2000) strengthens and extends the message of the original Standards documents. It provides a vision for mathematics education built on high achievement for all students in the classroom. This document and the NCTM's previous Standards make recommendations about what mathematics students should learn, what classroom practice should be like, and what guidelines can be used to evaluate the effectiveness of mathematics programs.

Overall, the NCTM Standards documents advocate a broader and more meaningful mathematics curriculum that meets the needs of a far greater proportion of the student population than has been true in the past. NCTM's Principles and Standards for School Mathematics sets ambitious goals for the teaching and learning of mathematics, including the following:

Learning mathematics with understanding and acquiring the skills and knowledge needed to solve mathematical problems

Having an in-depth knowledge of the traditional basics of mathematics as well as the expanded basics—such as data analysis and statistics—needed for the technological world in which we live

Developing reasoning skills that will engender flexible and resourceful problem solving Achieving these goals requires solid mathematics curricula, competent and knowledgeable teachers who can integrate instruction with assessment, education policies that enhance and support learning, classrooms with ready access to technology, and a commitment to both equity and excellence.

These documents were influential during the development of Common Core State Standards. The Common Core includes Standards for Mathematical Practice and Standards for Mathematical Content. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "process and proficiencies" with longstanding importance found in the earlier NCTM documents on mathematics.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

The Standards for Mathematical Content are a balanced combination of concepts, procedures, and applications. Content standards, which set an expectation of understanding for each grade level, are potential points of intersection between the content and mathematical practices.

The Illinois Council of Teachers of Mathematics supports the New Illinois Learning Standards as the foundation for improving mathematics for the State of Illinois. The state goal is to integrate the philosophies, beliefs, and content of the national document as a basis for change so that the teaching and learning of mathematics in Illinois schools is continuously improving and changing to meet the needs of and to better prepare for the 21st century. The complete New Illinois Learning Standards can be read and downloaded at www.isbe.net/common_core/.

NCTM has published a new book entitled *Principles to Actions: Ensuring Mathematical Success for All* that has more information specific to the new Common Core Standards for Mathematics.

Shifts in Math Education

The New Illinois Learning Standards suggest the following shifts in mathematics instruction:

Focus:

The Standards call for a greater focus in mathematics. Rather than racing to cover topics in today's mile-wide, inch-deep curriculum, teachers use the power of the eraser and significantly narrow and deepen the way time and energy is spent in the math classroom. They focus deeply on the major work of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the math classroom.

Coherence:

Thinking across grades: The Standards are designed around coherent progressions from grade to grade. Principals and teachers carefully connect the learning across grades so that students can build new understanding onto foundations built in previous years. Teachers can begin to count on deep conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

Linking to major topics: Instead of allowing additional or supporting topics to detract from the focus of the grade, these topics can serve the grade level focus. For example, instead of data displays as an end in themselves, they support grade-level word problems.

Rigor:

In major topics pursue conceptual understanding, procedural skill and fluency, and application with equal intensity.

- **Conceptual understanding:** The Standards call for conceptual understanding of key concepts, such as place value and ratios. Teachers support students' ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures.
- **Procedural skill and fluency:** The Standards call for speed and accuracy in calculation. Teachers structure class time and/or homework time for students to practice core functions such as single-digit multiplication so that students have access to more complex concepts and procedures.
- **Application:** The Standards call for students to use math flexibly for applications. Teachers provide opportunities for students to apply math in context. Teachers in content areas outside of math, particularly science, ensure that students are using math to make meaning of and access content.

Math Websites and Resources

Online Games and Resources

- Math Playground – Lost of interactive games for K – 8 mathematics (www.mathplayground.co)
- PBS Kids Math Games for younger Children (http://pbskids.org/games/math/)
- Bedtime Math – Download their app to get a new problem to ask you child each day! (http://bedtimemath.org/apps/)
- Calculation Nation (https://calculationnation.nctm.org/) – Challenge yourself or others in these engaging math games by the National Council of Teachers of Mathematics
- Multiplication.com – Various Games for Basic fact Practice (http://www.multiplication.com)
- NCTM Illuminations – Interactive Games and activities to explore various math topics
- Cool Math Games – Strategy, Puzzle, and Logic Games (http://www.coolmath-games.com/)
- Mr. Nussbaum Learning + Fun – Collection of games K – 6 (http://mrnussbaum.com/mathgames/)
- Cut The Knot - Games, Quotes, and Mathematical Topics (www.cut-the-knot.com)
- NCTM's Figure This! Is a collection of middle school challenges you can do at at home (http://www.figurethis.org/index.html)

Math Tools and Manipulatives

- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- Wolfram Alpha – Type in any computational problem and get the answer! (http://www.wolframalpha.com/)
- DESMOS – Free online Graphing Calculator (https://www.desmos.com/)

Math Tutorials

- KHAN Academy offers free video tutorials and practice for all grade levels (www.khanacademy.org)
- Math TV – Free Math Videos by Topic (http://www.mathtv.com/)
- Math Lesson Resources (www.learnzillion.com)

Games to Play at Home

- Download this packet of K-5 Games from Youcubed.com (PDF available here)
- Fun Math activities from Math.com (http://www.math.com/parents/articles/funmath.html)
- Ten ideas from "Mixing in Math" (http://mixinginmath.terc.edu/materials/athomewithmath_Eng_kits.php)

Resources for Parents

- Grade level parent guides, Parent guides to success, Frequently asked questions and more can be found in the "Parent Resources" section at http://www.isbe.net/common_core/htmls/resources.htm
- The ISBE Mathematics Model Curriculum Project contains family letters describing each course (Grades K-8 and High School Integrated Mathematics 1, 2 and 3). There is also a family letter describing each unit within the ISBE Mathematics Model Curriculum scope-and-sequence.http://www.livebinders.com/play/play?id=953710

Math Organizations

- Illinois Council of Teachers of Mathematics (www.ictm.org)
- Illinois Parent Teacher Association (www.pta.org): Download "A Parents' Guide to Success" which is a series of brochures for each grade level available in English and Spanish
- Illinois State Board of Education (www.isbe.state.il.us)
- The Math Forum (http://mathforum.org/) - Ask questions to "Dr. Math"!
- National Council of Teachers of Mathematics (www.nctm.org)
- You Cubed - a nonprofit providing free and affordable K-12 mathematics resources and professional development for educators and parents (http://www.youcubed.org/)

Help Your Child Explore the Magic of Math

Show That Math is Important
At home, in school and in life.

+ ### Talk About Math
Using terms and ideas.

+ ### Enjoy Games
And activities that involve math.

+ ### Have a Positive Attitude
About math and encourage your child.

It All Adds Up!