## Math Learning Today

 What parents need to know
## Table of Contents

Ontario's Math Curriculum at a Glance ..... 2
The Five Strands ..... 2
The Seven Math Processes ..... 3
How Is Math Learning Assessed and Evaluated? ..... 6
Myths \& Facts ..... 9
Resources ..... 10
Today's Math Classroom ..... 10
How and Why it's Different ..... 11
Myths \& Facts ..... 11
Resources ..... 12
Be a Math Role Model ..... 12
What can I do to Support my Child's Math Learning? ..... 12
Support for Problem Solving ..... 14
Myths \& Facts about Learning Math ..... 15
Resources for My Learning, as a Parent of a Math Learner ..... 16
Math in Everyday Life ..... 18
Suggested Activities ..... 18
Sample Activities that Involve Math ..... 19
Myths \& Facts ..... 21
Resources for You and Your Child ..... 21


Ontario's Math Curriculum at a Glance


Our world is rapidly changing. Technology is evolving at lightning speed. And, more than ever before, strong math skills are critical to future success. Ontario's math curriculum is designed to prepare your child for success in today's world.

## The Five Strands

The math curriculum for each elementary school grade is organized in five strands, or areas of learning. In each strand, students develop their ability to think mathematically, investigate concepts and relationships, apply their knowledge and skills to solve problems, and communicate their thinking.

## Number Sense and Numeration

In this strand, your child is learning about numbers and operations and how to use numbers to describe and understand the world around them. Your child is developing strategies to solve problems involving


Measurement number calculations efficiently and accurately. The knowledge and skills learned in this strand are used in all other strands.

## Measurement

Your child is learning to estimate and measure lengths and distances, area, mass, volume, capacity, time, and temperature. In higher grades, your child will learn and apply measurement $\pi r^{2}$ formulas, such as area of a circle $=\pi r^{2}$.

## Geometry and Spatial Sense

Your child is learning to classify, compare, and construct angles, lines, and shapes, and to visualize and describe positions and motion in space. Your child will apply the properties of two-dimensional shapes and three-dimensional
 figures when solving geometry problems.

## Patterning and Algebra

Your child is learning to build models to represent real-life situations. Your child is developing the ability to identify patterns and generalize and make predictions based on patterns. Your child is learning to use symbols and equations to describe mathematical relationships.

## Data Management and Probability

Your child is collecting, organizing, displaying, and drawing conclusions from data, and learning to use math to describe the likelihood that something will happen.

Your child is learning to apply the knowledge and skills acquired in these five strands to solve real-life problems in contexts that are appropriate for your child's grade level.

## The Seven Math Processes

The curriculum identifies seven key processes students engage in as they learn and use math throughout the grade. These are problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. Your child will use these processes when learning new concepts and procedures, practising skills, and solving problems. Your child will also draw on his/her knowledge and skills from the five strands and make connections with real-life situations.

## Problem Solving

Students enjoy and use math when the concepts they learn make sense to them. Investigating problems builds students' understanding of concepts. It also allows students to apply their math skills in everyday situations. In your child's math classroom, students:

- tackle math problems that are appropriately challenging
- explore many different approaches to solving problems



## Reasoning and Proving

Students need to be able to explain the reasoning behind a solution or choice of strategy. They need to be able to answer the question, "How do you know?"
In your child's math classroom, students:

- make predictions
- test hypotheses
- explain their thinking



## Reflecting

Reflecting is an essential part of good problem solving. Reflecting on their choices and results enables students to improve their approaches and discover new possibilities. In your child's math classroom, students:

- reflect on their own thinking and the thinking of others
- assess the reasonableness of an answer
- brainstorm other possible strategies
- share aspects of a problem that were challenging


## Selecting Tools and Computational Strategies

Tools used in math class include measuring tools such as rulers and protractors, physical manipulatives such as fraction strips, and digital learning tools such as graphing tools. Digital tools offer many ways to enhance learning by allowing students to see math unfold in

Fraction Strips

| 1 |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\frac{1}{2}$ |  |  |  | $\frac{1}{2}$ |  |  |  |
| $\frac{1}{4}$ |  | $\frac{1}{4}$ |  | $\frac{1}{4}$ |  | $\frac{1}{4}$ |  |
| $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | ways that can't happen with a physical object. Such tools can be used to reduce the time spent on routine tasks and allow more time for concept development.

In your child's math classroom, students:

- choose physical and digital learning tools and computational strategies to investigate, explore, represent, and solve problems
- use technology (tablets, computers, interactive whiteboards, etc.)
- use calculators for some tasks, but not for all tasks, depending on the goal of the lesson


## Connecting

Students learn best when they can connect new concepts with what they already know, and connect mathematical ideas to real-world situations.
In your child's math classroom, students:

- make connections between new knowledge and skills and prior learning
- make connections between math and other subjects



## Representing

Math concepts and procedures can be represented in many different ways. Using a variety of ways to represent a concept or procedure leads to deeper understanding. Math manipulatives (physical objects students can manipulate) are particularly valuable tools to allow students to represent their thinking. They allow students to explore abstract concepts in a hands-on, concrete way. A student's concrete representations can also give the teacher useful insight into the student's thinking.

In your child's math classroom, students:

- use a wide variety of learning tools to explore and represent math concepts
- use graphs, tables, words, physical and digital models, drawings, numeric and algebraic expressions and equations when solving problems



## Communicating

Communicating one's thinking and reasoning is an essential part of math. Through communication, students share and develop their understanding. Over time, students learn to use this language precisely and effectively.

In your child's math classroom, students:

- participate in many conversations with the teacher, and with other students, in which they ask questions, share and clarify ideas, compare strategies, draw conclusions, and explain their reasoning. Everyone's thinking is valued and considered
- communicate their math thinking orally and in writing

The following are samples of questions that support the development of these math processes.

## Problem Solving

What is happening in this problem?
What am I asked to find?
What do I know that I can use to solve this?

## Reasoning and Proving

Why does this make sense?


How do I know my solution is right?

## Reflecting

How else could I have solved this problem?
What did I learn from doing this work?

## Selecting Tools and Computational Strategies

Which tool could I use to measure...?
What strategy could I use to show...?

## Connecting

This concept reminds me of...


This problem is similar to...

## Representing

What does this diagram tell me?
What equation can I use to show this?

## Communicating

How can I explain my strategy?
Here is how I figured this out...

## How Is Math Learning Assessed and <br> Evaluated?



The goal of all assessments and evaluations is to improve your child's learning. Both teachers and students contribute to the assessment process.

## Assessment for and as Learning

The assessment process helps teachers make appropriate instructional decisions (assessment for learning), and helps your child to develop the ability to assess his/her own learning and set specific goals (assessment as learning). Before new learning begins, assessment can demonstrate to the teacher and the student what skills and knowledge already exist.
To help students monitor and direct their own learning, teachers identify learning goals and success criteria. Learning goals describe for students what they should know, understand, and be able to do by the end of a lesson, course, or unit. Success criteria describe what successful learning of the learning goals looks like. The teacher and students use these goals and success criteria to give feedback to each other.

As your child learns new knowledge and skills, both the teacher and your child collect information to demonstrate your child's thinking and understanding. This is done through individual or small group conversations, by reflecting on how learning materials are used, and by analyzing work. This informs the teacher's next steps and helps your child gather information about his/her own learning.

Your child will use the learning goals and success criteria to reflect on learning, celebrate successes,
 identify areas for improvement, make adjustments where needed, and set new personal learning goals.

## Assessment of Learning

At or near the end of a period of learning, the teacher gathers information about your child's learning, to evaluate and summarize what has been learned and to make a decision on a grade. He/she talks to and observes your child in the classroom, and looks at assignments, tests and projects, for evidence of what your child knows and is able to do, and compares that against the expectations in the curriculum.

## The Report Card

The report card summarizes your child's achievement at two points in the school year. It gives a grade or mark for at least four of the five math strands each time. Each strand is reported on at least once in the school year. The report card also evaluates your child's learning skills and work habits, essential for success.

## EQAO

At the end of Grades 3,6 , and 9 , your child will participate in a province-wide assessment of math learning based on the Ontario curriculum for mathematics and what students are learning in classrooms every day. These assessments are done by the Education Quality and Accountability Office (EQAO), an independent agency that measures how well Ontario's public education system is developing students' math skills. EQAO test results are not included on report cards in Grades 3 and 6 but provide important information to schools, districts and the province about how we can continue to grow as an education system.

## Your Role

Children do better at school when their parents are involved. Your child's teacher will do his/her best to keep you well informed throughout the school year, and will always be glad to hear from you. Ask your child's teacher about your child's strengths, areas in which to improve, and how you can best offer support at home. Being aware of the learning goals and success criteria for your child's math course will help you to support your child's math learning.

## Myths \& Facts

Myth: The math my child is learning in school is "new."

## Facts:

Your child is learning the same math facts and formulas you did—such as $2 \times 2=4$, and the circumference of a circle is $2 \pi r$. But the way math is taught has evolved in recent decades. Today's math learning emphasizes the development of understanding of concepts and skills, so that your child is able to apply these confidently in new situations. It also focuses on developing critical thinking, problem solving, and communication skills.
Your child is learning some topics and skills that you may not have learned in elementary school. These include data management and probability, and how to use calculators and computers to help model and solve math problems.
What your child is learning in math class, and how your child is learning, are equipping your child for success in today's
 knowledge-based economy and our global world.

Myth: Now that we have calculators, students don't need to know how to add, subtract, multiply, and divide, nor do they need to memorize the "math facts" (such as $7 \times 6=42$ ).

Fact: Knowing how to add, subtract, multiply, and divide are essential math skills and a major emphasis in the Ontario math curriculum. Automatic recall of math facts is needed in higher-level math. Games where children need to keep track of a score or that require automatic recall of math facts are a fun way to practise. Look for opportunities where your child can develop fluency. It takes time. This is a key area where you can help your child at home, by encouraging lots of practise in a variety of ways.

Myth: People who were taught math the old way can't make sense of today's math.
Fact: You can learn alongside your child, and strengthen your own math skills in the process. Ask your child to explain and show you what the class is learning. Children are great teachers, and explaining math concepts and procedures to you will help your child to understand them better. Also, ask your child's teacher for suggestions on how to quickly learn the strategies your child is using.

Myth: Doing well in math is only important if you want to be an engineer, doctor, scientist...

Fact: Math skills are needed in every career from fashion design to filmmaking, baking to car racing. And everyone needs math skills to effectively manage his/her money and time. A strong foundation in math will open doors to a
 successful future.

## Resources

The Ontario Curriculum: Mathematics, Grade I to 8 (2005) This curriculum describes, for each grade, the knowledge and skills that students are expected to acquire, demonstrate, and apply in their class work, on tests, and in various other activities on which their achievement is assessed and evaluated.
http://www.edu.gov.on.ca/eng/curriculum/elementary/math I 8curr.pdf

## Today's Math Classroom

Students used to spend almost all their time working at their desks, with the teacher at the blackboard and with little discussion. Math classes today look, sound, and feel quite different.

## How and Why it's Different

If you peeked inside your child's math class, here are some things you would notice.

- students working on their own, in pairs, in small groups, independently and with teacher direction
- students engaged in a wide variety of tasks - practising skills, solving problems about real-life situations, playing games, and applying math concepts to design challenges
- students using a variety of physical and digital learning tools as they explore math ideas and solve problems
- students using a variety of tools, including paper and pencil, chart paper and markers, and digital devices, to write and record their math thinking
- students talking about connections they
 have made personally or exploring new math concepts and skills
- students sharing their strategies for solving a problem

Learning math involves understanding concepts and procedures, acquiring skills, and applying math processes. Each of these aspects of learning requires different learning and teaching strategies. As well, individual students learn differently. It's important for students to have opportunities to learn in a variety of ways.

## Myths \& Facts

Myth: Children learn math best when the teacher simply shows them how to do it.
Fact: Students learn best when they are active participants in the learning process. They learn by participating in conversations, asking questions and being curious and skeptical.

## Resources

Video: Why Is Math Different Now? By Dr. Raj Shah (https://www.youtube.com/watch?v=uOMK6tmHUL8) This video explains why math learning today looks different from what you might remember. Now the focus is on building conceptual understanding. When students understand they will be equipped to meet new challenges and learn to persevere, instead of give up.
Article: Student Interaction in the Classroom: Stealing Ideas or Building Understanding, by Catherine D. Bruce


## (http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/Bruce.pdf)

This article explains how "math-talk" is used in the classroom to encourage deeper math thinking and understanding. By working on math problems, thinking about math concepts, and talking about math together, students are collectively engaging in powerful math.

## Be a Math Role Model

You are an important part to your child's success in math. It's true! Your encouragement, interest, and positive attitudes about math can go a long way to your child.

## What can I do to support my child's math learning?



Encourage your child. Help your child to not get discouraged when learning a concept or skill proves harder than was hoped. Remind your
 child that success comes from hard work and perseverance, and that making mistakes is part of learning and growing. Be genuinely curious about what your child is thinking and learning.

Be positive about math! Avoid saying "I was never good at math" or "I never liked math." Show that you think math is important and interesting. Use numbers when you discuss daily activities, sports, and so on. Look for opportunities for math to be a natural part of your conversations.


Ensure your child keeps up with his/her math homework. Make sure that your child catches up if any days at school were missed, because math concepts build on one another.
Be available to talk with your child about his/her math work. But don't do your child's work for him/her. Give your child time to figure out the answers on their own. When your child needs support, ask questions instead of showing your child directly how to do it. Allow your child to share the method used in class. If you aren't familiar with the method, ask your child to explain it to you. This will help your child to understand it better as well. If you and your child are more comfortable in a
 language other than English, use it. Your child will understand concepts better in the language that he/she knows best.
Help your child make connections to math in everyday activities (see pages 16-18). Make available the tools your child needs to do math. For example, ruler, graph paper, protractor, etc.
Ask your child's teacher to suggest ways you can help your child with math.

## Support for Problem Solving

If your child is struggling with a problem, remind your child that problem solving takes time. It also takes perseverance.

Encourage your child to use problem-solving strategies he/she is learning in school. For example:

- consider starting with the simplest part of the problem
- make a model or draw a diagram
- make a table, chart, or list
- guess, check, and revise
- look for a pattern
- use a formula
- work backward


Use question prompts to help your child discover a solution. For example:

- What information are you given? What are you asked to find?
- What is happening in the problem? Can you draw a picture of the situation to help you solve it? What other ways could you represent the problem? (e.g., make a model, act it out, write a number sentence or equation, organize the data in a table, etc.)
- What do you know by looking at the diagram?
- What strategies have you used before that you might try here?
- Is there another way you might have solved this problem?

Encourage your child to always check the accuracy of his/her work. By checking, your child will practise skills, build understanding, and become more self-reliant. Ask your child to explain why the solution is correct or incorrect.

Talk aloud as you solve everyday problems of all kinds. Discuss alternative approaches and solutions with your child. Modelling how to solve a problem with your child will give your child more ideas and strategies.

## Myths \& Facts about Learning Math

There are a lot of misconceptions about math ability floating around. Let's get those out of the way.

Myth: Math ability is a gift. Some people have the "math gene" and others just don't.
Fact: There is no such thing as a math gene.
Everyone can succeed in math. In fact, more than ability, a positive attitude towards mathematics makes deep learning possible.


Myth: Mathematicians solve problems quickly and never make mistakes.
Fact: Albert Einstein, one of the world's great mathematicians, once claimed, "It's not that I'm so smart, it's just that I stay with problems longer." If that was true of Einstein, then it shouldn't surprise us when we too make mistakes and need time to solve problems.

Myth: You have to be good at memorizing to be good at math.
Fact: It is important for your child to be able to quickly recall math facts. But memorization is only one approach. When your child understands the concepts and procedures involved in number operations, and the relationships between addition, subtraction, multiplication, and division, he/she will find it much easier to remember math facts and learn new ones. Math is more about thinking than it is about memorizing.

## Resources for My Learning, as a Parent of a Math Learner

Article: Making Math Children Will Love: Building Positive Mathitudes to Improve Student Achievement in Mathematics, by Lynda Colgan
(http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_MakingMath.pdf)
This short article explains strategies and suggests practical resources and suggestions for practical resources that you can access to help motivate your child to love math, including television shows, websites and books.

Video: Growth Mindsets, by Jo Boaler
(http://learnteachlead.ca/projects/jo-boaler/?pcat=| | 29\&sess=0)
This short video explains the difference between a growth mindset and a fixed mindset and the implications of each mindset for a child's confidence in his/her ability to succeed at math.

Video: Mindset and Mistakes, by Jo Boaler
(http://learnteachlead.ca/videos/mindsets-and-mistakes/)
This short video explains how important mistakes are to developing a growth mindset. This video can help you learn how to encourage your child to be a resilient math learner.

Tip Sheet: Math Tips for Parents, by Lynda Colgan
(http://www.edugains.ca/resources/SchoolLeader/ldeasForSchoolNewsletters/MathTipsforPa rents_Sept2014.pdf)

This tip sheet provides advice about how you can help your child learn math, including recognizing math in everyday life and how to be a math role model.


Toolkit: Inspiring Your Child to Learn and Love Math (http://www.ontariodirectors.ca/parent_engagement-math/en/index.htm)

This multimedia toolkit is based on the Ontario math curriculum. It provides resources you can use at home with your child to support his/her math learning.

Booklet: Partnering With Your Teen in Mathematics, Grade 7 to 12

(http://www.edugains.ca/resourcesMath/CE/HomeSupport/PartneringWithYourTeen.pdf)
You can play an influential role in your teen's math learning. This booklet is designed to guide you as you help your teen succeed in math through Grades 7 to 12 .

Website: Homework Help (https://homeworkhelp.ilc.org/secure/login.php) This website offers free online math help for students in Grades 7 to 10. Students can access live one-on-one tutoring from Ontario teachers.

## Math in Everyday Life

Everyday life is full of opportunities to help your child learn and practise math. When you highlight math in the things you do each day, you show that math is important. Using words like longer, shorter, first, last, likely, unlikely in conversation, builds your young child's understanding of math concepts. Playing games, reading books, and doing puzzles together builds your child's math skills and shows that math can be a lot of fun.

## Suggested Activities

Count everything! Also count forward and backward from different starting places. Sing counting songs and read counting books. Practise skip counting by $2 \mathrm{~s}, 5 \mathrm{~s}, 10 \mathrm{~s}, 25 \mathrm{~s}$, and 100 s .
Supply building toys like blocks and Lego ${ }^{\circledR}$.
Play lots of games - board games, card games, and computer games - and do puzzles.
When shopping, have your child compare prices, estimate the total for a number of purchases, or estimate the change you'll receive back. Have your child measure things and estimate measurements, from times, temperatures, and ingredients when cooking, to areas and lengths when building and distances when travelling.

Develop your child's sense of time through scheduling and calendar activities.
Make music, art, and dance a part of your child's life. These activities are filled with patterns. Have your child gather and organize information to help him/her make decisions.
Organizing and tidying a room involves sorting, classifying, and putting things in order.
Planning routes and reading road maps develops an understanding of distance and space.
Discuss interesting graphs and charts in books, magazines, and newspapers.

## Sample Activities that Involve Math

## Kindergarten to Grade 3

I'm decorating this cake with blueberries and strawberries in a pattern. What berry should I put next?
We have leftover food. Which size of container should we use to store it for later? Why?
How many different types of vegetables are in the cart?
We have 14 candies and 6 of them are red. How many of the candies are not red?
Let's sort the laundry into white clothes and coloured clothes. Let's count the blue socks by 2 s . How many are there?
Twelve guests are coming to the party. There are 4 of us. Do we have enough plates and utensils for everyone at the party?

## Grades 4 to 6

We need to pay the cashier $\$ 4.85$. What combinations of coins could we use to give the cashier the exact amount?
It costs $\$ 6$ to buy 2 cartons of eggs. How much would it cost to buy


3 cartons of eggs?
This bag of soil is 20 L . How many I .5 L pots can we fill to grow our tomato plants? It takes us 25 minutes to get home from school. What time do we need to leave home to get to school by 8:50 a.m.?
How much do you think the groceries in our cart will cost? What are some strategies we can use to help us figure this out?
A new friend is being invited over. Write directions so that your friend will know how to get to our home.

## Grades 7 \& 8



One store is selling the game you want for $30 \%$ off $\$ 26$. Another store is selling the same game for $10 \%$ off $\$ 19.99$. Which store has the better deal?
This muffin recipe uses $\mathrm{I}-\mathrm{I} / 4$ cups of flour. How many cups will we need for $2-\mathrm{I} / 2$ batches? We can either buy a $5-\mathrm{kg}$ bag of potatoes for $\$ 3.50$ or a $3-\mathrm{kg}$ bag of potatoes for $\$ 2.40$. Which is the better value?

According to the weather channel, it will be $8^{\circ} \mathrm{C}$ today. The temperature will drop $10^{\circ} \mathrm{C}$ overnight. What will the temperature be tomorrow?
About how much is a $15 \%$ tip on the cost of this meal?
Predict changes in the batting average of your favourite baseball or cricket player, based on his/her performances in recent games.

## What's the right level of challenge?

Use this quick guide to create everyday number problems for your child at an appropriate level. The skills shown in this chart are ones your child should know by the end of each grade.


| 4 | Up to <br> $\$ 100$ | 4-digit whole numbers (e.g., <br> $4217+1914)$ | to $9 \times 9$ and 8I $\div 9$ |
| :---: | :--- | :--- | :--- |
| 5 | Up to <br> $\$ 1000$ | any whole numbers, decimals <br> to hundredths | multiply 2-digit whole numbers (e.g., <br> $24 \times 3 \mathrm{I}) ;$ divide 3-digit by I-digit <br> whole numbers (e.g., 346 $\div 7$ ) |
| 6 |  | any whole numbers, decimals <br> to thousandths | any whole numbers, decimals to <br> tenths by I-digit whole numbers (e.g., <br> $1.4 \times 4$ and 5.6 $\div 4)$ |
| 7 |  | fractions, decimals, and integers | decimals to thousandths by I-digit <br> whole numbers |
| 8 |  | fractions, decimals, percentages, <br> and integers | fractions, integers, decimals by <br> powers of I0 |

## Myths \& Facts

Myth: Math belongs in the classroom. I can't help my child learn math at home.

Fact: Teachers and parents play different roles in helping children learn math. Both roles are equally important. Your child's teacher is trained to teach all aspects of the math curriculum. Your role is to support your child in learning math, and to encourage his/her curiosity and interest about math. A key way you can do this is through everyday activities that involve math.

## Resources for you and your child

Video: Real Life Math, by Melissa Grillo (https://www.youtube.com/watch?v=HtqlIVN9bh8)


This educational video shows how math is all around us.
It gives everyday examples of patterns, symmetry,
measurement, geometry, and other math concepts.
Video: Sesame Street: Tyler Perry \& Elmo Eat a Plate of Math (https://www.youtube.com/watch? v=i9jKFgnd IsE)

This video shows that math is everywhere you look, including on a plate of nachos.
With a plate of nachos, you can count the chips, subtract chips, add chips, and more.
Article: Why It's Important to Talk Math with Kids, by Annie Murphy Paul (http://anniemurphypaul.com/2014/0I/the-importance-of-talking-math-with-kids/)

This article highlights the importance of talking about math with your child at a young age and, together, identifying math all around us.

Website: Talking Math with Your Kids, by Christopher Danielson (https://talkingmathwithkids.com/)

This blog includes various conversation topics, activities and resources you can use to encourage "math-talk" at home.

Booklet: Doing Mathematics with Your Child, Kindergarten to Grade 6: A Parent Guide (http://www.edu.gov.on.ca/eng/literacynumeracy/parentGuideNumEn.pdf)

This booklet includes tips and activities that you can use at home to extend math learning beyond the classroom. All activities are organized by grade and curriculum strand, from Kindergarten to Grade 6.

Website: mathies
(www.mathies.ca)
This website hosts a wealth of interactive resources, including games, learning tools, and activities, for students from Kindergarten through Grade I2. There is also a section for parents.

School: Ask your school and local librarian to suggest books that will help your child learn math, from counting books for young children to puzzle books for older ones.

Online: For older children, there are many educational computer games and online games that build math skills, as well as websites devoted to building math skills. Ask other parents to share the best resources they've discovered.


