SCHOLASTIC

Math Place

Grade 1
Ontario

Overview Guide SAMPLE

Math Place Ontario Edition
Aligns with 2020 Math Curriculum!

Make Your Classroom a Math Place!

Welcome to *Math Place*—a Comprehensive Set of Mathematics Resources

Choose what works best for you. Use all 3 kits for a complete grade resource, or choose individual resources to support and supplement your current math program to meet the six strands of the mathematics curriculum:

- **Social-Emotional Learning Skills**
- **Number**
- **Algebra**
- **Data and Probability**
- **Spatial Sense**
- **Financial Literacy**

Learning Through Problem Solving

Math Place is based on the research-supported belief that "Problem solving is central to doing mathematics... thus problem solving should be the mainstay of mathematical instruction" (Ontario Ministry of Education, 2020, p. 22). For more, see Problem Solving Experiences on pages 18–24.

Current Research and Spatial Thinking

Math Place provides teaching support by integrating the best of current research into classroom practices to develop a balance of learning fundamental concepts and foundational skills. Many of the lessons and activities are based on recent research that shows how spatial reasoning plays an integral role in learning math concepts across all strands. Providing opportunities for students to build concrete representations of math concepts leads to an ability to form and use mental models to solve math problems. For more, see The Role of Spatial Reasoning in Mathematics on pages 14–15.

High-Impact Teaching Approaches

Math Place adopts a balanced model of teaching math, offering a variety of high-impact instructional practices that support the gradual release of responsibility model to scaffold the learning (Ontario Ministry of Education, 2010, p. 35). These practices include problem-solving experiences, direct instruction, using tools and visual representations, Math Talks, flexible grouping, deliberate practice, and small-group instruction including guided math lessons. Together, they support conceptual learning, meaningful practice, and acquisition of the fundamental math concepts and operational skills. There is an emphasis on actively 'doing' math using a variety of concrete representations and tools, while engaging in problem solving situations that are relevant to students' daily lives. For more, see High-Impact Instructional Approaches on pages 10–11.

Linking Math to Literacy and Science

Math Place includes Read Alouds, as well as big book and little book titles with engaging visuals and supportive text to introduce various math concepts and to prompt student investigations. The texts and visuals also support literacy, science, and other curriculum areas, offering rich and meaningful contexts for learning math. As additional support, teaching plans for the integrated Read Aloud texts identify and incorporate effective literacy strategies. For more, see Cross-Curricular Connections on pages 31–33.

Concrete and Visual Representations

Math Place effectively explains how to incorporate objects, tools, and drawings, which are essential for students of all ages to conceptually understand the math. Research indicates that students learn math more effectively by using and manipulating concrete objects to make their thinking visible. This allows students to progress from concrete to pictorial to symbolic representations and more abstract ways of thinking. For more, see Concrete Representations and Tools on pages 15–16.

Support of Differentiated Instruction

Math Place allows for differentiated learning with flexible groupings, and lessons and individual problems that can be tailored to meet the needs of all your students. For more, see Meeting the Needs of All Students on pages 27–30.

Assessment to Inform Instruction

Math Place offers ongoing assessment of students' understanding to guide future instruction. Assessment Opportunities within the lessons offer prompts and suggestions on how to triangulate evidence through observations, conversations, and products. Teacher Look-Fors serve as a guide for co-constructing success criteria with your students and for establishing criteria for evaluation. For more, see Assessment on pages 25–26.

Coding and Mathematical Modelling

Math Place integrates coding concepts and mathematical modelling throughout the strands so students can apply reasoning, communicating, and critical thinking in several different contexts. For more, see Coding and Mathematical Modelling on pages 23–24.

Social-Emotional Learning Skills and Positive Attitudes Toward Math

Math Place provides introductory lessons that lay the foundation for developing social-emotional learning skills and positive attitudes toward math. This can be continually reinforced throughout the year by using the Building Social-Emotional Learning Skills prompts that are embedded in many of the lessons. For example, students learn to view mistakes as learning opportunities and to recognize that their efforts and perseverance will be worthwhile. For more, see Building Social-Emotional Learning Skills on pages 12–14. In addition, the lesson, "Thinking Like a Mathematician," can be found on pages 34–36.

Math Talk

Math Place supports the understanding of math concepts through purposeful discussions that are embedded in every lesson. There are also additional Math Talks linked to many of the lessons to reinforce and extend the learning and offer further investigation. For more, see Math Talk on pages 16–18.

The Role of Spatial Reasoning in Mathematics

What Is Spatial Reasoning?

Research indicates that spatial reasoning plays a significant role in understanding math concepts and being able to effectively solve problems. It is also a better predictor of later math performance than early math and reading skills (Duncan, et al., 2007).

Researcher Nora Newcombe states that spatial thinking involves "the locations of objects, their shapes, their relations to each other, and the paths they take as they move" (Newcombe, 2010, p. 30). This is not one skill, but several skills that are intertwined and that support each other.

We are immersed in spatial thinking throughout our day, either physically or mentally, as we navigate around our world, pack boxes, or visualize whether our car will fit in a parking space. Early experiences with spatial reasoning can help students maximize their potential in this area. Your attitude and confidence level, as well as those of your students, also play a role. A recent study reveals that teachers' own comfort level with spatial activities is related to their students' growth in spatial abilities throughout the year, and that "teachers high in anxiety about spatial reasoning might avoid incorporating spatial activities in the classroom" (Ontario Ministry of Education, 2014, p. 20). *Math Place* is designed to support you and your students in developing and refining spatial reasoning skills.

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The good news is that spatial reasoning is malleable and can be improved. Through modelling, you can also instill confidence in your students and challenge them to persevere through spatial tasks.

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Spatial Reasoning Focus in *Math Place*

While people often assume that spatial reasoning is only embedded in spacial sense, it actually plays a significant role in all the strands, and particularly in number in the early years. For example, students should create quantities with concrete objects, tools, and visual representations, rather than just interpreting their value in their symbolic, numerical form. This allows them to 'see' the differences in the collections they made, or the effect that various operations have on quantity. While measuring quantities with concrete materials and tools, students can visually estimate the attributes of items and make comparisons. Similarly, when reading concrete graphs, students can effectively use the visual images to interpret and compare data, and make inferences. This helps students create mental images of the concepts, which leads to more effective problem solving.

Use a variety of concrete objects to develop spatial thinking and help students conceptually understand the math.

The lessons in this resource are designed to support and capitalize on the development of spatial reasoning. Embedded in the lessons are visualization activities that are excellent for promoting spatial thinking, acquiring mental math strategies, and developing automaticity with number facts and calculations.

Sample of Rotation Schedule

Activity/Da	Group A	Group B	Group C	Group D
Session 1	Guided math lesson with teacher	Centre 5	Centre 4	Centre 3
Session 2	Centre 2	Guided math lesson with teacher	Centre 5	Centre 4
Session 3	Centre 3	Centre 2	Guided math lesson with teacher	Centre 5

- The key is to get your students to be able to work for 15 minutes independently, without relying on your guidance. This can be achieved by practising routines early in the year.

  Make a chart of things that students can do if they get 'stuck,' rather than asking you. The way in which the activities are initially introduced is critical to this process so students are clear on the expectations and questions can be addressed. It can be beneficial to have some students model the process of the activities or games in front of the class, while you explain the task.

Guided Math Lessons Using Math Little Books

In the resource, there are two guided math lessons per strand that use a fiction or non-fiction book to uncover the math. The purposes of guided math lessons in relation to the little books are to:

- offer context for the math
- help students see the relevance of math in their lives and recognize the value of becoming proficient at solving problems
- use the text to help students develop math strategies for solving the problems
- monitor and assess students' mathematical understanding of concepts and abilities to apply skills in new situations
- monitor and assess students' problem solving abilities in terms of the mathematical processes, such as reflecting and connecting

Coding concepts are integrated across the strands, such as in Number, Spatial Sense, and Algebra.

Coding Concepts

Coding is a critical skill for students to develop since technology plays such an integral role in our lives. In *Math Place*, students engage in coding activities without a computer by reading, writing, and altering the sequence of sets of instructions (code) in order to achieve a desired

outcome. These activities support coding with technology since they develop logical thinking, communicating, and reasoning skills. Coding activities are integrated across the strands, such as in Number, Spatial Sense, and Algebra.

Mathematical Modelling Process

Mathematical modelling is a process that allows students to develop and refine a model that can be used to solve a problem or make decisions.

Mathematical modelling is a process that allows students to develop, analyse, and refine a model that can be used to solve a problem or make decisions. The process is cyclic in nature as students move back and forth and between the four components as they develop the model, compare it to the real-life situation it is modelling, and then make any necessary adjustments.

The four components include:

- understanding the problem;
- analysing the situation;
- creating a mathematical model; and
- analysing and assessing the model.

Also involved are applying social-emotional learning skills and the mathematical processes. Mathematical modelling can involve a variety of math concepts and is therefore applied across the strands.

Further Practice

At the end of many lessons, there are activities that offer additional reinforcement and practice of skills and concepts, often in a different context, so students can apply what they have learned to new situations. These activities can be completed by the whole class, small groups, partners, or individuals.

Students need individual time to practise since they may be successful solving problems with others, but have more difficulty when tackling a problem on their own. Examples of problems for students to solve independently and prompts for math journals are also offered in this section. All activities, including journal tasks, can contribute to ongoing assessment for learning as they are excellent indicators of students' understanding.

Reinforcement Activities

At the end of some units are reinforcement activities that can be used anytime throughout the unit, either as whole- or small-group activities, or as centres. They offer further practice of skills and concepts. While problem solving lessons may introduce or even extend understanding of a concept, students still require practice time to clearly consolidate their thinking and become more proficient at applying skills in different situations.

Assessment

The goal of assessment is to improve student learning and is therefore a critical component since it drives instruction.

- **Assessment for learning** involves the continuous process of gathering evidence of student learning and using it to provide feedback and adapt instruction.
- **Assessment as learning** focuses on the students and their ability to monitor their own learning. Students need to know what the learning goals are and benefit from co-creating success criteria in student-friendly language so they have clear indicators of learning.
- **Assessment of learning** involves interpreting gathered evidence to summarize and make a judgement on how the student has achieved the learning goals and what is outlined in the curriculum.

Math Place addresses all three aspects of assessment, with the major focus being on assessment for learning and how it evolves within the lessons and from lesson to lesson.

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Assessment for Learning

Possible Learning Goals and Teacher Look-Fors

- There are **Possible Learning Goals**, which outline the purpose of the lessons, based on the curriculum expectations. These can easily be adapted according to the goals of the teacher and the needs of the students.
- The **Teacher Look-Fors** break down the learning goals into specific observable behaviours that reflect students' understanding of the math. Teachers can use these to monitor student learning throughout the lesson. Modifiable *Observational Assessment Tracking Sheets* based on the Teacher Look-Fors can be found on the Teacher's Website.

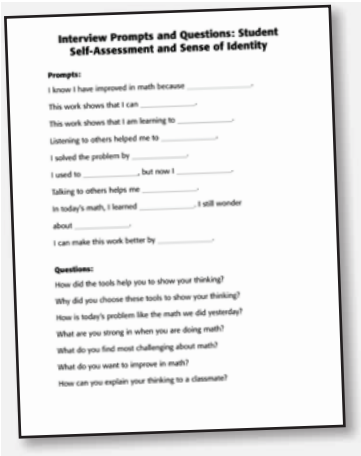
Assessment Opportunities: Triangulation of Evidence

- Anne Davies is one educator who has been instrumental in the research behind triangulating evidence. This involves gathering data from three different sources, namely observations, conversations, and products (Davies, p. 95). While educators are usually comfortable with assessing the products that student generate (e.g., students' recorded work on BLM recording sheets, problem solving on chart paper, photos of work such as models made with concrete representations, and work in their math journals), observations and conversations are less clear. In each *Math Place* lesson there are **Assessment Opportunities**, which highlight

what to observe that reflect student understanding. The Observations section outlines what to listen and look for as students work on the math to determine what they know, do, and understand. In some cases, signs of misconceptions are highlighted so they can be addressed. The Conversations section offers prompts you can ask to further probe for understanding. In some cases, possible responses from the students are offered to give teachers an idea of the feedback they can offer to move the learning forward or clear up any misconceptions. The conversations outlined within the lessons can be used as **individual interviews** to check for understanding or to use in assessment of learning.

Assessment as Learning

- In *Math Place* there are several means for helping your students monitor their own learning. The Possible Learning Goals can be adapted into student-friendly language and brought to the forefront during Consolidation discussions. The Teacher Look-Fors can act as a guide for co-creating success criteria, which students can use to reflect on and assess what they have learned.


Interview Prompts and Questions: Student Self-Assessment and Sense of Identity

Prompts:

I know I have improved in math because _____.

This work shows that I can _____.

This work shows that I am learning to _____.

Listening to others helped me to _____.

I solved the problem by _____.

I used to _____, but now I _____.

Talking to others helps me _____.

In today's math, I learned _____. I still wonder about _____.

I can make this work better by _____.

Questions:

How did the tools help you to show your thinking?

Why did you choose these tools to show your thinking?

How is today's problem like the math we did yesterday?

What are you strong in when you are doing math?

What do you find most challenging about math?

What do you want to improve in math?

How can you explain your thinking to a classmate?

- You can also hold individual conferences with students to help them reflect on their own learning. See page 38 for *Interview Prompts and Questions: Student Self-Assessment and Sense of Identity.* Select the prompts and questions that are most suitable for your students. A modifiable BLM version of this page is available on the Teacher's Website.
- Helping students monitor their self-confidence and attitudes toward math is critical to their learning. Students need to develop social-emotional learning skills and the attitude that with time and effort they can learn math. In *Math Place,* this is continually revisited throughout the resource. Many of the lessons have Building Social-Emotional Learning Skills prompts which offer suggestions directly related to the lesson that encourage students to reflect on themselves as mathematical learners and what they can do to continually develop a positive attitude toward mathematics.

Assessment of Learning

- The Possible Learning Goals and Teacher Look-Fors can be used as criteria to create a continuum or rubric for assessing what students can do and how students have mastered certain concepts and skills. The Possible Learning Goals can outline the learning that is being assessed. The Teacher Look-Fors can be broken into the various categories in the assessment charts to form the criteria so there are observable behaviours to assess each category. An example of continua/rubrics for Ontario is offered on the Teacher's Website.

Meeting the Needs of All Students

Student Recording of Thinking

Grade one students are in the early stages of writing and may find it difficult to record their thinking while problem solving. It is therefore important that students have several ways to express their ideas. For example, they can verbally state an idea and a teacher can scribe by writing, or record it using technology.

Students should use concrete objects to represent their ideas, which can serve as a focal point for getting students to verbally explain what they did. Paying attention to their actions with the tools, asking what their model represents or why they moved some parts can be very revealing. It is valuable to take photos of students' models so they can be discussed during the consolidation.

Students should also express their thinking through drawings, symbols, and/or written words. In some of the earlier lessons, Blackline Masters (BLMs) are suggested to help students organize and express their ideas in writing. Later in the year, students are given more flexibility in how they wish to express their thinking. For example, you might provide them with a blank piece of chart paper to record their ideas (chart paper cut into halves or fourths is good since the work is big enough to be seen by all in whole-group discussions). Students can use markers to record their ideas, and if they switch their thinking, to 'x' out the part they are no longer using, rather than trying to erase or completely cover it up. In this way, you can better follow the students' thinking processes when examining their work. It also reinforces the idea that mistakes are valuable learning opportunities. It is important to pay more attention to the thinking that students are expressing, rather than the actual written product, since the work may not be reflective of what they actually know. Questioning allows students to expand upon their work with verbal explanations.

Flexibility in Grouping Students

Students need opportunities to work on their own and to collaborate with others. They also need practice time to consolidate or 'mathematize' what they have learned and to apply it in various ways to new situations within meaningful contexts.

In many of the lessons, although it is suggested that the Minds On and Consolidation activities take place with the entire class, these activities can also be carried out with small groups. Throughout these sessions, students can 'turn and talk' with a partner to discuss an idea before presenting it to the rest of the group. Students also learn to listen to each other and to respond to their peers' ideas.

Throughout the lessons, it is often recommended that students engage in the Working On It problem solving in partners. This is often better than groups of four or five for young students, since all students may not interact or express their ideas in larger groups.

With partners, students also need to learn how to collaborate. At first, they may just sit side by side and solve the problem individually. A few prompts from you can encourage interaction. For example, you may ask a question and have both students answer parts of it, or you may encourage one student to explain to the other what he/she is thinking or doing. Over time, students will become more proficient at working together and creating a collaborative solution.

It is helpful if students work with many different partners throughout the year so they can benefit from different ideas, strategies, and points of view. Although partners are recommended, there may be times when you decide to have students work individually or in small groups, depending on the circumstances in your class.

Differentiation

Lessons and problems can be differentiated to meet the specific needs of students.

Lessons and problems can be differentiated to meet the specific needs of students. For example, by making the numbers simpler or more complex, depending on individual needs, students can work on the same math concept and engage in rich problem solving tasks, yet work with numbers they understand.

After consolidating a lesson, it may become evident that all or only some students require more experience to master a concept. This can be accomplished by changing the numbers or context to offer a variation of the completed lesson to students who need more reinforcement. Students can also be encouraged to solve the varied problem in another way or use different materials to show their thinking.

It is also beneficial to meet with students in guided math lessons (see description, pages 21–23) as they problem solve, so they can express their ideas and any misconceptions can be identified and clarified. Throughout the lessons and activities, there are tips on how to differentiate specific tasks.

English Language Learners

Teaching Tip

When conversing with beginning ELLs, you may use first language buddies so students can think in their first language. As well, asking questions for which students can answer by pointing, matching, or choosing between two choices are helpful strategies.

All students need to discuss math and learn the appropriate terms to describe their thinking, but it is a greater challenge for students who have a different first language and are just learning English.

It is sometimes assumed that, since English Language Learners (ELLs) cannot express all of their ideas in English, they require easier math tasks. ELLs actually benefit from collaboratively participating in the same activities as other students. Although they may not share their ideas within the group, they can work with concrete materials and listen to the conversations of others, thereby acquiring mathematical language. They also develop self-confidence as they manipulate the concrete materials and participate within a group.

While ELLs may go through a silent period, they are still learning and processing the math. Since all grade one students need to learn the correct mathematical terms, it is valuable to offer the vocabulary as it arises during the Minds On and Consolidation class discussions. Displaying these terms on the Math Word Wall, and drawing attention to them by playing games on a daily basis, will also help to encourage the use of math vocabulary in all students. In addition, ELLs benefit greatly from having visuals paired with instructions or problems. This can also assist all students who are in the early stages of learning to read.

Students with Learning Disabilities

Students with learning disabilities are usually not identified until the later grades. If you have students who have been identified as having a learning disability, it is important to realize that they are average to above average in overall cognitive abilities and should be able to attain the math concepts and skills outlined in the grade-appropriate curriculum by being given accommodations.

Taking an asset-based look at all students is best, identifying their strengths and areas of need. Accommodations can be designed to use their strengths to leverage their needs. For example, a student with a strength in perceptual reasoning and a need in working memory can benefit from having visuals, such as pictures and charts, so they do not have to hold all the information in their minds when solving a problem. These accommodations can be offered to any students who may benefit from the additional support. This aligns with the underlying principle of Universal Design for Learning, "necessary for some, and good for all" (Ontario Ministry of Education, 2013, p. 33).

Students with learning disabilities benefit from working with their peers in group situations, since the collaborative interaction gives them support, rather than the feeling of isolation that can be created when working alone.

Math Vocabulary and the Math Word Wall

Building a Math Word Wall with students is more meaningful than putting up premade words all at once.

Each lesson highlights the math vocabulary that pertains to the lesson, including terms that were previously learned but are important to current understanding, or new vocabulary. Rather than introducing vocabulary before the lesson, it is more meaningful to highlight or introduce the words as the related concept arises within the lesson. This provides students with an immediate example of a term that is relevant to what they are doing. If students describe a math concept in common language or through their physical model, offer the formal mathematical term and clearly link it to its meaning and an example. At this point, add the word to the Math Word Wall.

Building a Math Word Wall with students is more meaningful than putting up premade words all at once. As vocabulary arises in class, print the words on cards so they are visible from any point in the room. They can also be accompanied by a visual, which conveys word meaning, and arranged by strand so related words are together.

Every couple of days, take two or three minutes to ask questions about the Math Word Wall. For example, you can ask, "I am thinking of a word that means a whole that is divided into two equal pieces," or "What do you know about a dime?" This can also be done incidentally, for example, while students are waiting in line. It is important to draw attention to words that were used previously so students remember their meanings over time.

During a lesson, if a student describes a concept without using the mathematical term, it is an excellent opportunity to offer or ask for the vocabulary and have students locate it on the Math Word Wall. These activities do not take a great deal of time or effort to create or reinforce, but the benefits are substantial as students naturally integrate the vocabulary into their oral dialogue and written responses.