

Making Math Meaningful Braille Resource Kit

A Resource Project by the Provincial Resource Centre
for the Visually Impaired (PRCVI)

PRCVI is a Ministry of Education Provincial Resource Program

Provincial Resource Centre for the Visually Impaired (PRCVI)

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Project Rationale

The MMM Braille Resource Kit Project was developed, in 2008, in response to frequent and ardent requests for resources to nurture the development of early mathematics concepts in young children who are blind or visually impaired. The MMM Braille Resource Kit includes research articles, resource and materials information, activity examples, and strategy suggestions that support the development of number sense in young children.

The activities included in the MMM Braille Resource Kit are cross-referenced to the Prescribed Learning Outcomes for Mathematics K-7 for British Columbia and to the activity descriptions in the text Making Math Meaningful.

*** Prescribed Learning Outcome**

The prescribed learning outcomes set the learning standards for the provincial K-12 education system and form the prescribed curriculum for British Columbia.

They are statements of what students are expected to know and do at the end of an indicated grade or course.

<http://www.bced.gov.bc.ca/irp/mathk72007.pdf>

As we began to search for reference texts for this project, it was our good fortune to learn that Dr. Werner Liedtke, professor emeritus from the University of Victoria, was in the process of writing a book on the topic of “how to nurture mathematics growth in young children ages 4-7.”

We have chosen his book, Making Mathematics Meaningful, as the primary resource text for this project. The research-based information that is presented and the activities, that are carefully described, will help educators and parents understand the environment and experiences needed to promote development of number sense in young children. Making Mathematics Meaningful is scheduled to be published during the summer of 2008. We also felt that Making Math Meaningful was the perfect title for our project work and Dr. Liedtke has kindly allowed us to name our kit the Making Math Meaningful Braille Resource Kit.

The authors would like to express their special thanks to Dr. Werner Liedtke for his interest in this project. Dr. Werner Liedtke is a member of the WNCP development group, author of numerous books and articles on early mathematics development for young children and also published articles related to development of mathematics concepts in young children who are blind.

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Contributors

Graham Cook

Graham Cook studied with Phil Hatlen, and the late Sally Mangold at San Francisco State University in the early 1980's. Graham Cook was selected as the Braille Challenge 2006 Teacher of the Year. This international award honors a teacher of visually impaired students who demonstrates outstanding skills and abilities in teaching braille to children in elementary, middle or high school, and in so doing, promotes braille literacy. Graham is a gifted teacher who is passionate about providing his students with rich learning experiences. Graham is BC vision teacher for BC School Districts 59 and 60.

Harvinder Nahal

Harvinder completed her diploma in teaching of the visually impaired from University of British Columbia in 1981 and completed Orientation and Mobility Training, as part of Master's Program in special Education, from UBC in 1987. Harvinder has been teaching students with visual impairment in Richmond, B.C., since 1982. She has worked with students from a variety of different cultures and backgrounds with and without English as second language. Harvinder has worked with students from K-12 with or without other disabilities.

Michael Mizera

Michael had the good fortune of being in Sally Rogow's classes at UBC. He graduated from one of the last cohorts that Sally taught. As a teacher of students who are blind or visually impaired, with the Vancouver School Board, Michael had many opportunities to work with students who used Braille for Math and Science. He helped to develop the BAA course curriculum for Braille 10, 11, 12, which gave students learning Braille the opportunity to receive credit for these extended core curriculum courses. Working at the Bowen Island Braille Literacy Camp has provided the opportunity to interact with many colleagues, students and community members at large in a non-traditional educational setting. Michael's current position as Provincial Vision Outreach Coordinator provides the opportunity to work with teachers of visually impaired students throughout British Columbia.

Constance McAvoy

Constance received her Bachelor of Education with a major in Mathematics from the University of Saskatchewan. She received her Master of Arts from Gonzaga University in 1998. She has many years experience teaching and tutoring Mathematics in Saskatchewan and British Columbia. Constance currently has the position of resources and projects coordinator for PRCVI and SET-BC. Constance worked on many resource projects for PRCVI and SET-BC including the GPS Project, the Expanded Core Curriculum Project - Technology, the Vision Technology Resource Guide.

Notable Quotes on Number Sense and Numeracy

- 1st. Classroom settings that focus on the development of number sense can contribute to such favorable outcomes of mathematics learning as visualization, flexible thinking, problem solving strategies, metacognition, confidence, risk taking, and to outcomes in other areas as well. (Liedtke 2007)
- 2nd. In brain-based learning, educators see learners as active participants in the learning process. The teacher is not the deliverer of knowledge, but the facilitator and intelligent guide who engages student interest in learning. Students and teachers become partners in the pursuit of understanding. (Caine and Caine, "Education on the Edge of Possibility")
- 3rd. Schools and communities need to work together to build an exciting and effective mathematics curriculum for young children. (Canadian Children)
- 4th. Goals that are part of numeracy are unlikely to be reached without a skilful teacher who is able to create an appropriate classroom atmosphere and orchestrate discussions that provide opportunities for student to think, to think about thinking and to explain and compare thinking or thinking strategies. Without a major commitment by a teacher to experiences that develop number sense, many young students will never understand numbers in any way other than counting.

It (number sense) develops gradually as a result of exploring numbers and visualizing them in a variety of contexts in an environment that fosters curiosity. [(Howden, 1989) Liedtke 1998]
- 5th. An emphasis on numeracy outcomes, no matter which definition of numeracy or which outcomes are aspired to, indicates that early childhood professionals and parents are being faced with challenges to their thinking about, and their strategies for, student learning in the early childhood years. Doig, McCrae, Rowe; A Good Start To Numeracy. Effective numeracy strategies from research and practice in early childhood. © Commonwealth of Australia 2003
- 6th. Number Sense and Mathematics Instruction (summary)
Mathematics is an integral part of the human experience and numeracy is an important as literacy.

Number sense is an intuition about numbers that is not developed through direct instruction but rather is a by-product of learning experiences. Number sense develops gradually as a result of exploring numbers and visualizing them. Conceptual confusion occurs when children are unable to form meaningful models of reality. The development of number sense is encouraged through curiosity and flexible thinking in an environment where learners are encouraged through discussion to – think – explain – and compare thinking strategies to take risks to connect new ideas to what they already know (e.g. how many ways can you make 5).

Good mathematics instruction develops students who value mathematics, are confident, mathematical problem solvers, who communicate mathematically, reason mathematically, and use appropriate related terminology (by MMM Braille Resource Kit editor).

Making Math Meaningful Kit Contents

In 2008-2009, 10 teams from British Columbia will have the opportunity to implement the Making Math Meaningful Braille Resource Kit.

The contents of the kit include:

- Math Resources for Use in Mathematics instruction for students who are blind or visually impaired (includes all resources listed in resource showcase list)
- Making Math Meaningful Book by W. Liedtke
- MMM Resource Document in print form
- CD containing electronic version of MMM Resource Document
- Assessment forms
- Project survey and feedback forms

Applications are invited by teachers of young braille using students grades k-1 in British Columbia who are interested in to participating in the MMM Braille Resource Project study. Successful participants will use the kit in early mathematics concept development activities and complete feedback forms on the usefulness of the kit materials and resources. Common Assessment tools will be used to record entry and exit performance of students who participated.

Resources

The resources section , pages 9 - 46, entitled the **Resources Showcase** for the MMM Braille Resource Kit was developed to provide resource information to parents and educators interested in nurturing the growth of early mathematics concepts in young children who are blind or visually impaired. We hope it assists educators and parents and families to learn about, acquire, and use materials that support access to, nurturing of, and growth in mathematics concepts for young students with visual impairments.

Video Presentation

The accompanying MMM Braille Resource Project video presentation was developed to assist educators and parents to learn about, acquire, and use materials that support access to mathematics activities for young students with visual impairments. In this video, experienced teachers of students with visual impairments, describe materials and activities' adaptations that they have used to enhance accessibility and understanding of mathematics concepts.

Resources Showcase

Making Math Meaningful Braille Resource Kit (MMM Braille Resource Kit)

The MMM Braille Resource Project was created and funded by PRCVI to support the development of early mathematics concepts in young children who are blind or visually impaired. The MMM Braille Resource Kit includes resources and materials information, activity examples, and strategy suggestions to support the development of number sense in young children.

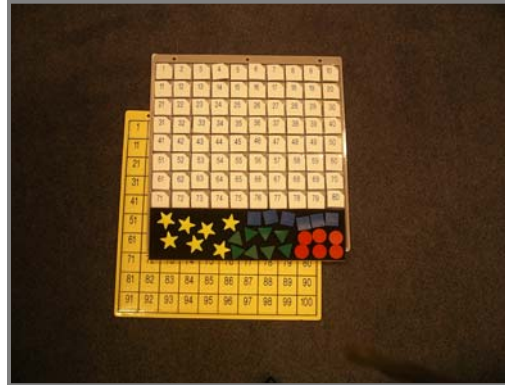
The print document entitled the **Resources Showcase** for the MMM Braille Resource Kit was developed to provide resource information to parents and educators interested in nurturing the growth of early mathematics concepts in young children who are blind or visually impaired. We hope it assists educators and parents and families to learn about, acquire, and use materials that support access to and growth in mathematics concepts for young students with visual impairments.

You are also invited to watch the accompanying video presentation. This short video is presented, by experienced teachers of students with visual impairments, who describe materials and activities' adaptations that they have found useful to enhance accessibility and understanding of mathematics concepts.

In 2008-2009, 10 teams from British Columbia will have the opportunity to implement the Making Math Meaningful Braille Resource Kit. Applications are invited by teachers of young braille using students grades k-1 in British Columbia who are interested in participating in the MMM Braille Resource Project study. Successful participants will use the kit in early mathematics concept development activities and complete feedback forms on the usefulness of the kit materials and resources. Common Assessment tools will be used to record entry and exit performance of students who participated.

MMM Braille Resource Kit Contents List

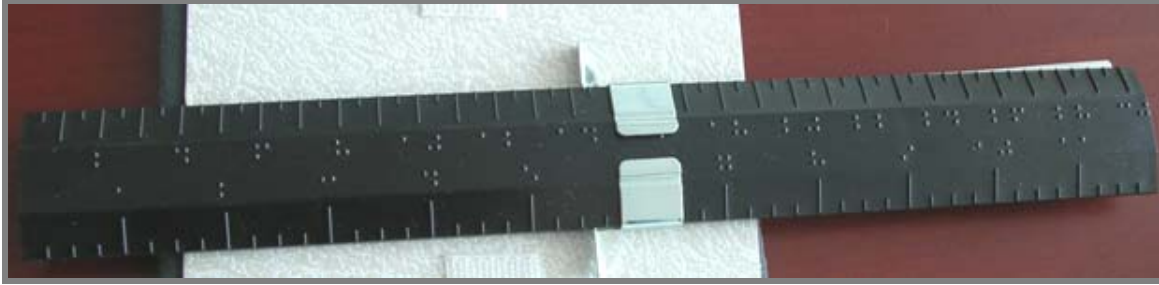
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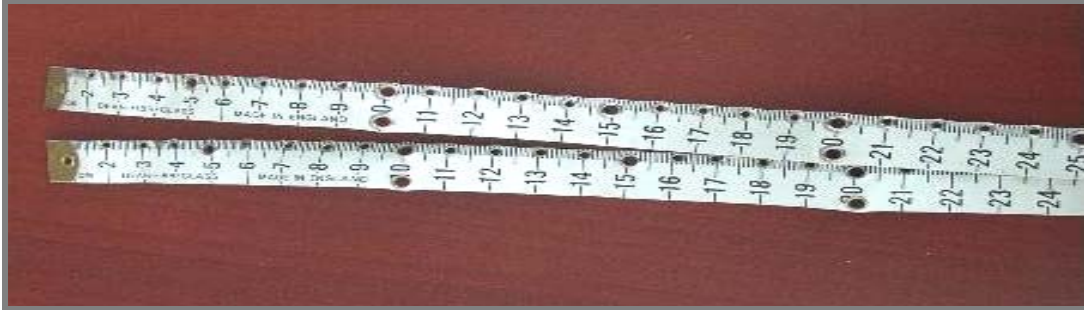
Item name:	Hundreds Boards with Shapes
Supplier:	American Printing House for the Blind (APH) On one of the boards the braille and bold print numbers are attached with Velcro, the other board has permanently attached numbers. The board also comes with four different types of shapes that can be added and removed.
Activity:	The hundreds board can be used for patterning, counting, ordering numbers, comparing numbers etc.
MMM resource reference:	This activity is described in Making Math Meaningful For Young Children, Age 4-7 Nurturing Growth (pg. 42) The activity focuses on development of learning outcomes related to Number, Patterns & Relations
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A1 say the number sequence A3 demonstrate an understanding of counting



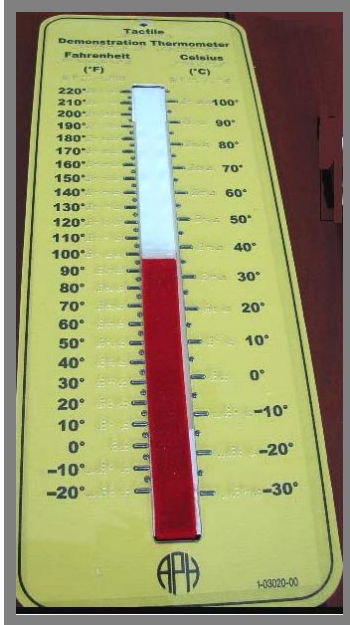
Item name:	Bingo Cards
Supplier:	<p>Independent Living Aids www.independentliving.com/ item no. 118743 cards in bundles of 20 for \$22 need braille added or Regular bingo cards from education supply store - braille added - velcro squares have been attached so that tactile markers can be added when the numbers are called</p>
Activity:	<p>These bingo boards are a very inclusive adaptation as all students both sighted and those with visual impairments can use the same boards.</p> <p>Bingo is a great activity that encourages students to scan numbers quickly. They have to promptly find the correct letter column (B-I-N-G-O) and check the five numbers listed below. The excitement can motivate some slower braille readers to speed up.</p> <p>Concepts such as diagonal, horizontal, and vertical can be discussed.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A4 - represent and describe numbers concretely, pictorially, and symbolically



Item name:	Braille/Tactile Ruler
Supplier:	This 'all metric' ruler will avoid any confusion that often occurs with the standard metric/imperial ruler that most braille using students currently have. The braille, raised cm lines and tactile notches on the side of the ruler make this an excellent ruler for the elementary years. The small rubber pads on the base of the ruler stop any slippage.
Activity:	<p>The ruler can be used to measure items that have a flat surface. Some pre-teaching will need to be provided before students can use it independently in the classroom.</p> <p>Activity: Sorting According To Length</p> <p>Provide students with a variety of items at different lengths i.e. paper clip, straws, string, popsicle sticks etc.</p> <p>Place a paper clip on one plate and keep the other plate empty. Have the student place the items that are the same length as the paper clip on the paper clip plate and place the things that are not as long on the other plate.</p> <p>In addition have the student measure the paper clip and other items using the Braille ruler. After the student has measured a few things have them predict the length of certain items.</p>
MMM resource reference:	This activity is described in Making Math Meaningful For Young Children, Age 4-7 Nurturing Growth (pg. 132)
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C1 - demonstrate an understanding of measurement as a process of comparing A4 - represent and describe numbers concretely, pictorially, and symbolically



Item name:	Tactile Tape Measure
Supplier:	Canadian National Institute for the Blind (CNIB) This is a tactile tape measure. There are small metal eyelets indicating each cm, a larger eyelet indicates every 5 th cm and two larger eyelets indicate every 10 th cm.
Activity:	As the tactile tape measure doesn't rely on braille it can be a useful math tool for younger, pre-braille students. The tape measure can be used to develop tactile counting skills in a linear sequence, just like a number line. In later grades it can actually be used for measuring. Have the student start tactually counting the eyelets at one end by passing the tape measure through their fingers. Have them observe the larger 5 th eyelet and the two larger 10 th eyelets. Use for development of learning outcomes related to Numbers; number sequence, skip counting 5, 10, 15, 20 etc. and Patterns & Relations.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C1 - demonstrate an understanding of measurement as a process of comparing C2 - relate the size of a unit of measure to the number of units (limited to non-standard units) used to measure length and mass (weight) C3 demonstrate an understanding of measuring length units, and make statements of comparison C4 - measure length to the nearest non-standard unit by using multiple copies of a unit using a single copy of a unit (iteration process)



Item name:	Thermometer
Supplier:	American Printing House for the Blind Kelvin Talking Thermostat \$75 (1-03973-00) Indoor Outdoor Talking Thermometer LS&S (learning sight and sound made easier) http://www.lssproducts.com/product/4511/household-items
Activity:	
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A3 describe order or relative position using ordinal numbers A5 compare and order numbers



Item name:	Refreshable braille cells
Supplier:	American Printing House for the Blind (APH) This is a 10-cell refreshable braille display.
Activity:	The refreshable braille display can be used in the classroom to quickly indicate a new Nemeth symbol. The refreshable braille display can be used to demonstrate basic patterning. Students can take turns with other students creating and explaining different pattern combinations.
MMM resource reference:	This activity focuses on development of learning outcomes related to Number, Patterns & Relations.
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A



Item name:	<p>Snowman Hand made tactiles & snowmen</p>
Supplier:	<p>handmade These tactile snowmen have attachable hats with print and braille numbers. The body of the snowman has a strip of Velcro on which the corresponding number of buttons can be attached.</p>
Activity:	<p>This is a fun way to teach students the match between numbers and their respective quantity.</p> <p>Students select and attach a numbered hat along with the correct number of buttons.</p>
MMM resource reference:	<p>This activity focuses on development of learning outcomes related to Number (a numeral 1-10 and its respective quantity)</p>
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A4 represent and describe numbers to 100, concretely, pictorially, and symbolically B2 demonstrate an understanding of increasing patterns</p>



Item name:	Glove and Puppet
Supplier:	Glove from educational supply store Props ordered from story prop sites This special glove has Velcro attached on each finger and on the palm. Various items can be attached such as Old Mc Donald and his farm animals or The Old Lady Who Swallowed A Fly.
Activity:	The glove and attachments can be used to encourage math and singing activities. The glove can be used to teach number sense. Addition: Old McDonald – adding a new animal after each verse. Subtraction: The Old Lady Who Swallowed A Fly – feeding an animal to the lady after each verse.
MMM resource reference:	This activity is described in Making Math Meaningful For Young Children, Age 4-7 Nurturing Growth (pg. 73 using the glove and Velcro animals) This activity focuses on development of learning outcomes related to Number, Patterns & Relations.
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A1 say the number sequence A3 demonstrate an understanding of counting A4 represent and describe numbers 2 to 10, concretely and pictorially



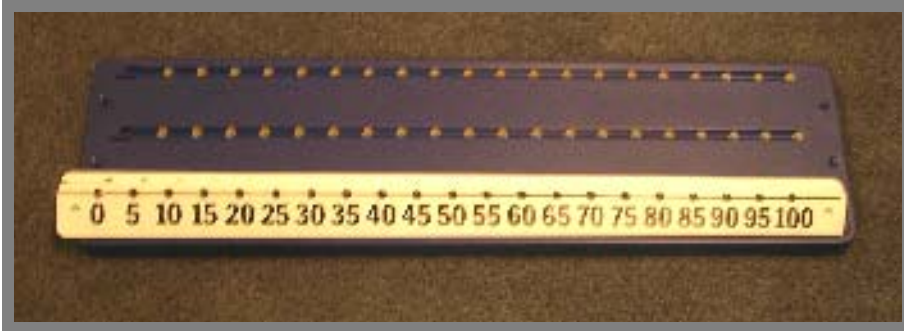
Item name:	Calendar Braille & Large Print Classroom Calendar.
Supplier:	American Printing House for the Blind (APH) Classroom Calendar kit 1-18970-00
Activity:	<p>This calendar can be used again and again to teach any month of the year. After putting on the month, year, and names of the days of the week, a new number for each day can be added by the student until the month is complete. Symbols like heart can be used to point out special days and make it more interesting. These symbols can be adapted to feel little more realistic and meaningful for a student with vision impairment.</p> <p>Favorite use: Have the student with vision impairment actively participate in daily calendar activity along with their sighted peers. It helps them learn concepts like number recognition, one-to-one correspondence, sequencing numbers, and development of time awareness.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A1 say the number sequence</p> <p>A3 demonstrate an understanding of counting</p> <p>C1 relate the passage of time to common activities using non-standard and standard units (minutes, hours, days, weeks, months, years)</p> <p>C1 relate the number of days to a week and the number of months to a year in a problem-solving context</p>



Item name:	Modern Counting Abacus
Supplier:	American Printing House for the Blind Beginner's Abacus (includes print guidebook): 1-03180-00 -- \$25.00 And Mathematics/educational supply stores
Activity:	<p>The abacus is a manipulative tool and is used to teach place value of ones, tens, hundreds and thousands and help students understand the meaning of numbers up to 9,999. It can be used to teach one on one correspondence, counting, place value, addition and subtraction. For a student with visual impairment, learning the efficient use of abacus is highly beneficial to understand mathematical computations and is a big time saver in the long run. An early introduction to it establishes strong foundation for moving on to Cranmer's Abacus. Use of Abacus is quite parallel to the use of paper and pencil for solving math problems. It is a good back up for a calculator.</p> <p style="text-align: center;">Favorite use: Prepare students to advance from the concrete stages of math to more abstract representation..</p>

Online resource reference:	<p>from Bob MacCulley at The University of Massachusetts at Boston. Online announcing online abacus tutorial for teachers http://media.umb.edu/p87083467/ https://email.umb.edu/exchweb/bin/redirect.asp?URL=http://media.umb.edu/p87083467/ Introduction to the Cranmer Abacus http://media.umb.edu/p85777603/ Cranmer Abacus - Addition http://media.umb.edu/p42763302/ Cranmer Abacus - Subtraction http://media.umb.edu/p83977423/ Cranmer Abacus - Multiplication http://media.umb.edu/p95088534/ Cranmer Abacus - Short Division</p>
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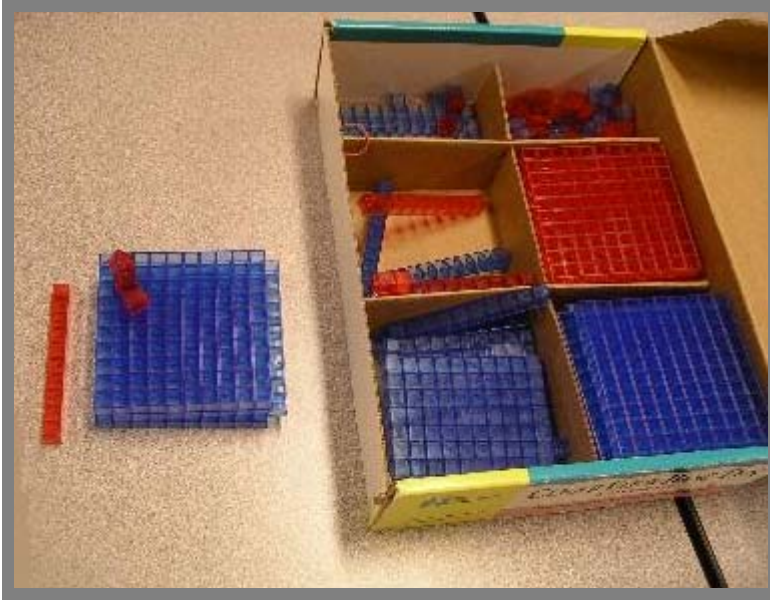
	http://media.umb.edu/p87083467/
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A1 say the number sequence A3 demonstrate an understanding of counting A4 represent and describe numbers to 100, concretely, pictorially, and symbolically



Item name:	Number Line Device
Supplier:	American Printing House for the Blind (APH) Number Line Device 1-03480-00
Activity:	<p>This can be used to bridge a gap between the concrete objects and the abstract number concepts. Concrete objects are used to get the idea; Number line is used to show operations.</p> <p>Favorite use: To teach number sequence, counting, addition, subtraction, and common fractions. I find it versatile, manipulative and simple tool, which can be used to teach a lot of mathematical operations in elementary grades</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>C3 demonstrate an understanding of measuring length</p> <p>C4 - measure length to the nearest non-standard unit by using multiple copies of a unit using a single copy of a unit (iteration process)</p>



Item name:	Folding Binder
Supplier:	Handmade
Activity:	<p>This binder provides surface area that can be used to adhere different kind of stick-on materials like double sided tape, Velcro or reusable glue. You can use cut-out shapes, numbers, symbols of operation to teach variety of concepts.</p> <p>Student can learn spatial arrangement of numbers to solve different mathematical problems using number and signs of operations cards. It can also be used for sorting and matching of shapes and sizes, grouping, pattern making and pattern copying.</p> <p>The binder is very useful for handling materials for 'On the Carpet' kind of activities. Student can easily manipulate objects, shapes and numbers on this binder as everything stays within their reach and doesn't roll away. Its use is as unlimited as your creativity.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A



Item name:	Base Ten Starter Set
Supplier:	Educational supply store
Activity:	<p>Base ten blocks representations can be very helpful in developing mental images of numbers, place value, and operations. Base ten blocks are also useful in illustrating the grouping rules.</p> <p>This a very effective tool to teach addition, subtraction to a Braille using student. It can also be helpful in understanding area and volume. As these blocks are interlocking, they are very compact for manipulation and can be detected tactually by ones.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A5 compare and order numbers up to 100</p> <p>A5 illustrate, concretely and pictorially, the meaning of place value for numerals to 1000</p> <p>A7 illustrate, concretely and pictorially, the meaning of place value for numerals to 100</p> <p>A8 demonstrate and explain the effect of adding zero to or subtracting zero from any number</p> <p>A5</p>



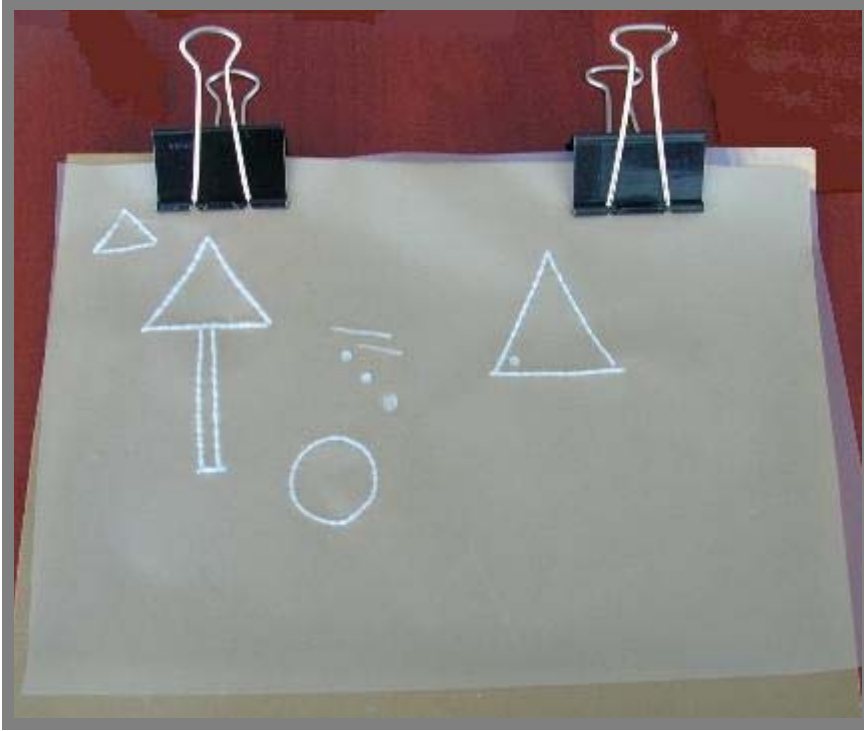
Item name:	Fraction Stax
Supplier:	Educational supply store
Activity:	Fraction stax can be used to explore and demonstrate wholes, halves, thirds, fourths, fifths. Sixths, eights, tenths and twelfths. Fraction pieces fit securely over vertical rods. They can be used for demonstrating fractions as a part of the whole, comparing fractions of the same whole.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A13 demonstrate an understanding of fractions by explaining that a fraction represents a part of a whole describing situations in which fractions are used comparing fractions of the same whole with like denominators C2 relate the size of a unit of measure to the number of units (limited to non-standard units) used to measure length and mass (weight)



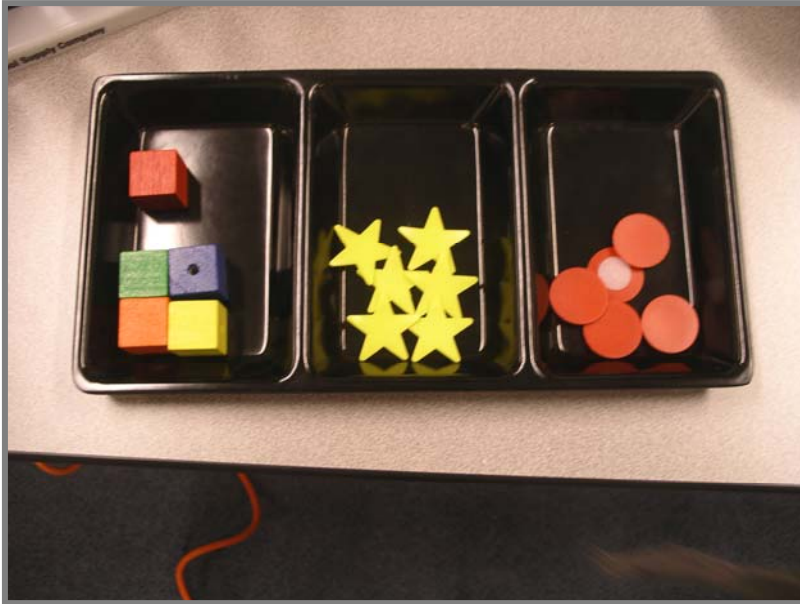
Item name:	Clock
Supplier:	American Printing House for the Blind (APH) Analog Clock Model 1-03125-00
Activity:	<p>To teach the student the concept of time in relation to the passage of time to common activities using non-standard and standard units (minutes, hours and days). Taught in conjunction with the calendar which teaches weeks, months, and years. The time concepts utilize mental mathematics & estimation, connections and reasoning.</p> <p>The estimation of how much time before a favourite activity or lesson, recess, lunch or before the lesson is over. Can be used as a motivator to obtaining a real Braille or talking watch.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>C1 relate the passage of time to common activities using non-standard and standard units (minutes, hours, days, weeks, months, years)</p> <p>C2 relate the number of seconds to a minute, the number of minutes to an hour, and the number of days to a month in a problem-solving context</p>



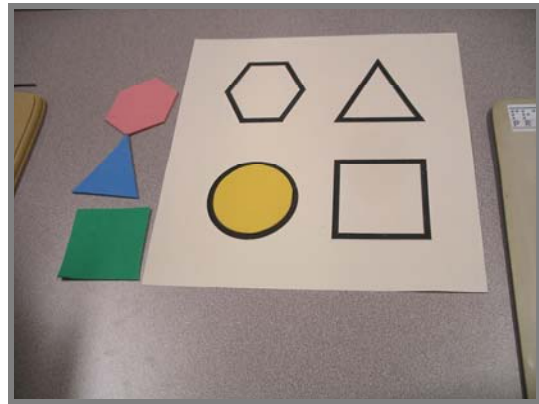
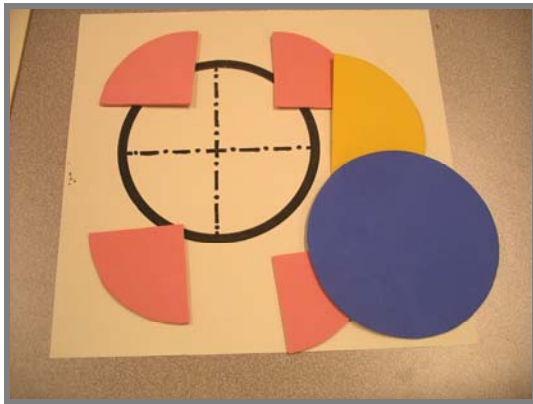
Item name:	Beads of various Shapes and Lace
Supplier:	Educational supply store
Activity:	<p>The beads can be used for demonstrating the understanding of repeating patterns by identification, reproduction, creation and extension to illustrate concept understanding using communication, connections, reasoning and visualization</p> <p>Favourite use: Creating and matching various sequences as per class instructions by stringing the beads in necklace fashion. The beads are controlled, meaning they are not rolling all over the place, the student can check and recheck work and the student can take them over to the teacher to have her evaluate concept understanding.</p> <p>Allows activity independence by the blind student. Student can easily create ones own patterns once the concept is learned.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>B1 demonstrate an understanding of repeating patterns (two or three elements)</p> <p>B2 translate repeating patterns from one representation to another</p>



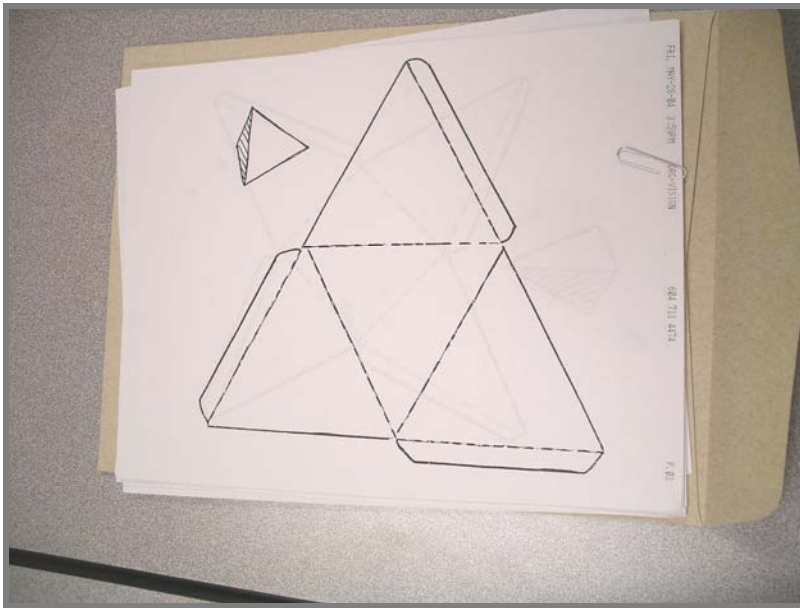
Item name:	Clip Board, Stylus, and Drawing Surface
Supplier:	This is handmade from the following materials: clipboard, stylus, paper. Paper: Tactile Drawing Film (25 sheets) Catalog #: 1-08858-00 Price: \$6.00
Activity:	The clip board is ideal for quick illustration of concepts being taught in the classroom, such a shapes – done in a timely fashion, by using a stylus or any writing instrument) , pen or pencil. The illustration can be referred to over and over again, if the student needs additional instruction, practice or reinforcement.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A



Item name:	Sorting Tray
Supplier:	dollar store, educational supply store, kitchen stores
Activity:	Use the tray for sorting and categorizing activities. The items to be sorted are in a controlled space, not rolling all over the place, and the student can check and recheck work.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C2 sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule



Item name:	Raised Line Drawings with Foam Inserts
Supplier:	Handmade using Corel draw (for raised line drawing) and cut outs of foam shapes
Activity:	A very portable way of teaching geometric shapes using comparison/matching, problem solving, reasoning and connections, and one to one correspondence. Favourite Use: Checking for the understanding of the individual properties of each shape.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C3 replicate composite 2-D shapes and 3-D objects C8 describe, compare, and construct 2-D shapes, including triangles, squares, rectangles, and circles



Item name:	Raised Line Drawings
Supplier:	Handmade / prepared from Math activity sheet
Activity:	<p>When the items are cut out, the student is able to build/assemble what was once a flat one-dimensional object into a 3 dimensional shape thus allowing the possibility of greater understanding.</p> <p>Favourite Use: A fun way to teach the attributes of geometric shapes. Fine motor and dexterity skills come into play.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>C3 replicate composite 2-D shapes and 3-D objects</p> <p>C8 describe, compare, and construct 2-D shapes, including triangles, squares, rectangles, and circle</p>



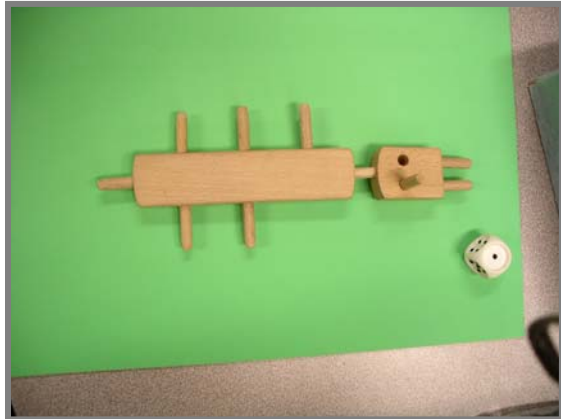
Item name:	Shapes Puzzles
Supplier:	Oakmont http://www.teachersaidsforblindchildren.org/about.html Oakmont materials are available free of charge and are made by retired volunteers ranging in age from 60 to 90. The tactiles are now made on thermoform, but most woodworking shops could easily make similar items.
Activity:	Use these tactiles for exploration and comparison of size and shape, patterning from largest to smallest and relationships to each other, and understanding that size does not change their attributes. E.g.: all the triangles still have 3 angles, nor do attributes change because of their orientation. Favourite use: to teach the properties of each geometric shape and relationships. Children love the challenge of a puzzle and these help in the development of reasoning skills, problem solving, connections and visualization.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C8 describe, compare, and construct 2-D shapes, including triangles, squares, rectangles, and circle



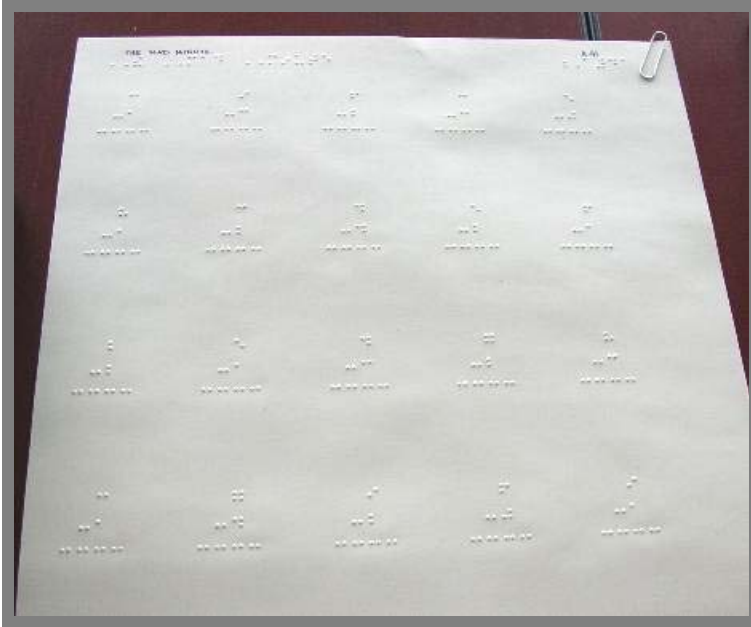
Item name:	Pegboard
Supplier:	Educational supply store
Activity:	<p>The pegboard can be used for simple number matching activities i.e. have the student read a braille number and then place the corresponding number of pegs. It could also be used to introduce simple graphing activities i.e. number of girls and boys sitting in the group.</p> <p>Pegboard activities will help strengthen the student's fine motor skills.</p> <p>Favourite Use: Activity: Assigning An Appropriate Number Without Counting (estimating)</p> <p>The teacher places a number of pegs in the pegboard. The student is encouraged to tactually 'look' at the pegs and to estimate the number without actually counting the individual pegs.</p>
MMM resource reference:	<p>This activity is described in 'Fostering The Development Of Number Sense – Selected Ideas For The Blind (Braille Users), Liedtke & Stainton</p> <p>This activity focuses on development of learning outcomes related to Number, Patterns & Relations, Shape & Space.</p>
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A2 recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots</p> <p>C3 replicate composite 2-D shapes and 3-D objects</p> <p>A6 estimate quantities to 20 by using referents</p>



Item name:	<p>3D Geo Shapes</p> <p>These 3 dimensional geometric shapes are quite unique. Each 3-D shape is housed in a clear plastic container. When removed from the container the 3-D shape folds flat revealing the outer structure.</p>
Supplier:	Educational supply store
Activity:	<p>Students with visual impairments often have difficulties understanding the complexity of geometric shapes. These special pull apart 3-D geometric shapes help to explain the complexities of each shape.</p> <p>Place a 3-D shape into the student's hand. Ask them what the block reminds them of, have the student explain why. Get the student count the number of sides on their shape. Have them remove the block from the clear plastic case and lay it flat on the table. Have the student count the sides of the shape to check their answer.</p>
MMM resource reference:	<p>This activity is described in Making Math Meaningful For Young Children, Age 4-7 Nurturing Growth (pg. 119)</p> <p>This activity focuses on development of learning outcomes related to Shape & Space (3-D Objects)</p>
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>C6 describe 3-D objects according to the shape of the faces, and the number of edges and vertices</p> <p>C7 sort regular and irregular polygons, according to the number of sides</p>



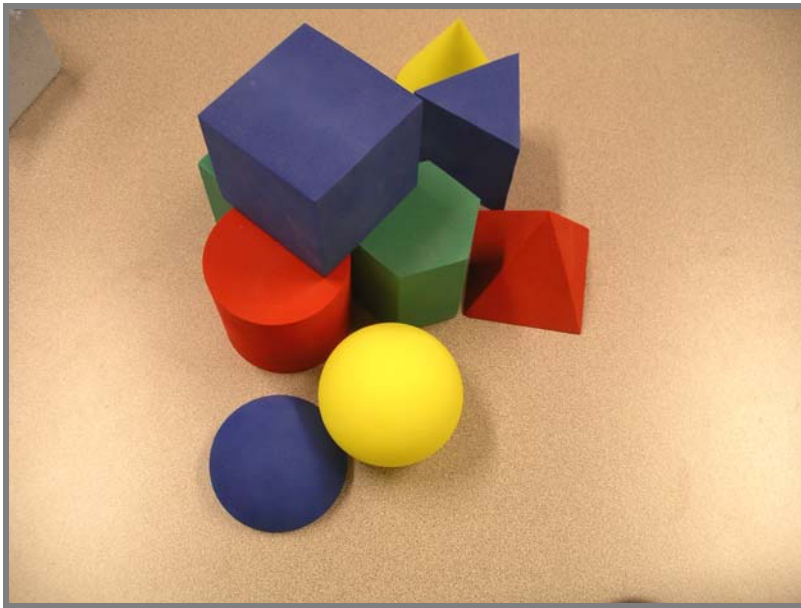
Item name:	Beetle Game
Supplier:	Royal National Institute of the Blind (RNIB) This beetle game is a popular children’s game that was developed in the United Kingdom. The only adaptation for students with visual impairments is the addition of tactile dice.
Activity:	<p>By rolling the dice students will have to build a tactile beetle. Different numbers relate to the different beetle body parts. To start the game the student needs to roll a 6 to get a beetle body.</p> <ul style="list-style-type: none"> - roll a 5 for head - roll a 4 for eyes - roll a 3 for antenna - roll a 2 for tail - roll a 1 for legs <p>The first completed beetle wins.</p> <p>It will assist students in learning number sense. When played in small groups children will learn turn taking and will develop concepts such as how many more, and how many do you have? etc.</p> <p>The beetle game is an ideal game for those cold or wet weather days.</p> <p>This activity focuses on development of learning outcomes related to Number, Patterns & Relations</p>
MMM resource reference:	N/A
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A2 represent and describe numbers to 1000, concretely, pictorially, and symbolically C3 replicate composite 2-D shapes and 3-D objects



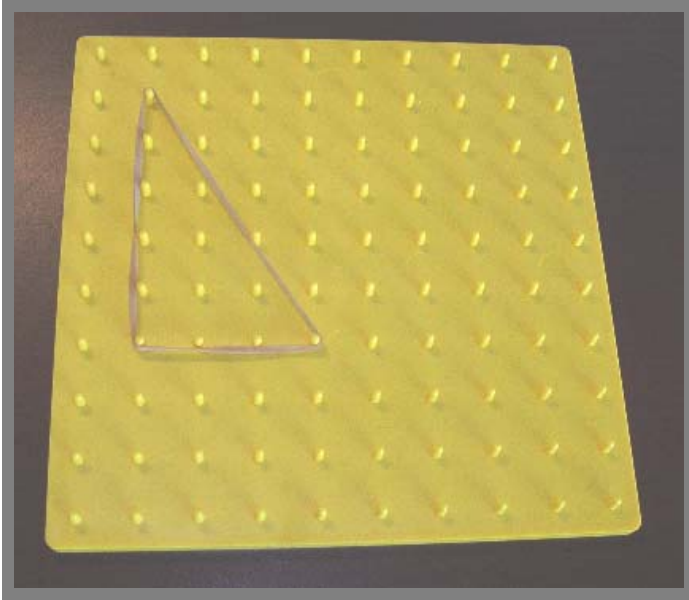
Item name:	Mad Minute
Supplier:	Use classroom mad minute materials to make braille version. Several activity templates provided in kit.
Activity:	<p>The main purpose of these sheets is to reinforce math skills like addition and subtraction.</p> <p>Mad minute is a popular activity in an elementary math class. Participation in these drill activities reinforces math skills being taught in the class, teaches them a sense of time needed to finish an activity in Braille format, and also a sense of speed reading and solving a math sum.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A9 demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially, and symbolically by recording the process symbolically</p> <p>A10 describe and use mental mathematics strategies to determine the basic addition facts to 18 and related subtraction facts</p>



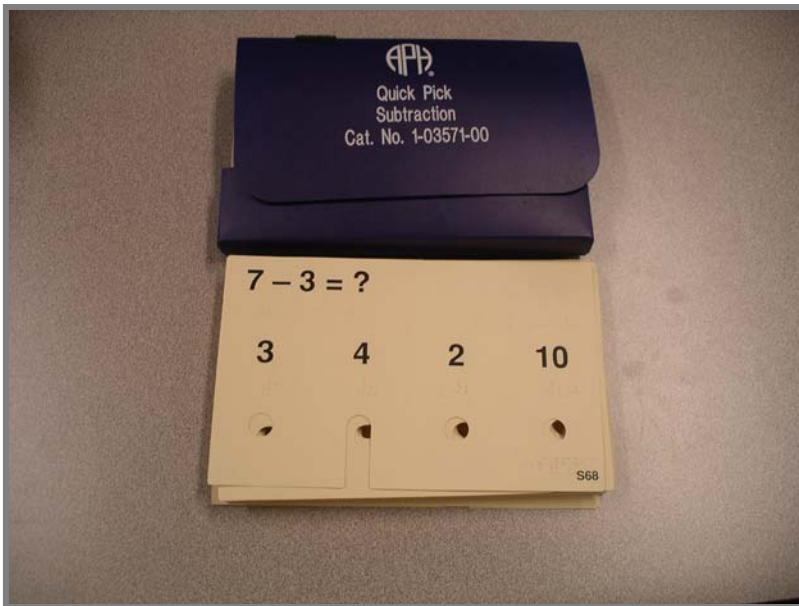
Item name:	Dice and Game Board
Supplier:	Royal National Institute of the Blind (RNIB) Shut the Box
Activity:	<p>This game board provides an enclosed surface area to roll the dice and count dots on it to match with the numbers on it. It's good reinforcement for reading numbers and number sign in Braille.</p> <p>The object of the original Shut the Box game is to 'shut' the numbered tiles by throwing the two tactile dice (provided) into the tray and using the scores to flip over tiles to the dice value.</p> <p>This interactive dice and board game is used to teach number recognition, number correspondence.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A9 demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially, and symbolically by recording the process symbolically</p> <p>A10 describe and use mental mathematics strategies to determine the basic addition facts to 18 and related subtraction facts</p>



Item name:	Geo Shapes
Supplier:	Educational supply store
Activity:	Place a 3-D shape into the student's hand. Ask the student to name the shape. Discuss the shape. Ask the student what the block reminds them of, have the student explain why..
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>C6 sort 2-D shapes and 3-D objects using two attributes and explain the sorting rule</p> <p>C6 describe 3-D objects according to the shape of the faces, and the number of edges and vertices</p> <p>C7 describe, compare, and construct 3-D objects, including cubes, spheres, cones, cylinders, pyramids</p> <p>C7 sort regular and irregular polygons, including triangles, quadrilaterals, pentagons, hexagons, octagons, according to the number of sides.</p> <p>C8 describe, compare, and construct 2-D shapes, including triangles, squares, rectangles, and circles</p> <p>C9 identify 2-D shapes as parts of 3-D objects in the environment</p>



Item name:	Geo Board
Supplier:	educational supply stores
Activity:	Explore area, relationship size, shapes. Recognize and create shapes that have symmetry. The geo board can be used to introduce simple graphing activities (e.g. boys and girls in a group).
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	C8 describe, compare, and construct 2-D shapes, including triangles, squares, rectangles, and circles C9 identify 2-D shapes as parts of 3-D objects in the environment



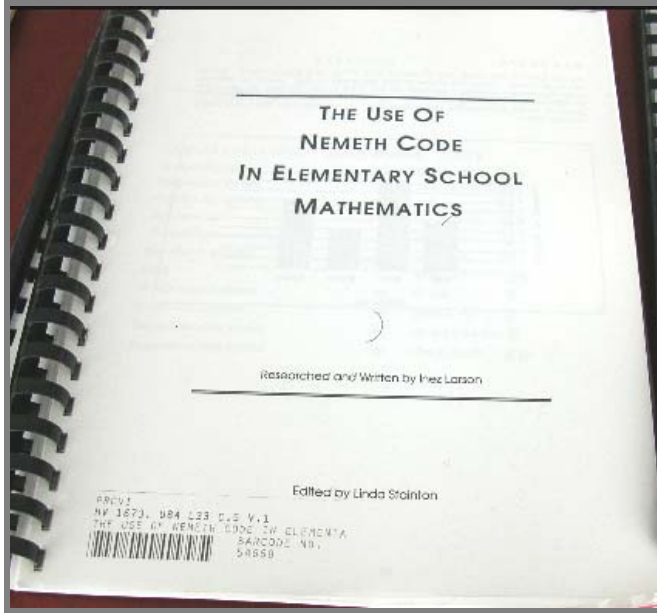
Item name:	Quick Pick Flash Cards - Braille
Supplier:	American Printing House for the Blind (APH) self-correcting flashcards in braille for addition and subtraction Quick Pick Math -- Addition: 1-03570-00--\$30.00 -- Subtraction: 1-03571-00--\$30.00
Activity:	To play, read the number fact, then "quick pick" the choice that matches, put the wooden tool in the corresponding hole for the answer choice, and try to pull the card out of the case. If the card slides out, the answer is correct. If incorrect, the card will not slide out. The object of the game is to "quick pick" as many cards as possible on the first try.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A9 demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts A10 describe and use mental mathematics strategies (memorization not intended), such as counting on and counting back, making 10, doubles, using addition to subtract to determine the basic addition facts to 18 and related subtraction facts



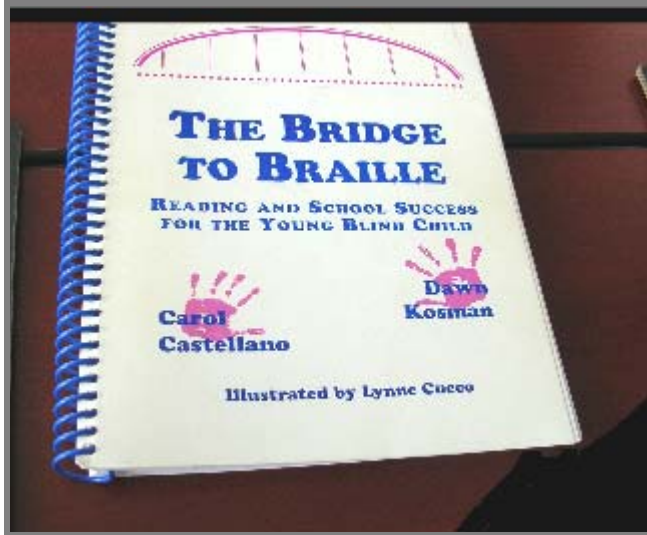
Item name:	Setting the Stage Kit
Supplier:	American Printing House for the Blind Complete Kit (1-08853-00) \$190. USD
Activity:	Setting the Stage is a set of materials intended to encourage and informally assess the development of early tactile literacy in young children who are blind or visually impaired. The tangible items and activities assist young tactile readers in making the transition from exploration of real objects to the interpretation of two-dimensional representations both in thermoformed formats and simple raised-line illustrations.
Resource reference:	See the American Printing House for the Blind PowerPoint file included in the MMM kit and available on the APH website.
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<ul style="list-style-type: none"> • development of early tactile literacy • make the transition from exploration of real objects to the interpretation of two-dimensional representations



Item name:	Tactile Treasures Kit
Supplier:	American Printing House for the Blind Complete Kit (1-08842-00) \$147. USD
Activity:	Tactile treasures teaches more than 90 concepts related to shape, size, comparison of two or more objects, amount, position, and page orientation. 79 thermoformed sheets featuring tactile pictures created from real objects that illustrate math and language concepts.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<ul style="list-style-type: none"> • development of early tactile literacy • make the transition from exploration of real objects to the interpretation of two-dimensional representations



Item name:	Use of Nemeth Code in Elementary School Mathematics, The Researched and written by Inez Larson
Supplier:	Alberta Education
Activity:	Useful information, for parents and educators, about the Nemeth code. Nemeth is the braille code for mathematics.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A



Item name:	Bridge to Braille, The By Carol Castellano and Dawn Kosman
Supplier:	Amazon.com
Activity:	“Practical step-by-step guide that will show parents and educators how to help blind children progress from early literacy experiences to full participation in the classroom.”
MMM resource reference:	See pages 93-125 for information pertaining to Mathematics
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A

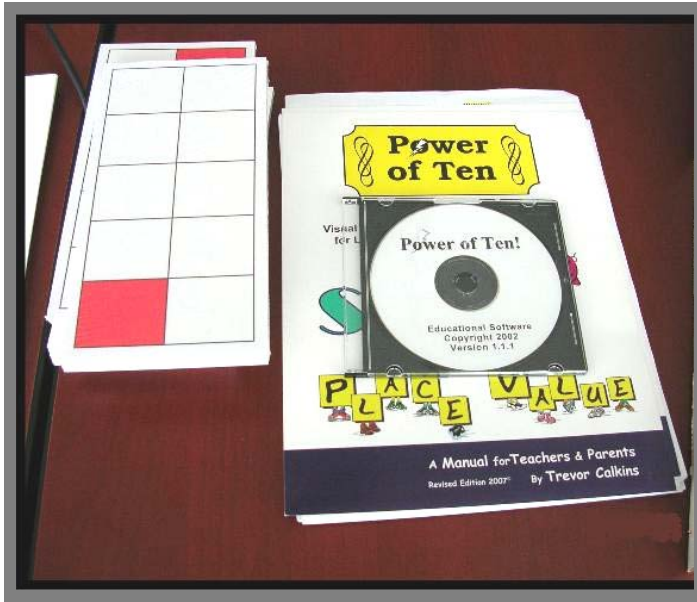
**Making Mathematics Meaningful for Young Children: Ages 4 to 7
Nurturing Growth**

By **Werner W. Liedtke and Jennifer S. Thom**

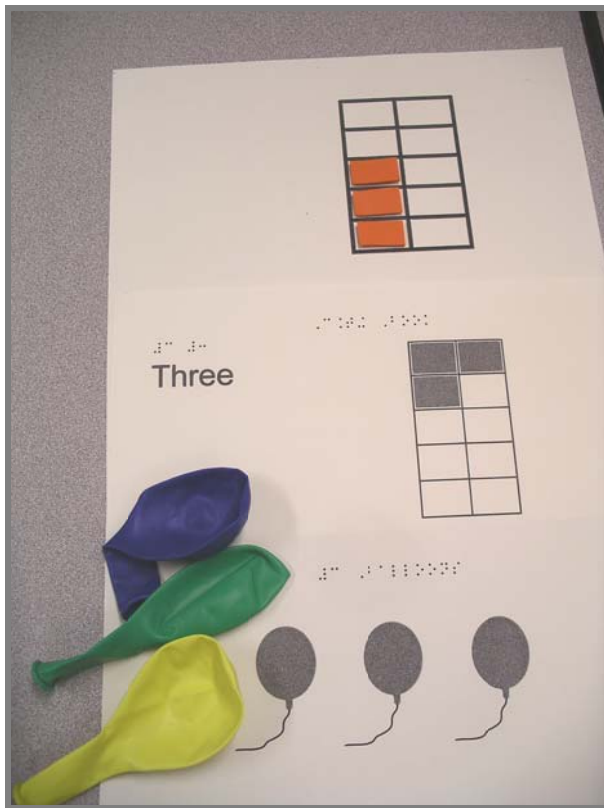
Item name:	Making Mathematics Meaningful for Young Children: Ages 4 to 7 Nurturing Growth
Supplier:	
Activity:	
MMM resource reference:	See MMM activity list , below, for use with items in the MMM Braille Resource Kit.
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	N/A

Example of Making Math Meaningful Text resource reference activities from the resource showcase files:

- Hundreds board – see MMM page 42
- Braille / tactile ruler – see MMM page 132
- Glove and puppet – see MMM page 73
- 3D geo shapes – see MMM page 119



Item name:	<p>Power of Ten Visual Strategies for Learning Number</p>
Supplier:	<p>Power Of Ten Educational Consulting http://www.poweroften.ca/index.html</p>
Activity:	<p>The Power of Ten Visual System includes a set of specially designed cards, games, and teaching strategies and assessment tools that encourage children to visualize number, making it easier to add, subtract, multiply and learn place value.</p> <p>10 is a powerful referent in developing number sense. Students with visual impairments can use raised-line representations to participate in Power of Ten activities. Using hands - 5 fingers and 10 fingers- is a good activity for young students to develop sense of ten-ness.</p> <p>Many classrooms in British Columbia use the Power of Ten visual strategies. Students with visual impairments can used raised-line representations to participate in Power of Ten activities.</p>
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	<p>A9 demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts</p> <p>A10 describe and use mathematics strategies (Power of Ten™ strategies), such as counting on and counting back, making 10, doubles, using addition to subtract to determine the basic addition facts to 18 and related subtraction facts</p>



Item name:	Real Numbers Book
Supplier:	Made by PRCVI
Activity:	Counting, 1-1 correspondence to real objects, raised illustrations, and power of ten grid representation Each page contains shaded Power of Ten grid referents.
MMM resource reference:	
B.C. Prescribed Learning Outcome www.bced.gov.bc.ca/irp/irp_math.htm	A1 say the number sequence by 1s starting anywhere from 1 to 10 and from 10 to 1 A2 recognize, at a glance, and name familiar arrangements of 1 to 5 objects or dots A3 relate a numeral (Braille), 1 to 10, to its respective quantity A4 represent and describe numbers 2 to 10, concretely and pictorially A5 compare quantities, 1 to 10, using one-to-one correspondence

Video for MMM Braille Resource Kit

Watch the Making Math Meaningful Braille Resource Project video at http://setbc.org/setbc/vision/making_math_meaningful.html

Video Presentations - Resource Showcase

The MMM Braille Resource Project video presentation was developed to assist educators and parents to learn about, acquire, and use materials that support access to mathematics activities for young students with visual impairments. In this video, experienced teachers of students with visual impairments, describe materials and activities' adaptations that they have used to enhance accessibility and understanding of mathematics concepts.

And you can find the link to the Making Math Meaningful Braille Resource Project at

www.prcvi

Or

www.setbc.org /The Learning Centre/ Making Math Meaningful Braille Resource Project.

Consumables in the Kit:

- Wiki Stix
- Velcro
- Felt circles (adhesive)
- Clay
- Flash Cards
- Art Tape (raised)
- 2 Sided Tape
- Foam (sheets)
- Raised dots (clear plastic)



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Alternate Learning Standards Emphasizing the Expanded Core Curriculum Section 3. Basic Math Skills Evaluation table pg. 1031-1035.