Transitions: Bridging Success to Numeracy

A project of Enhancing Transitions for Adults to Further Education, Employment and Training
and
The Manitoba Adult Literacy Strategy

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The Bridging Success to Numeracy will help to increase your understanding of numeracy practice at the Adult Literacy Program level and to become more aware of high school math curricula in order to prepare learners for the transition to Adult Learning Centres.

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Enhancing Transitions for Adults to Further Education, Employment and Training

In 2009, the federal government announced a two-year Strategic Training and Transition Fund to be administered in Manitoba by Entrepreneurship, Training and Trade through the existing Labour Market Agreement and Labour Market Development Agreement. Adult Learning and Literacy submitted a proposal and was approved for a two-year project that would support the Manitoba Adult Literacy Strategy.

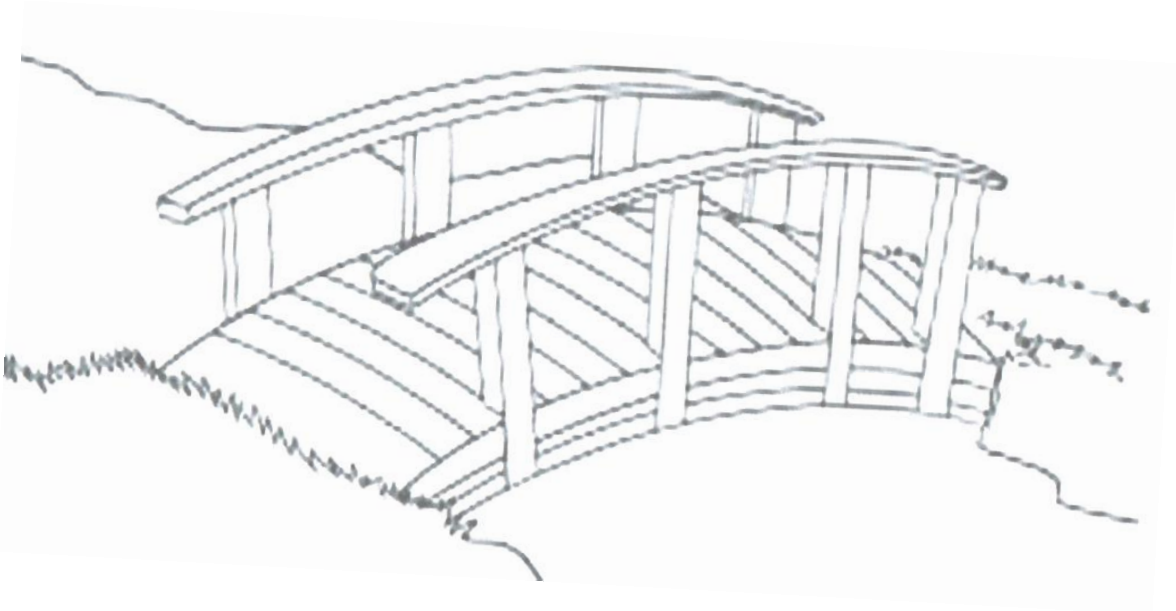
The goals of the *Enhancing Transitions* project were to enhance adult learners' transitions:

- from adult programming to meaningful, long-term employment
- to further education and training to support their lifelong career and personal goals.

Enhancing Transitions was administered by Adult Learning and Literacy in partnership with Workplace Education Manitoba. A collection of tools and resources was developed by a project team. The development and testing of transition related materials, structures, tools and lessons was based on research in four case study communities.

Bridging Success to Numeracy

From Adult Literacy Programming to High School Credit Math Courses



Prepared By:
The Enhancing Transitions for Adults to Further Education, Employment and Training Project

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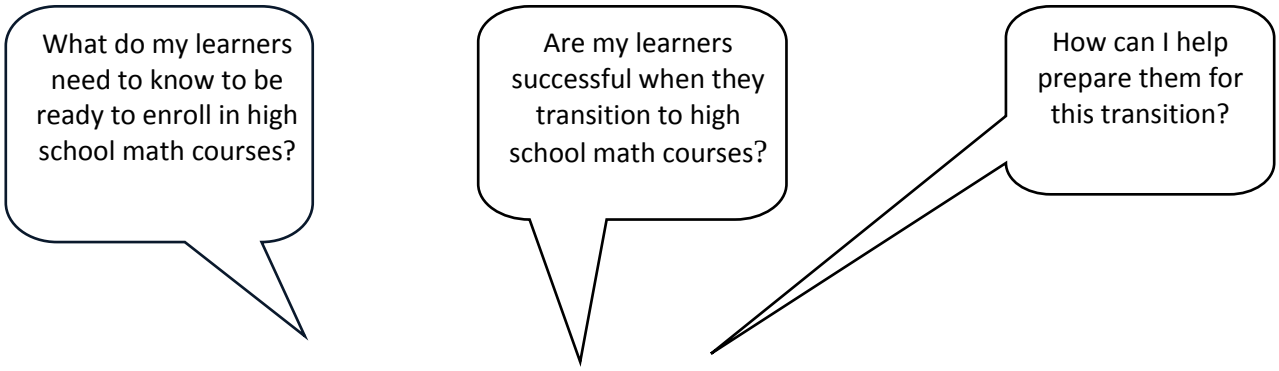
Introduction

Are there learners in your program whose educational goals include enrolling in high school math courses

If your answer is yes, then you may be asking yourself:



Bridging Success to Numeracy was created to help you find the answers to these and similar questions as you prepare your learners for success in high school math.

The document contains:

- Background information on the new Grade 9 – 12 *Mathematics: Manitoba Curriculum Framework of Outcomes* which is fully implemented in 2012
- Highlights of the seven mathematical processes which are key components of the new mathematics curricula;
- Information and activities which you can use with your learners to help build math self-confidence;
- Numeracy lessons and suggested resources based on math curriculum-related terminology, topics, and processes which can be used to enhance your learners' transition.

The objective of this resource is not to transform you into an expert in high school math curricula, but rather to help you increase your expertise in *understanding numeracy practice* at the Adult Literacy Program level (pre-Grade 9); and, more specifically, become aware of both affective and cognitive transition outcomes, language, and practice that will help prepare the learners who are beginning the transition to high school math courses.

Building Numeracy Confidence

Helping Adult Learners Build Self-Confidence in Manipulating Numbers and in Solving Mathematical Problems

How does a lack of math self-confidence affect adult learners?
A lack of math self-confidence, or math anxiety, can create roadblocks for adults in their daily lives, in the workplace, as well as in their transition to more complex math programs.

What is math anxiety?
Math anxiety involves feelings of frustration, fear, and helplessness related to one's ability to manipulate numbers and solve mathematical problems.

Math anxiety is *not*...

- A genetic condition
- A sign of lower intelligence
- Determined by one's race, gender, or educational background

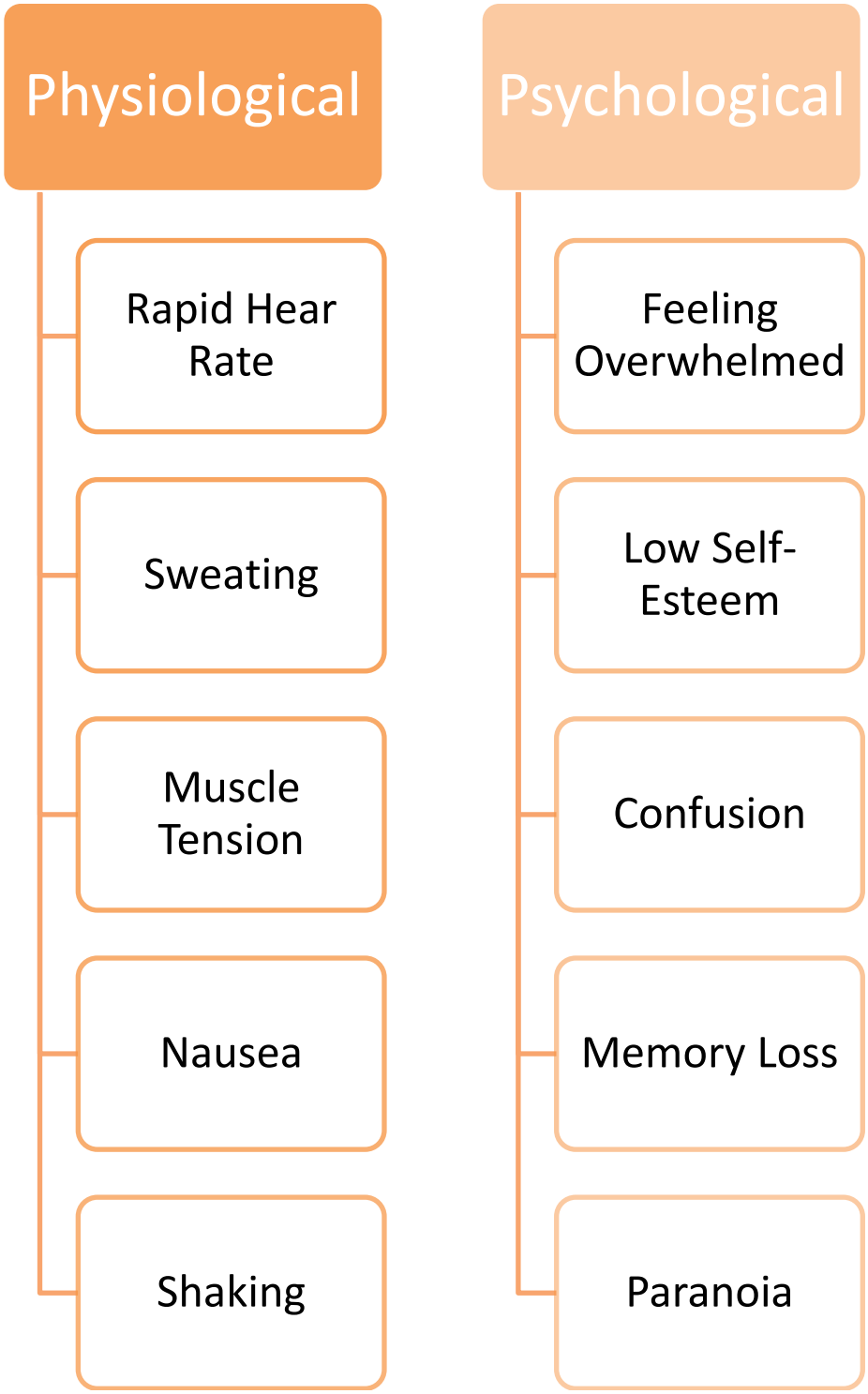
What does math anxiety sound like?
"Men are supposed to be good at math, but I can't even keep track of my own bills! I've really let my family down!"

"I've never been good at math, and trying to help my son with his homework is a nightmare! Usually, we both end up in tears!"

"Math tests terrify me! My palms get sweaty, I breathe too fast, and I can't focus on anything! I feel like I've forgotten everything I learned!"

What does math anxiety feel like?

Symptoms of Math Anxiety



What are the causes of math anxiety?

Teaching tips for reducing math anxiety:

- Accommodate the different learning styles of your learners
- Provide opportunities for learners to discover their own preferred math learning style(s)
- Use group work
- Encourage original thinking
- Provide hands-on math experiences – manipulatives, calculators, computer activities
- Design relevant math activities
- Make math fun!

Writing an "Automathography"

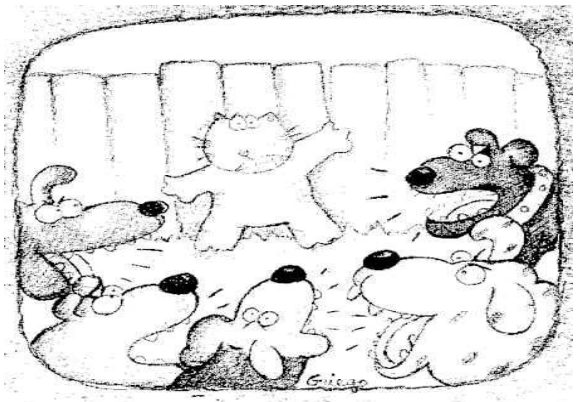
One way that instructors in adult programs can help learners re-gain and/or develop greater self-confidence in math is by encouraging them to share their prior learning experiences and the effects of those experiences on their present life.

Having learners write an "automathography" or a narrative about their past experiences in learning math, can provide insight into their abilities, feelings, attitudes, and beliefs about math and about themselves as math learners.

Examples of writing or discussion prompts to encourage learners to share their experiences in learning math:

Describe the following:

- Your earliest memories of learning math in school.
- An event or situation that affected how you felt about learning math.
- Your best experience related to learning math.
- The most important math skill you have ever learned?
- What math skill(s) have you been taught that you think you will never need to use in your life?
- When you get a math problem wrong (and everybody does sometime), what is your reaction? How would you like to react?
- How would you describe your feelings about learning math as an adult?
- What are your math goals? How do you hope to reach those goals?



Mathematical Processes

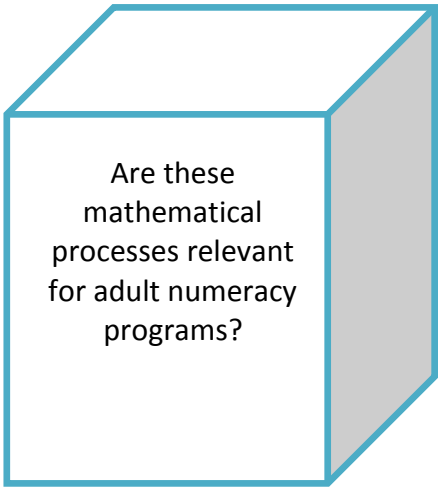
1. Mathematics: Manitoba Curriculum Framework of Outcomes

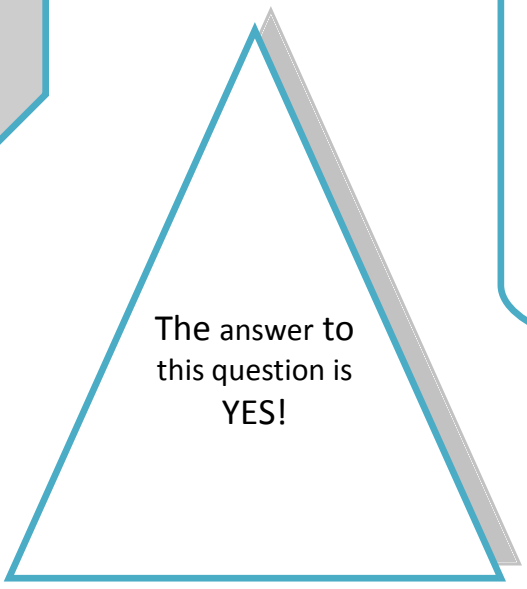
The *Manitoba Curriculum Framework of Outcomes* emphasizes seven **mathematical processes** which are to be integrated across all levels from Kindergarten to Grade 12. These processes are critical aspects of ***learning, doing, and understanding mathematics***. Students must encounter these processes regularly in a mathematics program in order to achieve the goals of mathematics education.

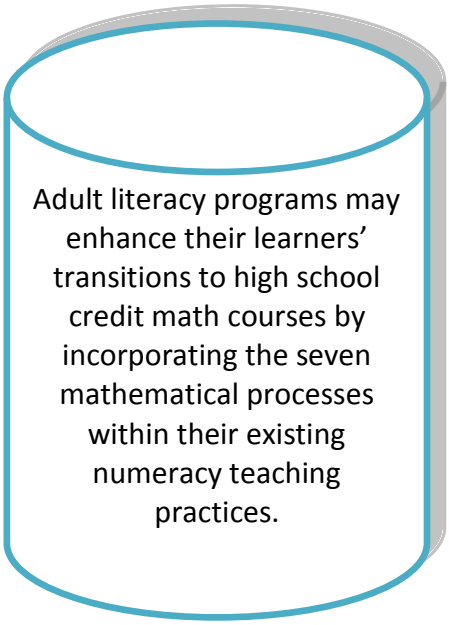
The common curriculum framework incorporates interrelated processes where the students are expected to:

- Use **communication** to learn and express their understanding
- Make **connections** among mathematical ideas, other concepts in mathematics, everyday experiences and other disciplines
- Demonstrate fluency with **mental mathematics and estimation**
- Develop and apply new mathematical knowledge through **problem-solving**
- Develop mathematical **reasoning**
- Select and use **technology** as a tool for learning and solving problems
- Develop **visualization** skills to assist in processing information, making connections, and solving problems (curriculum p.8)

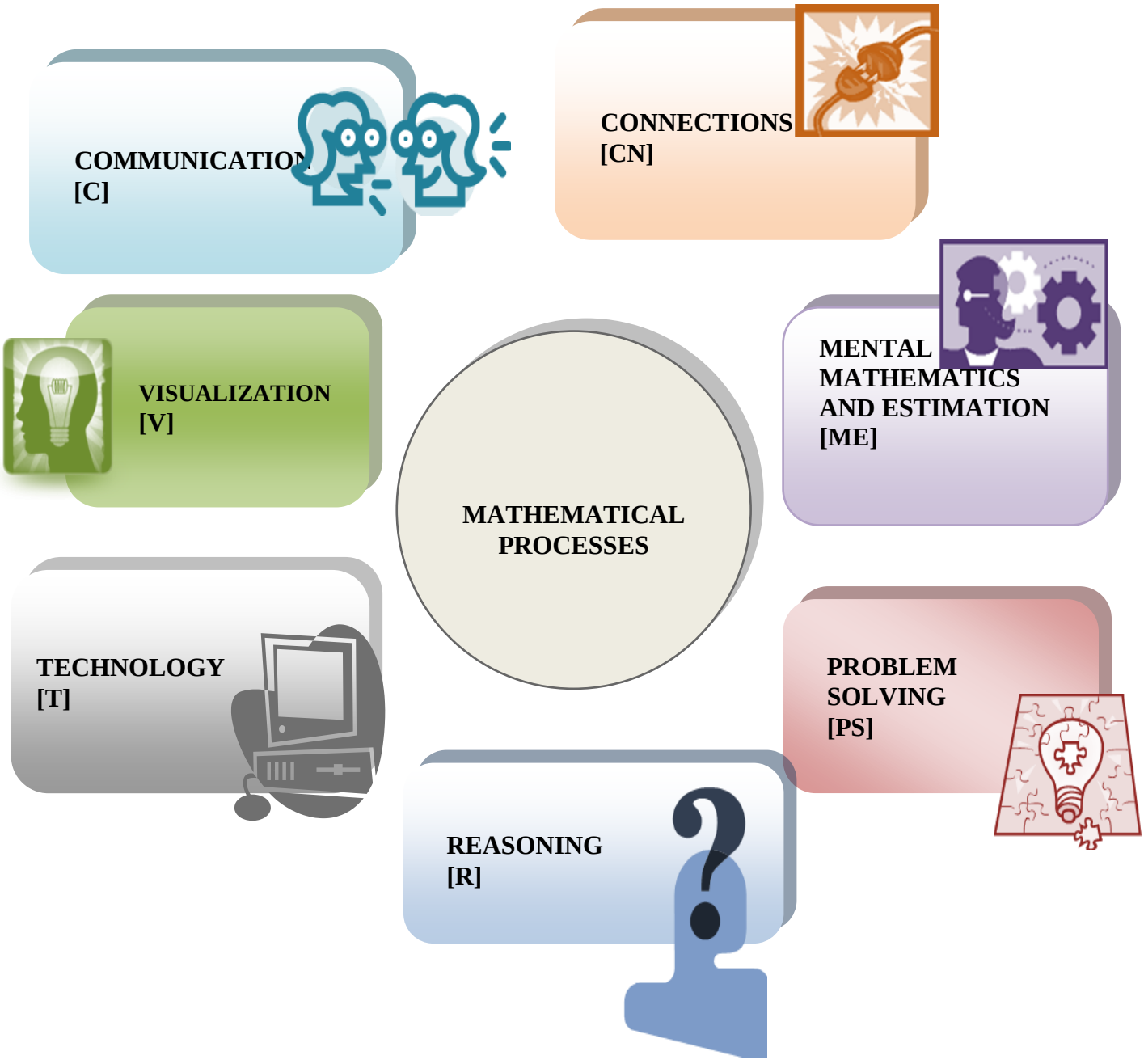
Adapted from *Grades 9-12 Mathematics: Manitoba Curriculum Framework of Outcomes*







This graphic is a visual representation of the seven mathematical processes and includes the corresponding abbreviations which are used throughout the common curriculum frameworks. Helping learners become aware of these processes and their relationship to mathematical understanding may enhance the transition to more advanced math programs.



The following chart can serve as an on-going self-assessment for numeracy instructors to document how the mathematical processes are being incorporated in their instruction practices.
Directions: Write the lesson or activity's outcome(s) in the first column and then place a check in the column(s) describing the mathematical processes that were used.

Numeracy Lesson/Activity	Communication	Connections	Mental Math & Estimation	Problem-Solving	Reasoning	Technology	Visualization

Communication

The benefit of incorporating oral and written communication in adult numeracy practices is important because communication:

- Provides an opportunity for assessment (at both the initial stages and throughout the program e.g. "Blank Page" assessment)
- Offers a risk-free opportunity for learners to describe (in oral and/or written form) their prior experiences with math. This can provide insight for the instructor about the learner's level of "math anxiety" (e.g. Math journal writing – Mathography")
- Promotes peer and small-group learning which integrates higher level thinking such as visualization, reasoning, and problem-solving
- Provides an opportunity for learners to: reflect on their learning, deepen their understanding of important concepts by explaining and providing examples of those concepts, and make important connections to real-life applications.

"Numeracy includes knowledge of mathematics, but goes beyond that to include problem-solving or reasoning skills and oral discussion about numeracy skills. Learners are encouraged to talk about math and talk through the problem-solving process, rather than being asked merely to memorize a strategy and do pen-and-paper exercises.

Because many adults suffer from "math anxiety", the ability to talk about math and discuss problem-solving with others is crucial. Also, many learners already have numeracy skills and have learned to solve mathematical problems without the benefit of formal instruction". *(Saskatchewan Literacy Network, 2001, Saskatchewan Level 2 Numeracy Kit)*

Problem Solving and the Task Process Cycle

How it applies to Numeracy

What is the Task Process Cycle?

The Task Process Cycle is a problem solving method used in some literacy classrooms. It can also be applied to numeracy.

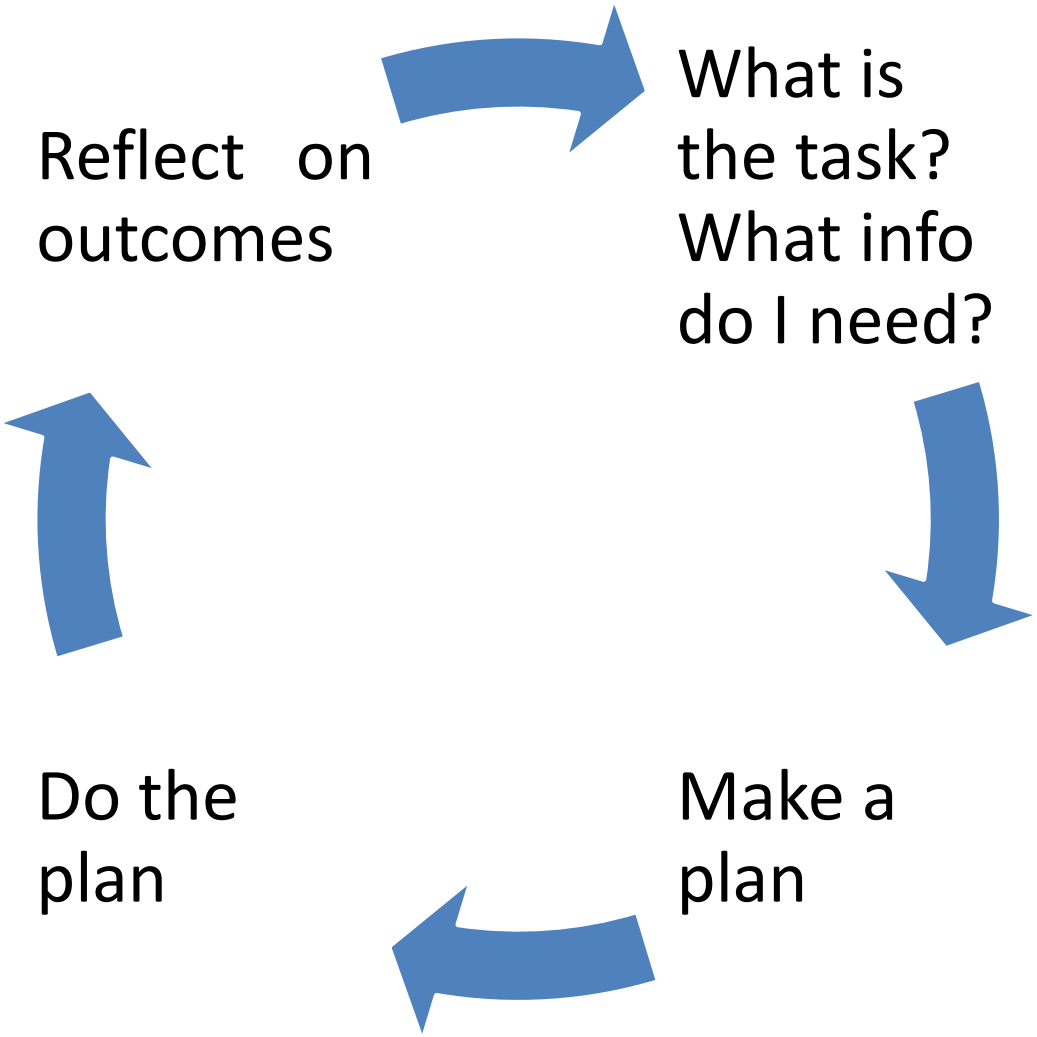
The poster on the next page may be put up on the wall so that everyone can refer to it on a regular basis. It seems to work in every circumstance: tackling the learner's first logic problem, when a learner wonders which cell phone plan to purchase, and when a chainsaw needs to be filled with a specific oil to gas mixture.

By using the Task Process Cycle to solve problems, learners:

- *See alternative strategies for solving the problem*
- *Compare which strategies are most efficient*
- *Learn to communicate numeracy ideas*
- *Take autonomy in their problem-solving*
- *Reflect and make personal connections*
- *Feel more confident about tackling other numeracy challenges*

For the activities offered in this document, the use of the Task Process Cycle is encouraged.

Task Process Cycle



Adapted from *Model of Holistic Numeracy Competence* OLES Project Module 2 Workshop
Adapted from: *Rethinking Assessment: Strategies for holistic adult numeracy assessment* by B. Marr, S. Helme and Tout, 2003

2. A Social/Holistic Approach to Numeracy

Each of the three domains is further described in the following way:

Being (identity)

- Becoming self-aware in using mathematics
- Gaining confidence as a "numerate" person
- Making personal connections throughout the learning process

Doing (practice)

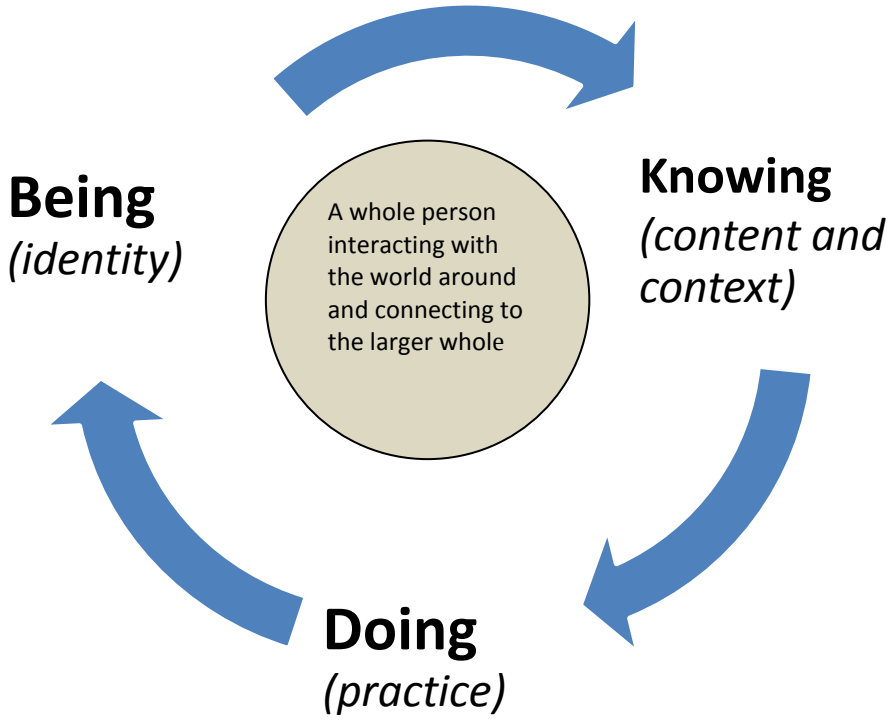
- Choosing relevant information
- Applying appropriate skills and strategies
- Reflecting on the learning and on the results

Knowing (content & context)

- Generating mathematical problems, skills or procedures
- Employing mathematical content and techniques that vary according to the situation and depend on the purpose and context in which the numeracy takes place
- Creating meaning in daily activity

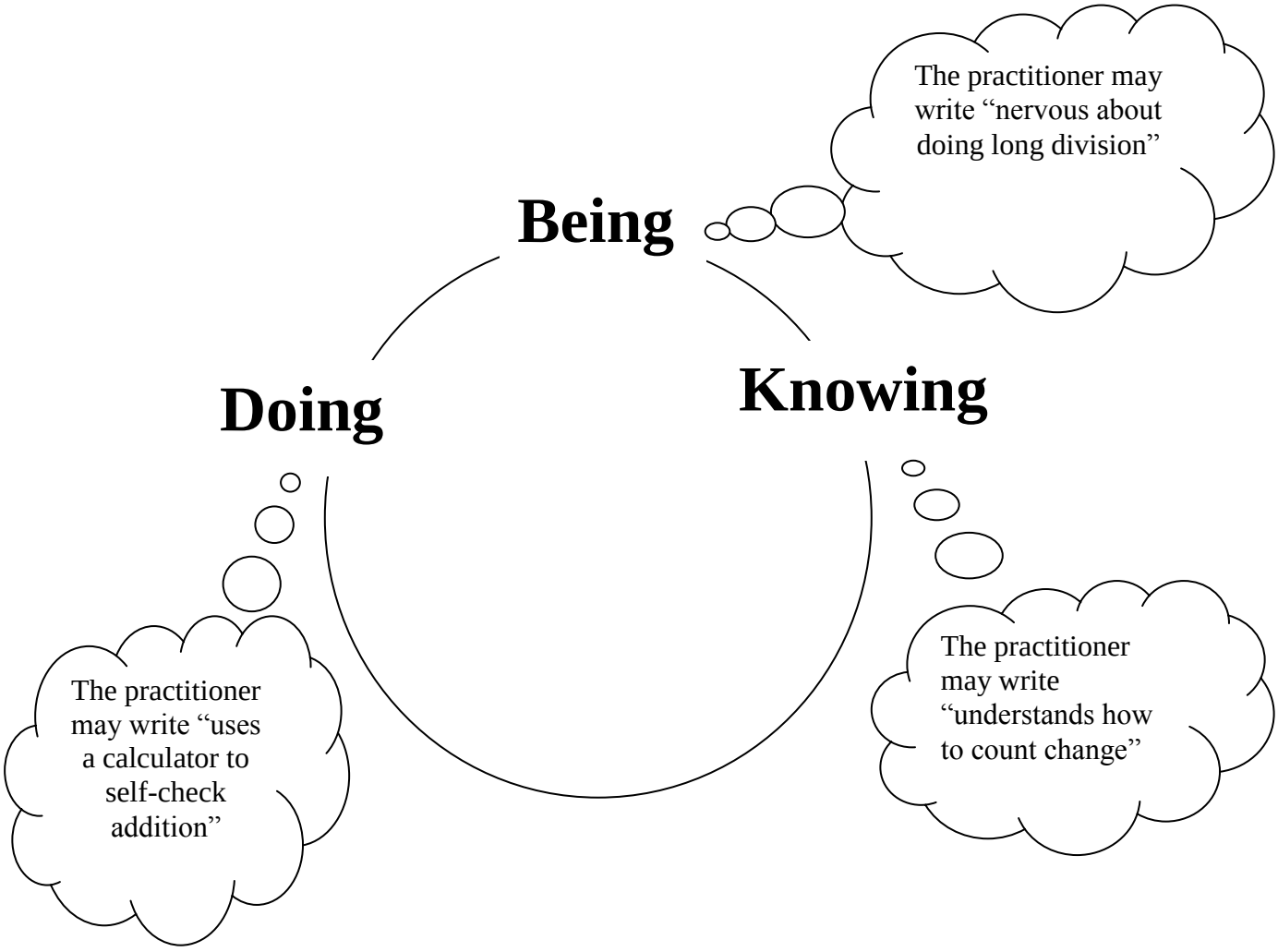
(*Beyond Worksheets: A Social and Holistic Approach to Numeracy* p. 30)

The authors of *Beyond Worksheets: A Social and Holistic Approach to Numeracy* suggest that "Numeracy learning and teaching can best be provided through a social and holistic approach. This [approach] is based on the principle that the learner is a whole person and that mathematics is a human construction" (p. 29). The authors' proposed approach to numeracy teaching and learning uses a schema of learning which is analyzed within three overlapping domains: BEING, KNOWING, and DOING, as illustrated below.



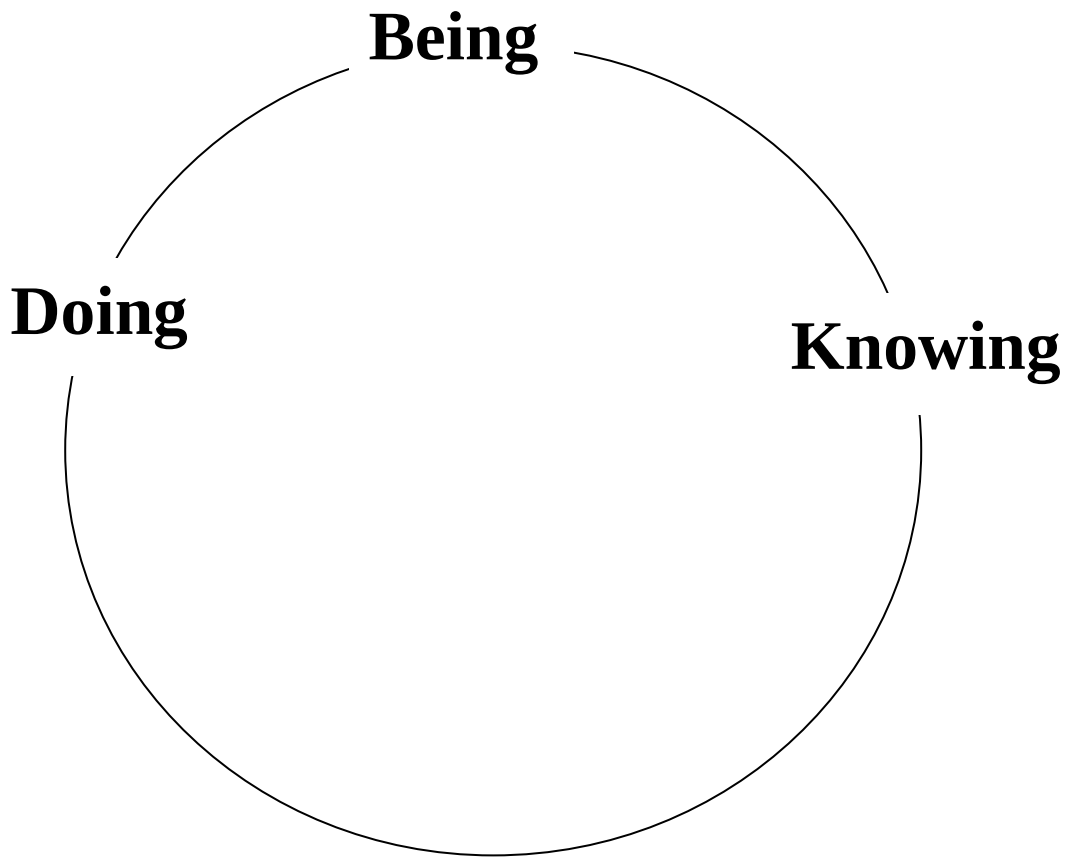
To further highlight the social and holistic approach to numeracy within the "blank page assessment" procedure, the authors suggest that the practitioner uses a "reflection circle" (illustrated below) to "map" the learner's "math stories" as they are described. This tool can then be used to gain an understanding of where the learner is coming from and an awareness of relevant and meaningful context for the learner.

Reflection Circle



The central principle of this schema is that a learner is a whole person – mind, body and spirit – interacting with the world around and connecting to a larger whole. *Beyond Worksheets: A Social and Holistic Approach to Numeracy*

Reflection Circle



Adapted from *Beyond Worksheets: A Social and Holistic Approach to Numeracy*

Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes

As of 2012, the new *Grade 9 to 12 Mathematics Manitoba Curriculum Framework of Outcomes* will be fully implemented. The framework identifies 3 pathways (Essential Math, Applied Math, Pre-Calculus Math) and their respective topics. Note: Accounting courses are not referenced in the framework but may be used as mathematics credit for graduation.

<table>
<tr><th colspan="3">Grade 9 Mathematics (10F)</th></tr>
<tr><td colspan="3">Unit Possibilities include:
▪ Number Sense
▪ Powers
▪ Circle Geometry
▪ Similarity
▪ Statistics and Probability
Statistics
Linear Relations
Polynomials
Symmetry
Geometry</td></tr>
<tr><th colspan="3">Grade 10 Math (20S)</th></tr>
<tr><td colspan="2">Essential Mathematics 20S</td><td>Introduction to Applied and Pre-Calculus Mathematics</td></tr>
<tr><td colspan="2">Unit Possibilities include:
▪ Analysis of Games and Numbers
▪ Personal Finance
▪ Measurement
▪ 2-D Geometry
▪ Trigonometry
▪ Consumer Decisions
▪ Transformations
▪ Angle Construction</td><td>Unit Possibilities include:
▪ Linear Modeling
▪ Number Sense
▪ Measurement
▪ Linear Functions
▪ Algebra
▪ Coordinate Geometry
▪ Trigonometry
▪ Application of Linear Functions
▪ Graphs and Relations
▪ Linear Measurement
▪ Relations and Functions
▪ Polynomials
▪ Surface Area and Volume
▪ Systems</td></tr>
<tr><th colspan="3">Grade 11 Mathematics (30S) & Grade 12 Mathematics (40S)</th></tr>
<tr><td>Essential Mathematics</td><td>Applied Mathematics</td><td>Pre-Calculus Mathematics</td></tr>
</table>

To view the K-8 or Grades 9-12 Mathematic Outcomes, follow the link below. This link also provides additional links to Manitoba's math support documents, as well as activities and games.
http://www.edu.gov.mb.ca/k12/cur/math/index.html

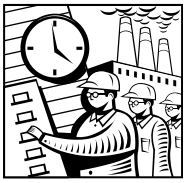
Sample Numeracy Skills

The following list contains numeracy knowledge and skills, as well as practical applications for successful transition from adult literacy program numeracy (pre-Grade 9) to high school credit mathematics.

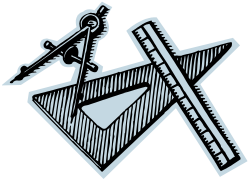
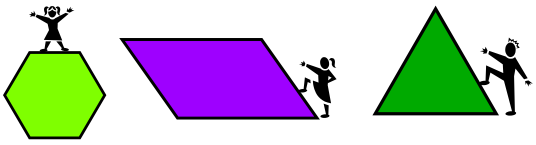
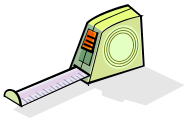
This list reflects samples of strands and learning outcomes highlighting how the instructor can make real life connects for the learner. For a complete list of learning outcomes, see the *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes.*

NUMBER	
The adult learner will be able to:	**Real-Life Connections**
▪ Read, write, compare, and order numbers to millions including: - Reading and writing number words	▪ Rank populations of cities and towns in Manitoba from largest to smallest ▪ Research the cost of purchasing a new vehicle compared to a used vehicle ▪ Practice writing cheques
▪ Demonstrate an understanding of place value for numbers to millions	▪ File plans in numerical order ▪ Read route numbers on delivery labels
▪ Read, write, order, and compare fractions and mixed numbers 	▪ Read fractions used in recipes ▪ Compare interest rates (e.g. 1 ¼% versus 1 ½%) ▪ Compare overtime rates
▪ Read, write, order, and compare decimals up to three decimal places	▪ Read and compare gas prices ▪ Read and compare metric measurements ▪ Compare currency exchange rates
▪ Convert fractions to decimals and decimals to fractions	▪ Compute discounts efficiently and flexibly using percents or fraction equivalencies ▪ Determine a tip using mental math
▪ Read, write, and order simple percentages and understand percentage of increase and decrease	▪ Understand 20% off in a sale flyer ▪ Understand a price increase of 10% ▪ Determine the actual price of a purchase with the additional GST and PST charges 
▪ Recognize equivalencies between common fractions, percentages, and decimals	▪ Write fractions of an hour as decimals on a time sheet (e.g. ½ hour as 0.50) ▪ Determine the percentage of a pay cheque which is deducted for income tax and employee benefits ▪ Determine the difference between wholesale and retail prices

NUMBER	
The adult learner will be able to:	**Real-Life Connections**
▪ Use ratio and proportion to solve one-step percent problems	▪ Adjust a recipe for a larger or smaller number of servings ▪ Convert measurements from one standard to another (e.g. miles per hour to feet per second)
▪ Apply estimation strategies in real-life problem-solving contexts	▪ Keep a running estimate of total cost while grocery shopping ▪ Estimate the best buy in comparison shopping
▪ Round whole numbers and decimal numbers in practical contexts and verbal problems	▪ Work out the total amount due for an order ▪ Work out the change needed from a purchase ▪ Estimate the difference between wholesale and retail costs ▪ Estimate the amount of tip to leave a service provider
▪ Demonstrate and describe processes of addition and subtraction of whole numbers up to 100 000 with and without regrouping	
▪ Demonstrate an understanding of multiplication (up to 3-digit numerals by 3-digit numerals) to solve problems	▪ Research the hourly wage for various jobs in the community ▪ Calculate the differences per day and per week
▪ Demonstrate an understanding of division (up to 3-digit numerals by 3-digit numerals) to solve problems	
▪ Understand and explain the properties of 0 and 1 for multiplication and division, concretely and pictorially	
▪ Determine and use the divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10	▪ Learning about common factors and common multiples of whole numbers will help in understanding operations with fractions
▪ Read, write, and compute with exponents: - Be familiar with the terms *square, cube,* and *square root* - Recognize that exponents represent repeated multiplication	
▪ Calculate square roots of perfect squares, estimate within range of square root value, and demonstrate an understanding of how squaring and taking the square root are related	▪ Estimate the number of 12-inch tiles needed to cover a rectangular floor ▪ Estimate the amount of carpet needed for a room

NUMBER	
The adult learner will be able to:	**Real-Life Connections**
▪ Recognize and use equivalent forms of common fractions including: - Demonstrate an understanding of how to change fractions to equivalent fractions for the purpose of adding and subtracting - Demonstrate an understanding of simplest form - Know how to bring a fraction to its simplest form - Recognize prime numbers	▪ Change minutes to fractions of an hour to fill in a time sheet 
▪ Use fractions to add, subtract, multiply, and divide amounts or quantities	▪ Add hours on a time sheet that includes fractions ▪ Calculate time-and-a-half pay rate when working overtime
▪ Add, subtract, multiply, and divide decimals up to three places including: - Know and use strategies to check answers - Know how to align numbers for column addition and subtraction - Know decimal placement in products and quotients	▪ Work out the total amount due for an order ▪ Work out change needed from a purchase ▪ Calculate weekly/annual income ▪ Keep track of daily expenses as part of a budget plan 
▪ Work out simple ratio and direct proportion	▪ Dilute a liquid in a given ratio (e.g. weed killer, paint) ▪ Change quantities in a recipe to make twice as much ▪ Compare the price of products of different weights or capacities ▪ Mix household or workplace materials
▪ Follow order of operations in evaluating number sentences with more than one operation	▪ Solve algebra equations containing multiple operations
▪ Add and subtract integers: - Demonstrate an understanding of positive and negative integers	▪ Balance a checkbook
▪ Multiply and divide whole numbers and decimals by 10, 100, and 1000 to understand the impact on place value	▪ Simplify large numbers to estimate products/quotients

STATISTICS AND PROBABILITY	
The adult learner will be able to:	**Real-Life Connections**
▪ Pose questions about themselves and their surroundings and gather data to answer those questions	▪ Conduct a survey for community planning
▪ Understand and represent data in a variety of ways and from a variety of sources (e.g. single and double bar graphs, lists, tables, and line graphs found in pamphlets or newspapers)	▪ Create a presentation or a pamphlet. 
▪ Display categorical data in a bar graph or simple fractions of data in a circle graph	▪ Show various groups' responses to school activities or programs ▪ Create a bar or circle graph to represent monthly expenses
▪ Describe the likelihood of an event occurring using words such as *impossible, possible, likely, unlikely, certain*	▪ Decide whether to avoid or use certain products on the market
▪ Give the probability of a single outcome in simple concrete situations demonstrating an understanding that probability depends on the total number of possibilities	▪ Tossing a coin ▪ Rolling dice 
▪ State probability as a ratio fraction	▪ Determine the chances of winning a prize in a draw or lottery

SHAPE AND SPACE	
The adult learner will be able to:	**Real-Life Connections**
▪ Demonstrate an understanding of angles by: - Identifying examples of angles in the environment - Classifying angles according to their measure - Estimating the measure of angles using 45°, 90° , and 180° as reference angles - Determining angle measurement in degrees using a protractor - Drawing and labeling angles when the measure is specific - Identifying types of angles such as right, obtuse, acute, and straight	▪ Quilt making ▪ Following plans for carpentry projects 
▪ Demonstrate an understanding of circles by: - Describing the relationships among *radius, diameter,* and *circumference* of circles - Relating circumference to *pi* - Constructing circles with a given radius or diameter - Solving problems involving the radii, diameters and circumferences of circles	▪ Measure car tires ▪ Design a circular garden 
▪ Demonstrate an understanding of area of regular and irregular 2-D shapes by: - Recognizing that area is measured in square units - Estimating area by using referents for cm^2 and m^2 - Determining and recording area	▪ Determine the amount of carpet or paint needed in home improvements
▪ Design and construct different rectangles given perimeter or area, or both (whole numbers)	▪ Build a deck ▪ Backyard landscaping
▪ Describe the characteristics of 2-D and 3-D objects and shapes including: - Rectangles - Squares - Trapezoids - Parallelograms - Rhombuses	
▪ Use the language (prefixes) of SI (metric) units to describe measurement: - milli = 1/1000 - centi = 1/100 - deci = 1/10 - deca = 10 - hecto = 100 - kilo = 1000	

SHAPE AND SPACE	
The adult learner will be able to:	**Real-Life Connections**
▪ Convert units of measure within one system (e.g. SI or imperial)	▪ Measure medication 
▪ Convert units of measure from SI (metric) to imperial and vice versa	▪ Convert measurements in favourite recipes ▪ Convert temperatures from Celsius to Fahrenheit and vice versa
▪ Estimate and measure length of objects using millimetres, centimetres and metres ▪ Estimate and measure distances using metres and kilometres	▪ Measure and cut wallpaper accurately ▪ Make crafts that involve accurate linear measurement
▪ Explain and apply formulas for calculating the perimeter of rectangles and squares	
▪ Estimate, measure, and compare capacity using simple instruments graduated in standard units ▪ Know when to use appropriate measures	▪ Cooking

Sources:

Curriculum Framework for Mathematics and Numeracy, Massachusetts Adult Basic Education, October 2005

Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes, Manitoba Education, Citizenship and Youth, 2008

Literacy Foundations Mathematics Curriculum 2010, British Columbia Ministry of Education

The Level Descriptions Manual, Ontario Literacy Coalition, 2000

Introducing Grade 10 Essentials Math

Some learners are able to easily transition from an ALP program to a Grade 10 Math course. The following pages introduce the Grade 10 Essentials Math Course and, more importantly, look at the skills and terminology the learner should acquire in a numeracy program to make the transition easier.

Each of the seven Grade 10 Essential Math topics (Personal Finance and Consumer Decisions are combined) will offer all three of the following activities:

Review the topic	• Review relevant pre-Grade 10 skills • Introduce purpose of and time alloted for topic • Become aware of potential anxiety issues
Try a lesson and learn vocabulary	• Try out a pre-Grade 10 lesson • Use the Task Process Cycle to help solve the problems given in the lesson • Integrate various mathematical processes • Introduce relevant skills, vocabulary, and real-world numeracy examples
Link to online activities	• Motivate a class with great website links • Combine technology to help master concepts • Offer the links to an independent learner for further numeracy discovery

Grade 10 Essential Math Topics

The following activities and websites will encourage learners to build skills and to make personal connections with the numeracy topic.

Scroll down to see all of the Grade 10 Essential topics along with sample lesson plans and resources.

Use the hyperlinks to take you to the topic you want to review. Hold down the control key and click on your topic of interest.

1. Analysis of Games and Numbers

Analyze puzzles and games to develop critical thinking and problem solving skills

Questions to think about...

- Are your learners comfortable playing board games or card games?
- Have they grown up with puzzles, riddles, or logic problems...?
- Do they play video games?
- Are there cultural or social barriers that might deter the learner from succeeding in this unit?

Preparing for this unit...

- **This unit might introduce** a whole new language and way of thinking which might create:
  - **Confusion** (*How in the world can I figure this out?)*
  - **Defiance** (*Why should I fool with this? What a waste of time!)*
  - **Anxiety** (*I can't do this! I won't be able to learn this, my mind has gone blank already!)*

Pre Credit Mathematics:

- Games & puzzles are used in the classroom to foster number and spatial sense, and to engage students in numerical activities.
- Games, puzzles and problem-solving activities are now embedded in most mathematics classes and textbooks.

10% Grade 10, 11, 12

Essential Mathematics

Analyze puzzles and games that involve numerical and spacial reasoning using problem solving strategies.

The Outcome

ALP Learners need to develop a vocabulary and schema to be ready to analyze games and numbers.

Experience with games and puzzles will help the learners gain more confidence.

Experience

⇩

More Competence

⇩

Greater Confidence

Becoming a skilled problem-solver will build the skills needed to interpret, explain, analyze and solve problems in life & in both Pre-Calculus Mathematics and Essential Mathematics

Lesson Plan - Four in a Row

Topic	Mathematical Process
Analysis of Games and Numbers	Communication, Connections, Mental Mathematics, Problem Solving, Reasoning

Purpose	To introduce learners to a numeracy game. To use reasoning and problem solving skills while analyzing the best way to win at the game.
Materials	Two colors of clear bingo chips (A box of 20 each will do) Handouts of *Four In A Row Instructions* and *Four in A Row Game Board* (Optional: Website http://www.thechessacademy.org/news.html)

Method:

1. **Ask learners:**
   - Do you play cards and board games, tell riddles, or do puzzles?
   - What role do these activities play in your past or present lives? (This might be a good chance for multi-cultural sharing and conversation. Encourage this sharing. Have learners bring in or teach these games in later classes).
   - Is there any value in participating in these activities? Why? Or Why not?
     - Tell learners that they will have the opportunity to play and analyze various games throughout this year.
     - Scan the room for signs that learners are anxious or unhappy about "playing a game." *If a learner seems unwilling to try the activity, discuss the use of games to build problem solving, analytical and reasoning skills. Look for a connection in the learner's life where the skills and mathematical processes will transfer.*

Chess is in many ways like life itself.

"It's all condensed in a playful manner in a game format and it's extremely fascinating because first of all I'm in control of my own destiny, I'm in charge. You have to be responsible for your actions" - Susan Polgar, Four time World Champion

For a free chess curriculum and activities, click the link below:

http ://www.susanpolgar.com/susan-polgar-chess-curriculum.html

Optional Activity:

- Have learners do a quick research activity on the Chess Academy Website http://www.thechessacademy.org/news.html.

  Chess is a part of the curricula in nearly thirty countries. At this site there are over 60 articles explaining how chess learning can improve learning in general. Have each learner pick a different link and spend 5 minutes getting the theme of the article. Have them report to the class.

2. **Tell the learners they will now be playing a factors and multiples game.**
   - Review definitions and ask for examples of multiples and factors.
   - Read directions and look over the game board from the handout *Four In A Row – Factors & Multiples Game.*
   - Put the Task Process Cycle on the board. Refer to it at different stages in the games, discussions and class period.
   - Have learners play this game one or two times.
   - Still in pairs, discuss the following: *What strategies did you use to win? How much of the game is based on luck? How can you also play defensively? What did you do to keep your opponent from creating a line?*
   - Discuss as a whole group each group's findings. If learners are aware of the different levels of the Essential Skills, discuss how playing these games helps to improve one's Thinking Skills. Divide the white board into three columns. Write 1, 2, 3 in each column. Ask how learners would play this game if they were asked to only play it at Thinking Skill Level 1. Ask how they would play the game if they were playing at a Thinking Skill Level 2. How would they play the game if they were playing at almost a Level 3?

Note to teacher – *suggested answers:*

Level 1 – Move the markers and randomly put down the bingo chips, hoping that eventually you would get four in a row.

Level 2 – Begin playing offensively, trying to get the marker to work in your favour for the lines you are trying to create. Also, play defensively by moving the marker so that you can put your bingo chip in your opponent's line.

Level 3 – Play as in Level 2, but also play so strategically that you are sure that neither marker will work in your opponent's favour as you both begin to get close to completing a line.)

- Have learners play the game again.
- Ask them for feedback on the game using an Exit Slip. The question could be as follows:

How did you feel about learning and then playing the game today? What strategy did you use to play your first game? How did your playing change as your became more familiar with the game and its strategy?

Four in a Row - Instructions

Factors and Multiples Game

Materials

- Two colors of clear bingo chips
- Photocopy of Four in A Row Game Board (1 for every two learners)

Game Objective

- To get four of your bingo chips in a straight or diagonal line.

Number of Players

- 2

Procedure:

- Hand out one Game Board
- Each player chooses one color of 18 bingo chips.
- Two extra bingo chips of any color are needed as markers for the number line at the bottom of the game board.

Directions	**Game example**
Player one goes first. She places both markers somewhere on the number line.	Perhaps, 5 and 6
Player one figures out what the two numbers multiply or divide to.	As 5 and 6 are the factors of 30, she places one of her colored bingo chips on the 30.
Player two goes second and can only move **one** marker.	He moves the marker off the 5 and now places it on the 3. Now there is a marker on 6 and on 3.
Player two figures out what the two numbers multiply or divide to.	He has two choices: 6x3 = 18 or 6/3 = 2. He picks 2 and places his first bingo chip on 2 of the game board.
Player one has to now move **one** marker.	Player one decides to move marker 3 to marker 6. That means both markers are on 6. She has two choices: 6x6 = 36 or 6/6 = 1. Since she will have more luck making a line with 6/6, she puts her bingo chip on 1 of the game board.
The game is played until someone gets four in a row (vertically, horizontally or diagonally).	

On line version of game: http://illuminations.nctm.org/ActivityDetail.aspx?ID=29

Four in a Row

Factors and Multiples Game

1	2	3	4	5	6
7	8	9	10	12	14
15	16	18	20	21	24
25	27	28	30	32	34
36	40	42	45	48	49
54	56	63	64	72	81

1 Number Line	2	3	4	5	6	7	8	9

Links to Websites

Analysis of Games and Numbers

There are many great games, below are just a few links.
LEARN4GOOD – http://www.learn4good.com/kids/games.htm

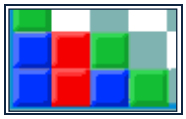
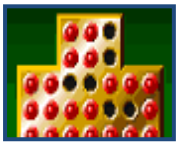
Board games	
	All out Strategy, Online Chess, Battleship, Chinese Checkers, Checkers Board, MahJong Solitaire, Chess Game, Crazy Chess, 3D Chess Game
Card/Dice Games	
	Card Matching, Memory Cards, Free Solitaire, Memory Game , Tri Towers Solitaire
Maze Games	
	Blox Forever, Cable Capers, Donkey Kong, Caray Snake, Driller, Beaver Brothers, Super Slyder, Bubble Bobble The Revival, Bloxorz Strategy, Silvershpere Logic Puzzle, Super Mario World, Super Mario Flash, Roly-Poly Eliminator
Online Games	
	Bubble Trouble, Minesweeper, Fishy, Xraye Pegs, Coball, Blooming Garden, Match the bugz, Bad Apple, Beaver Dive, Brilliant Blocks, Nurse Suzy, Beads Puzzle, Mysteries of Sherlock Holmes Museum, Huje-Tower
	http://labyrinth.thinkport.org/www/educators/about/about.php

The math is one of the most fun parts of the game. It is embedded in a strong story line that engages students in an eerie world where monsters want world domination at any cost.
The only way students can prevent that from happening is by solving the puzzles.

And the only way that students can solve the puzzles is by using their logic and understanding of the ways numbers work together.

COOLMATH GAMES

http://www.coolmath-games.com/

	Gravity Grid LOTS of thinking and planning ahead involved. You have to tip the game area around to get blocks of the same color together so they'll disappear.
	Loop the City Put streets around the numbers so that you can make one big loop around the city.
	Mahjongg This is our newer version of this ancient board game. Find matching tiles to eliminate them. The goal is to get rid of all the tiles on the board.
	Mancala This is a classic board game with lots of strategy and planning involved. Can you beat the computer?
	Peg Solitaire Your goal is to remove all the pegs by jumping over them... Can you get down to just one peg left?
	QvK This is a classic logic puzzle where you need to place four knights and four queens on a chess board so that none threaten each other.

Chess Curriculum

http://www.susanpolgar.com/susan-polgar-chess-curriculum.html

The Official Susan Polgar Foundation Chess Curriculum is being used by a number of schools across the the U.S. and around the world. This course includes: the history of chess, chess notation language, how to check and checkmate, opening principles, different chess tactics, 62 pages with illustrations

Note: We will continue to offer links to games in the proceeding pages. They can be used for discussion and analysis, as well as becoming more competent in numeracy topics and terminology.

2. Personal Finance & Consumer Decisions

To develop an understanding of employment earnings

To make informed consumer decisions

Questions to think about...

- **Do your learners read their receipts, pay slips, & bills?**
- **Do they fill out cheques, budgets, petty cash or order forms?**
- **Can they estimate, reason, and use their number skills to solve money problems?**

Preparing for this unit...

- **The numeracy learner can prepare by :**

•Choosing a personal financial interest, making a learning plan, and working through the numeracy, literacy and terminology to meet his goals.

•Taking more ownership of personal budgets and expenses. Reading, filling out and organizing financial and tax documents

•Improving financial and consumer vocabulary.

•Working through various consumer spending activities and problems available.

Grade 8
Demonstrate an understanding of:

•Percents greater than or equal to 0%.

•Ratio and rate.

•Solving Problems with Ratio, rate and poportional reasoning

•Multiplying and dividing positive fractions and mixed numbers concretely, pictorially, and symbolically.

25% Grade 10
30% Grade 11
40% Grade 12
Essential Mathematics

Grade 10 Outcomes

- **Calculating gross pay** and net pay using various income sources.
- **Solving problems** that require the manipulation and **application of formulas** related to income.
- **Solving problems such as unit pricing and currency exchange..**

Grade 11 & 12 Outcomes

Topics include:

- Compound interest,
- Credit options,
- Manipulation of formulas related to finances,
- Financial institution services,
- Proportional reasoning and unit analysis, vehicle finances,
- Small business and home finance options,
- Government taxation.

Lesson Plan - Winona's Problem

Topic: Personal Finance	**Mathematical Process:** Communication, Connections, Problem Solving, Reasoning
Purpose	To practice reading and checking a pay stub.
Materials	**For the practitioner** – Task Process Cycle, white board and markers **For the learner** - handout *Winona's Problem*

Method:

1. **Distribute the hand out, *Winona's Problem* and ask learners to read it.**
2. **Draw the Task Process Cycle on the board or flip chart paper.**
   Have learners work through Winona's Problem using the Task Process Cycle. They are welcome to work in pairs.
3. **Once everyone has completed the problem, they may choose to share their answers.**
   Work through the Cycle with the learners. Ask questions such as the below. Write their answers around the Cycle you have drawn on the white board.
   i. What is the problem? What information did I need in order to see if Winona's pay was correct?
   ii. What strategies did I choose to figure out the answer?
   iii. What did I do to figure out the answer?
4. **Put the Task Process Cycle on the board or flip chart paper. Use sticky notes or markers to add the learner comments as your discuss #1 through #4.**
   Ask the group about # *i)* *just above*. What is the task? What is the relevant information?
   Ask the group about # *ii)*. What strategies did they use? What was their plan of attack? Note: There are various ways learners can come up with the answer. They might use a calculator or paper. They might multiply the 8 extra hours by $14.10. They might multiply 48 hours by $9.40, or by 1.5. There is value in showing more than one way to get to the answer. Put these different strategies up on the board and ask learners to choose the method that works the best for them.
   Ask the group about # *iii)*. It might be the same as # *ii)*. However, maybe a learner or group had to go back and try and new strategy, if so how did that go?
5. **Allow for discussion about how people figured out the problem. Then ask questions below.**
   i. What did I find out about how I did the problem?
   Was it challenging?
   Did I get anxious?
   Have I worked out a similar problem to this before?

ii. What about Winona, what is the meaning of this outcome?
What should she do about it?

Optional Activities:

- Oral Communication – Discuss, plan or role-play how Winona should begin this conversation with the payroll department or her boss. You might mention approach, tone, lead sentence, body language, etc.
- Document Use – Bring in documents that you want to practice reading. Are there some documents that you make calculations with as well? What other work-related documents would you like to read or fill out?
- Thinking Skills - How do you organize your work documents or contracts? Are there any changes you would like to make to your organization of time cards, pay slips, contracts, etc.?
- Writing – Send an email to the payroll department on this matter.
- Computer Use, Reading and Writing – Research and report on Manitoba Employment Standards

Winona's Problem – Student Pages

Winona works for Exodus Cleaning Service. She is a night cleaner. In a normal week, Winona works from 9 p.m. to 5 a.m. from Sunday to Thursday. She gets half an hour off every night for a "midnight snack" on paid time. Her rate of pay is $9.40 per hour. She usually makes $376.00 before deductions for a 40-hour week. When she works overtime, she gets time and a half.

Last week, her co-worker Maria, stayed home with her sick child. Winona had to work her extra hours. She worked until 6 a.m. on Monday and until 7 a.m. on Tuesday. On Wednesday and Thursday, she worked until 7:30 a.m. On Friday morning, she worked her normal shift.

Winona's pay for last week was more than usual, but it is less than she expected.

Here is Winona's pay slip:

Exodus Cleaning Service			*For the week of 2011-01-10*
Hourly Rate:	**$9.40**		**Stub: #539**
Total Hours:	**48.0**		
Gross Earnings:			**$ 451.20**
Deductions:			**$ 129.40**
	Income Tax	**$ 99.26**	
	C.P.P.	**$ 22.33**	
	E.I.	**$ 7.81**	
Net Earnings:			**$ 321.80**

- Review the above pay slip and answer the question below.
- Is Winona's pay correct?
- Adapted from Numeracy at Work: A Social and Holistic Approach to Math as an Essential Skill, October 2010 OLES Project Winnipeg Workshop.

Personal Finance & Consumer Decisions - Links to Websites

The City

http://www.themoneybelt.ca/theCity-laZone/eng/Ab-eng.aspx

The City is a learning program developed by the Financial Consumer Agency of Canada (FCAC) with the goal of teaching young people financial skills that they can carry with them throughout their lives. The materials can be downloaded for use in a classroom or used as an online, self-directed version that can be completed virtually anywhere.

You can choose between in-class modules or online modules that students can do independently to achieve many of the same outcomes. The in-class resource contains everything you need to teach financial life skills, including lesson plans, overheads, student handouts and financial documents. They'll use an engaging series of activities to learn basic financial life skills in a way that is relevant to their own lives. Using realistic characters, they can learn about personal finances in a fun, interactive and non-threatening way.

The Coffee Shop

http://www.coolmath-games.com/0-coffee-shop/index.html

The Coffee Shop is a great business game where you run your own coffee shop. You have to plan your budget, your recipe and how much to charge. Be sure to keep your customers happy!

The Money Belt

http://www.themoneybelt.qc.ca/tools-atelier-eng.asp

This website helps with learning financial basics, comparing credit cards, bank accounts, online quiz, and many other resources.

In this section the learner will find tips that summarize the essentials of money management. There are also quizzes and comparison tools for choosing bank accounts or credit cards.

1. compare credit cards
2. compare bank accounts
3. quiz yourself
4. quick tips
5. watch our clips
6. cast your vote

http://financialliteracy.org.nz/

Managing My Money - A money management education package

http://www.financialliteracy.org.nz/financial-education/tertiary/unit-standards

The Managing my Money package deals with the high risk areas of managing personal money, career, goals, and plans. The packs provide an excellent opportunity for developing general numeracy and literacy skills as well as for financial education. They are suitable for foundation skills programs, adult and community education, and workplace learning.

- Making wise money decisions
- Making a family or household budget
- Financial goals and plans
- Knowing how banks can help you
- Understanding income, credit and tax

All of the seven packs are available on the Retirement Commission website.

Money Instructor
http://www.moneyinstructor.com/
This is an excellent site for teaching and learning basic money skills, personal finance, money management, business education, careers, life skills, economics, and more. It will allow you to be a limited member for free or for $29.95 a member for one year.

The website includes lessons, lesson plans, interactive tutorials, printable worksheets, games, simulations, activities, exercises, quizzes, personal finance information, resources, ideas, money saving suggestions, tips, and helpful advice. Teach and learn money skills, personal finance, money management, and real life skills. Curriculum includes counting money, money math, banking, check writing, checkbook, checking, budgeting, spending money, saving money, taxes, jobs, careers, investing, basic economics, elementary economics, finance, and other everyday life skills.

Lemonade Stand
http://www.coolmath-games.com/lemonade/index.html
Welcome to Lemonade Stand! Your goal in this game will be to make as much money as you can within 7, 14 or 30 days. To do this, you've decided to open your own business -- a Lemonade Stand! You'll have complete control over almost every part of your business, including pricing, quality control, inventory control, and purchasing supplies. You'll also have to deal with the weather, which can be unpredictable. Unfortunately, the weather will play a big part when customers are deciding whether or not to buy your product.

PBS: Your Life, Your Money
http://www.pbs.org/your-life-your-money/chapter_01_russell_simmons.php

Watch the video above.
Realizing that young adults don't receive enough fundamental knowledge about finances at school or at home, music mogul Russell Simmons co-founded the Hip Hop Summit Action Network, which puts on the *Get Your Money Right* seminar on personal finance. At the summit in Atlanta, Georgia, Hip Hop stars and music industry professionals share the life lessons they learned with an engaged audience.

- Real Stories
- Making It & Keeping It
- Make Your Money Work For You
- Digging Out Of Debt
- Start Saving
- Get Insured
- Do It Yourself

Money Smart Podcast Network
http://74.205.121.32/audio.html
About 40 podcasts including topics such as:

- Chequing and Savings (Direct Deposit , bank cards, interest rates, how to open an account, how to write a cheque, …)
- Budget and Savings (How to save, budget plans, what to do when debt gets overwhelming…)
- Credit (Borrowing Basics, credit cards, loans…)

Listen to podcasts online or download them to learner's audio player.

Money Math
http://library.nald.ca/search?q=money&collection=research&collection=learning

Series: Everyday Math Skills

By: Lisa Campbell, NWT Literacy Council

Collection: Learning Materials

Money Math is one of three workbooks in the NWT Literacy Council's Everyday Math Skills series. It can be used in conjunction with the math booklet, Simply Math. Money Math is designed to help adult learners with math and is written in plain language. It is divided into three sections, each covering a variety of math concepts, followed by worksheets and a review page

Section one includes personal finances, and setting up a budget. Section two is on saving money and compound interest. Section three covers consumer math and helps students learn to calculate discounts, tips, gas consumption and cell phone options.

3. Measurement

To develop an understanding of the Systeme International (SI)

To solve probems that involve SI and Imperial measurements.

Questions to think about...

- **Do your learners use measurement in their school or work lives?**
- **Can they understand and use the SI (metric) system?**
- **Can they estimate, reason, and use their number skills to solve measurement problems?**

Preparing for this unit...

- **The numeracy learner can prepare for this topic by understanding:**
  - How to select the appropriate measuring tool to measure length, width, distance, volume, and mass.
  - The vocabulary used in SI and Imperial measurement.
  - The differences between the SI and Imperial systems of measurement.

Demonstrate an understanding of:

- Estimation and accurate measuring.
- Multiplying base 10 numbers (10, 100, 1000, etc.)
- Multiplying and dividing decimals.

25% Grade 10

15% Grade 11

10% Grade 12

Essential Mathematics

Grade 10 outcomes include:

- Understanding and **using the SI and imperial systems.**
- Apply strategies to **convert between SI and imperial measurements.**
- Solve and **verify problems** using the SI and imperial systems.

Grade 11 outcomes include:

- Solve problems that involve SI and imperial units in surface area, volume and capacity measurements.
- Demonstrate an understanding of the limitations of measuring instruments.

See next page for more detailed outcomes.

Measurement Outcomes

The following outcomes are taken from the ***Grades 9-12 Mathematics: Manitoba Curriculum Framework for Essential Mathematics.***

Grade 10 Specific Outcomes

10E1.M1. Demonstrate an understanding of the Systeme International (SI) by describing the relationships of the units for length, area, volume, capacity, and mass.
[C, CN, ME, PS, V]

10E.1.M2. Demonstrate an understanding of the Imperial system by

- The relationships of the units for length, area, volume, capacity, and mass
- Comparing the American and British imperial units for capacity**.**
- Applying strategies to convert between imperial units and SI units

[C, CN, ME, V]

10E1.M.3 Solve and verify problems that involve SI and imperial linear measurements, including decimal and fractional measurements.
[C, ME, PS, V]

Grade 11 Specific Outcomes

11E3.G.1. Solve problems that involve SI and imperial units in surface area measurements.

[C, CN, ME, PS, V]

11E3.G.2 Solve problems that involve SI and imperial units in volume and capacity measurements.

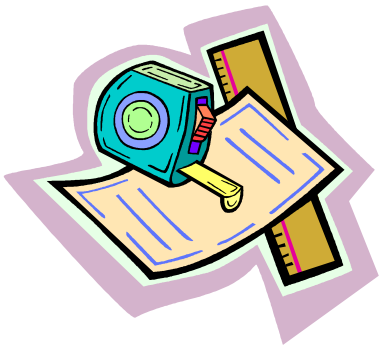
Grade 12 Specific Outcomes

12E5.P.1 Demonstrate an understanding of the limitations of measurement instruments, including:

- Precision
- Accuracy
- Uncertainty
- Tolerance

What is Measurement?

Measurement is the foundation skill for geometry. Measuring skills are used every day on the job, for home-improvement projects, or for daily tasks such as food preparation. Understanding measurement includes the understanding of:



- Length
- Time
- Weight
- Mass
- Area
- Volume
- Angles

It also includes understanding concepts such as:

- Volume
- Proportion
- Problem-solving

Source: Saskatchewan Literacy Network
Level II Kit Section 6: pp 1-2

Why Teach Measurement in Adult Programs?

Other than number sense, measurement may be the most frequently used numeracy concept in daily life. However, it is listed by adults with numeracy goals as one of the concepts with which they experience the most difficulty. Measurement is the foundation skill for geometry and many adults associate *geometry,* like *algebra,* with failure, especially in relation to their previous math learning experiences. In addition, many adults do not see the relevancy of measurement in their everyday lives, when in fact it is an essential life skill, one that adults use in many different but familiar contexts. Numeracy instructors can facilitate their learners' understanding of the concept of measurement as an essential life skill, and improve their learners' self-confidence as they transition to higher levels of math, by providing connections between measurement, geometry and their daily lives.

Implications for Teaching Measurement in Adult Literacy Programs

1. **(Instructors should) …use exact and estimated measurements to describe and compare phenomena to increase the understanding of the structure, concepts and process of measurement.**

   Despite the fact that competence in measurement is vital, some adult learners have difficulty selecting and determining appropriate units of measure as well as appropriate tools of measurement. Concrete activities with non-standard and standard units help learners develop an understanding of the many measureable attributes of physical objects (length, time, temperature, capacity, weight, mass, area, volume, and angle). This is the natural way of building a vocabulary for measurement, and for comprehension of what it means to measure.

2. **Measurement skills should be extended to concepts such as area, volume, proportion, and problem-solving.**

3. **The place to start is the learner's strengths; instruction must be practical and useful for learners to overcome their fears regarding geometry.**

4. **Finally, it is necessary to focus on hands-on problem-solving and to give special attention to developing spatial sense in order for learners to develop an understanding of geometric principles.**

   Spatial reasoning includes not only geometry, but measurement and the ability to visualize. It is often the visual and concrete models that can help (learners) understand and learn…this kind of reasoning, this part of mathematics, often helps learners who have talents in this direction realize and accept that they do have mathematical potential.

   Source: Adult Numeracy Themes
   Ohio Mathematical Planning Committee (1996)

Lesson Plan

Introduction to Measurement

Topic	**Mathematical Process**
Measurement (Think-Pair-Share) Activity	Communication; visualization; connections; problem-solving; estimation
Purpose	Learners will reflect on and discuss their prior knowledge, attitudes, and beliefs about the metric and imperial systems of measurement..
Materials	Question cards; one card per learner Math journal (optional)

Method:

Photocopy and cut out the question cards (Sets A-D)

Randomly distribute one question card to each learner

Think-Pair-Share:

- **a.** Have the learners read the questions independently, spending 3-5 minutes reflecting on their responses.
- **b.** Ask each learner to find a partner (or small group) who has the same set of questions. Each group will appoint a recorder and a reporter and then spend 6-8 minutes sharing and discussing their responses
- **c.** Ask one member from each group to summarize and share their group's responses with the whole class**.**

Alternatively, the learners could be assigned to choose one set of questions from the questions cards and then write their responses to the prompts in a math journal.

Set A:

- Why is it necessary to measure things?
- Why do we have standard systems of measurement?
- What does it mean to estimate?
- Describe a measuring situation when estimation is good enough.
- Describe a measuring situation when exact measurement is required.

Set B:

- What is the difference between length and distance?
- When would you need to measure length? Which unit of measurement would you use?
- When would you need to measure height? Which unit of measurement would you use?
- When would you need to measure distance? Which unit of measurement would you use?

Set C:

- Why do we have both metric (metres, kilometres) and imperial (foot, yard, miles) measures?
- Which measurement system did you first learn about?
- When in your daily life do you use imperial measures?
- When in your daily life do you use metric measures?
- Which system would you say you use the most often?

Set D:

- List as many examples as you can of ways you have used measurement today; at home, at work, or at school
- Describe one example from your life of learning how to measure something (What were you measuring? What form of measurement was used? Who taught you? How were you taught?)

Lesson Plan

Measurement Vocabulary Word Sort

Topic	**Mathematical Process**
Recognizing and categorizing imperial and metric(SI) measurement vocabulary	Communication; reasoning; connections; problem-solving; visualization

Purpose	Learners will: ▪ Demonstrate prior knowledge of vocabulary related to the imperial and metric(SI) systems of measurement ▪ Describe similarities and differences among vocabulary words ▪ Work collaboratively to categorize words
Materials	▪ Vocabulary word sheet (one per group) ▪ Chart paper (one sheet per group) ▪ Felt markers ▪ Scissors/glue (optional)

Method:

- Have the learners join a partner or form small groups
- Distribute one vocabulary word sheet, one sheet of chart paper, and felt markers per group
- Each group will appoint a recorder and a reporter
- Each group will work cooperatively for approximately 15 minutes to read and sort the vocabulary words into three or more categories. It is up to the group to decide on the categories, as well as a title for each. Once the group has reached a decision, the recorder will divide the chart paper into sections, write in the titles, and then record each word in the corresponding category.
- Once all of the groups are finished, each reporter will present his/her group's list to the whole class, and will provide an explanation for each category.

> A group may categorize the words in any way they choose, as long as they can explain their thought process.
>
> For example, a group may list the words *inch, foot, and yard* under a heading *Used to Measure Fabric. Another group* may list *millimetre* and *millilitre* under the heading *Words That Begin With Milli.* The choices the groups make will give the instructor insight as to the learners' prior knowledge and understanding of the various terms.

MEASUREMENT VOCABULARY WORD SORT

INCH	**POUND**	**FOOT**
MILLIMETRE	**YARD**	**MINUTE**
CUP	**DECIMETRE**	**GRAM**
MILLILITRE	**QUART**	**KILOMETRE**
OUNCE	**LITRE**	**METRIC TON**
CENTIMETRE	**MILE**	**KILOGRAM**
POINT	**METRE**	**GALLON**

Lesson Plan

Estimating and measuring length, width and mass

Topic - Estimating and measuring length, width, and mass of familiar objects; - Selecting appropriate measuring tools; - Reading measurements accurately	**Mathematical Process** Communication; visualization; estimation
Purpose	Learners will be able to: ▪ Estimate the length and width of various common objects ▪ Select the appropriate measuring tools and measure the length and width of various common objects ▪ Use and read measuring tools accurately ▪ Estimate the mass of various common objects ▪ Select the appropriate measuring tools and determine the mass of various common objects ▪ Use and read measuring scales accurately
Materials	▪ Classroom objects which can be used for estimating and measuring length and width ▪ Enough measuring tools, with both imperial and metric measures, for each group of learners (measuring tapes; rulers; metre/yardsticks; kitchen scales; bathroom scales) ▪ 2 Handouts Estimating and Measuring Length and Width; Estimating and Measuring Mass ▪ Whiteboard/chalkboard

Method:

1. **Distribute the handouts and introduce the activity to the learners**
2. **Demonstrate using the various measuring tools, indicating the imperial and metric measurements**
3. **Review the definitions of the vocabulary words; write the definitions on the board:**

   Vocabulary:

   Length Width Mass Estimate Scale
4. **Put aside the measuring tools until the estimating activity is completed**
5. **Have the learners form pairs or small groups**

   Each pair will choose various objects to use to complete the activities on the handouts

   As a whole group, the learners can discuss the completed activities and describe their accuracy in estimation.

Estimating and Measuring Length and Width

Use the measuring system with which you are most comfortable

List six objects	**Guess the length and the width m/cm or yards/feet/inches***	**Measure the actual length and width**	**How close was your estimate? + ___ - ___**
1.			
2.			
3.			
4.			
5.			
6.			

Estimating and Weighing Objects

Use the measuring system with which you are most comfortable

List six items	**Estimate the weight** **oz./lbs** **kg/g***	**Measure the actual weight**	**How close was your estimate?** **+ ___** **- ___**
1.			
2.			
3.			
4.			
5.			
6.			

VOCABULARY FOR MEASUREMENT

measurement
length
width
height
volume
mass
scale
estimate
Metric measurement terms:
millimetre
centimeter
metre
decimetre
kilometre
decametre
litre
millilitre
gram
Imperial measurement terms:
inch
foot
yard
mile
ounce
pound
pint
quart

Measurement – Links to Websites

www.mathisfun.com
This website is adult-friendly and interactive. Click on the topic "Measurement" on the home page. The link contains many illustrations and examples of metric measurement with real-world applications. The site promotes estimation strategies and includes an interactive question and answer section to test the learner's knowledge after they read through the material. Useful for introducing the metric system or as a review.

www.nrdc.org.uk (Maths4Life Measurement)
From this website; or by "googling" Maths4Life Measurement", the instructor is able to download a pdf booklet which contains useful teaching and assessment strategies and activities related to measurement.

http://www.literacy.kent.edu/Oasis/Resc/Educ/geometry3.html
This link is one of the Ohio Literacy Resource Center's *Adult Numeracy Themes.* The link provides several lessons related to measuring perimeter and area.

The Ruler Game
http://www.rsinnovative.com/rulergame/
The Ruler Game allows the learner to read an imperial measurement ruler. You have the option of difficulty and playing against the clock.

Fun Brain - Reading a Measuring tape
http://www.funbrain.com/measure/
The tape measures come in either centimeters or inches

U.S. Metric Association
http://lamar.colostate.edu/~hillger/puzzles/
This link offers many PDF activities to use in the classroom to teach metric.

Trades Math Workbook – HRSDC
http://www.hrsdc.gc.ca/eng/workplaceskills/essential_skills/pdfs/trades/trades_math_workbook.pdf
The first section of this free workbook is called *Measurement and Calculation*. It includes great measurement activities using trades themes. The other sections include: Money Math, Scheduling/Budgeting/Accounting, and Data Analysis.

Skillwise
http://www.bbc.co.uk/skillswise/numbers/measuring/lwc/index.shtml
This link offers factsheets, three quizzes, and a game where the learner builds a new shed by converting between mm, cm, and meters, and worksheets with answers.

http://www.bbc.co.uk/skillswise/numbers/measuring/temperature/
This module explains how to measure temperature. It will help you to read thermometer scales and compare Fahrenheit and Celsius measurements. Factsheet, quizzes, worksheets.

Lesson 15 - Canadian Language Benchmarks Essential Skills
http://www.nald.ca/library/learning/cclb/language/lesson15/lesson15.pdf
Measuring in Metric and Imperial is a lesson plan with five activities including estimating and converting.

Metric Conversions
http://www.metric-conversions.org/metric-conversion-table.htm
A very easy to use online metric and imperial conversion calculator

BBC Raw Skills For Everyday Life
http://www.bbc.co.uk/raw/numbers/chef_weighing_metric.shtml
A three minute video where, Kieran Leverett, apprentice chef at Fifteen restaurant in Newquay, Cornwall, discusses the use of measurement in the restaurant. This is a good video to introduce a measuring lesson. Also, there is a step-by-step comic that comes with this video.

Birmingham Grid for Learning – SI measurement
http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/measures/index.htm
Practice deciding which unit of SI measurement you need to use. Help Jack to decide which unit of measurements to use and to read mass, length and volume of objects.

Mathfrog – Metric Converstion
http://cemc2.math.uwaterloo.ca/mathfrog/english/kidz/metric6.shtml
Practice converting various metric units.

Problems with a Point
http://www2.edc.org/mathproblems/problems/htmlProblems/nsCOMAPDrink/nsCOMAPDrink.asp?problemID=191&caller=/mathproblems/listProblem.asp&filename=nsCOMAPDrink
This activity allows learners to use volume and surface area formulas to pack soft drinks. The answers, and solutions are provided, so that learners can work independently while gaining problem-based learning related to an out of school setting.

4. 2-D Geometry

To develop an understanding of spatial relationships applied to area.

Questions to think about...

- Have your students worked with area and perimeter?
- Are your learners competent in using a measuring tape?
- Are they able to manipulate their fractions and decimals in order to solve area and perimeter problems?

Preparing for this unit...

The numeracy learner can prepare for this topic by:

- Understanding area and perimeter of rectangles, circles, triangles, parallelograms and irregular shapes. (Pre-Grade 8 outcomes).
- Understanding Geometry vocabulary and identifying geometric shapes.
- Applying their fraction, decimal and measurement skills; and their knowledge of formulas to 2-D measurement (area and perimeter)

Grade 8:

- Demonstrating an understanding of multiplying and dividing positive fractions and mixed numbers concretely, pictorially, and symbolically.
- Modelling and solve linear equations
- Determining surface area of right rectangular prisms, right triangular prisms, right cylinders to solve problems.

9% Grade 10

Essential Mathematics

Applies skills learned in the *Measurement Unit.*

Grade 10 Outcomes include:

- Solve problems that involve SI and imperial area measurements of regular, composite, and irregular 2-D shapes including decimal and fractional measurements.
- Solve problems that require the manipulation and application of formulas related to: perimeter and area.

Lesson Plan – New Flooring Plan

Topic 2-D Geometry	**Mathematical Process** Connections, Problem Solving, Reasoning, Visualization
Purpose	To measure and calculate surface area of a room with an entrance or closet and then calculate the costs associated with purchasing the flooring.
Materials	Imperial Unit Measuring Tapes, Handouts – *New Flooring Event!* *Task Process Cycle* - Poster

Method:

1. **Distribute the New Flooring Event! Handouts and ask the learners to read over the first task.**
   - Use the *Task Process Cycle* poster to discuss the first task. Prepare the learners to solve Task One.
   - Have learners work on Task One. When they are finished, do a group reflection using the cycle. (Decide whether you need to work through each task together or whether to let the learners work independently.
   - Point out that there are a few tasks to solve. You might list these on the board as learners point them out.
   - Encourage learners to use the Task Process Cycle as they work through each task.
   - Walk around the room and ask learners how they have planned out each task. Reflect with them when a task seems complete.

New Flooring Event!

You have saved $2,500.00 for new flooring.
This flooring will go in the entranceway and the main room of your house or learning program.

There is a flooring sale and you need to decide whether you have enough money to go ahead and buy the flooring.

Task One

Below, make a blueprint of the room and entrance way. It doesn't have to be to scale.

Measure out the real space (this might include a closet or an entrance). Add the measurements to the below blueprint.

Task Two

Calculate the surface area of your space. Show your calculations below.

Task 3

Read the flyer. Decide on the flooring you want to buy and put a check mark on its picture.

Task 4

Decide how much it will cost to put in the flooring.

Show all your work.

This should include:

- Cost of flooring
- Cost of installation
- Taxes
- Total Cost to put in the flooring.
- Explain whether you have enough money to put in the flooring.

Optional tasks

- Present the cost of buying and installing two different types of flooring.
- Read the financing options. Present what the cost of the flooring will be if you finance for one year and then pay it off a year and a month later.

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- Measure your own living space and decide on the cost of flooring.
- Redo a kitchen. Find out the surface area of cabinets, countertops, flooring, and walls. Pick out colors, flooring, etc. Estimate the costs.
- Oral communication activity – Phone a local handy person and ask:
- What are the other costs associated with putting in flooring? (Taking off floor boards, etc...)
- What does he or she charge?

2-D Geometry - Links to Websites

SkillWise
http://www.bbc.co.uk/skillswise/numbers/measuring/perimeterareaandvolume/areарectangle/index.shtml
This link offers factsheets, a quiz, a video of a man building some garden decking and using measurement skills, and worksheets with answers.

National Centre for Excellence in the Teaching of Mathematics
https://www.ncetm.org.uk/self-evaluation/browse/strand/110
This link offers the practitioner: vocabulary, activities, matching cards, and real life context questions for area and perimeter. It needs some adaptation for adult learners.

Birmingham Grid for Learning
http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/perimeter_and_area/index.html
Lessons on Perimeter and area.

Area Formula Lab
http://mason.gmu.edu/~mmankus/AreaLab/0Area.htm
Formulas are often presented to students as if they dropped out of the sky. Exploring the areas of various geometric shapes provides an excellent opportunity for them to see where these formulas come from, and how they are related to each other. This set of activities presents a sequence of worksheets in which students can explore the areas of shapes, using their knowledge of shapes already studied, to derive additional formulas. Students are encouraged to literally use "cut and paste" methods, cutting shapes apart and taping them back together so that they resemble shapes that are already understood. In this way, students will form a better understanding of the formulas and how they work.

SuccessLink
http://www.successlink.org/GTI/search-results.asp

- **Classroom Makeover – Measurement and financing lesson**
- **Dancing on the Roof - Shingle a roof**
- **Gazebo Project – Learners make a scale model of a gazebo**

My first garden
http://urbanext.illinois.edu/firstgarden/
This is a project that involves creating a garden. Through various activities learners will learn to collect and organize data, measure using non-standard units, and plan and problem solve using estimation. There are many additional ideas for incorporating math into such a project. However, the practitioner should do some planning to incorporate this link's potential into her numeracy class.

5. Trigonometry

To develop spatial sense relating to triangles.

Questions to think about...

- **Do your learners use variables? Are they comfortable problem solving with an unknown?**
- **Can they use proportional reasoning in a variety of contexts?**
- **Do they have a concrete, pictoral, and symbolic understanding of the Pythagorean theorem? Do they know where and when they would use it?**

Preparing for this unit...

Grade 8:

- Demonstrate and understanding of perfect squares and square roots, percents, ratios, rates, and proportional reasoning.
- Model and solve problems using linear equations where *a, b,* and *c* are integers.
- Develop and apply the Pythagorean theorem to solve problems.

15% Grade 10
Essential Mathematics

10% Grade 10
Applied Mathematics

5-25% Grade 11
Essential and Applied Mathematics

Grade 10 outcomes include:

- Demonstrate an understanding of factors of whole numbers by determining prime factors, GCF, LCM, square root and cube root.
- Solve problems that require the manipulation and application of formulas related to the Pythagorean theorem and primary trignometric ratios
- Demonstrate an understanding of primary trignomentric ratios

Grade 11 outcomes include:

- Manipulate and apply formulas related to slope and rate of change
- Solve problems by applying proportional reasoning, that involve scale, that involve two and three right triangles.
- Demonstrate an understanding of linear relations by recognizing patterns and trends, writing equations, solving problems.

Lesson Plan – Three Bean Salad

Topic	**Mathematical Process**
Preparing for Trigonometry	Connecting, Reasoning, Visualization, Communication, Estimating and Mental Math
Purpose	To review proportional reasoning. To practice making and working with equations.
Materials	*Three Bean Salads Learner Page* A bag of Red beans, Lima beans, and Black-eyed peas Paper plates or coffee filters for learners to put their beans in.

Method:

Copy the Three Bean Salad recipe on the board.

Three Bean Salad

This salad contains:
3 times as many Red beans as Black-eyed peas
One more Lima bean than Red beans
8 beans in all

1. **Ask learners to pick up some beans and peas and work out the recipe.**
   Watch how learners attempt the activity. Do they work together? Do they share information? Do they use the beans to figure out the recipe?
2. **Discuss the learner answers.**
   Pull out the Task Process Cycle. Go through the cycle.
3. **After the learners share how they solved the problem, go back to the "Make a Plan" section.**
4. **Ask learners if they could create an algebraic equation to help them figure out the bean salad recipe.**
   Try it out on the board together. (Let Peas = P, let Red beans = 3P, let Lima beans = 3P+1…)
5. **Now that everyone has the answer, ask learners to write their answer as a proportion. (Lima beans: Red Beans: Peas)**
6. **Ask the learners to leave that salad, grab more beans, and make the salad three times bigger.**
   Ask them to write the proportion. (You will see here, whether you need to review the meaning of ratios and proportion).
7. **Go back to the Task Process Cycle's "Reflect on Outcomes," ask the learners if they would be able to create other three bean salads.**
8. **If the answer is "no", do another Three Bean Salad on the board. If yes, hand out the *Three Bean Salads Learner Page.***
9. **Once learners are finished, discuss how well their problem solving plans worked and their results.**

Note: Please see the activities in the *Trigonometry: Links to Websites* if you are ready to introduce your learners to Pythagoras, right triangles, and similar triangles.

Three Bean Salad – Learner Page

Bean recipes taken from Family Math by Kate Nonesuch

Recipe	Show your answer and work
1 **This salad contains:** **The same number of Red beans as Lima beans** **3 more Black-Eyed Peas than Red beans** **A total of 18 beans**	
2 **This salad contains:** **4 Red beans** **½ as many Black-eyed peas as Red Beans** **10 beans in all**	
3 **Lima beans make up ½ of this salad** **The salad has exactly 2 Red beans** **The number of Lima beans is double** **the number of Red beans**	
4 **This salad contains at least 12 beans** **It has one more Lima bean than Red beans** **It has one more Red bean than Black-Eyed Peas**	
5 **This salad contains:** **Equal number of Red beans and Black-Eyed Peas** **5 more Lima beans than Red beans** **No more than 20 beans**	

Trigonometry – Links to Websites

Khan Academy – Well explained lectures
Understanding Exponents Part 1
http://www.khanacademy.org/video/understanding-exponents?playlist=Developmental%20Math

Understanding Exponents Part 2
http://www.khanacademy.org/video/understanding-exponents-2?playlist=Developmental%20Math

Understanding Square Roots
http://www.khanacademy.org/video/understanding-square-roots?playlist=Developmental%20Math

Pythagorean Theorem when you don't know the Hypotenuse
http://www.khanacademy.org/video/the-pythagorean-theorem?playlist=Geometry

Pythagorean Theorem when you know a side and the hypotenuse
http://www.khanacademy.org/video/pythagorean-theorem-ii?playlist=Geometry

Web Quests – In Search of Pythagoras
http://pberlin.com/pythagoras.htm
http://edweb.sdsu.edu/t2arp/quest/pythagoras.webquest/webquest.pythagoras.html
These two links are identical. The tasks include: Learning about Pythagoras, demonstrating a proof of the Pythagorean Theorem, solving problems, and creating a real world problem to give to the class.

Pythagorean Theorem: Pythagorean Theorem: word problems
http://www.ixl.com/math/practice/grade-7-pythagorean-theorem-word-problems

NOVA Online
http://www.pbs.org/wgbh/nova/proof/puzzle/
This link takes you to an introduction of Pythagoras.
http://www.geom.uiuc.edu/~demo5337/Group3/applic.html
The next link will allow you to see why the theorem works.
There are also "real world" theorem problems to solve.

- Playing baseball – throwing a runner out
- Using a ladder – Breaking and entering
- Scaling the pyramids

6. Transformations

To develop spatial sense

Questions to think about...

Do you have learners who have been away from from the classroom for more than 10 years?

If so, the vocabulary associated with this unit might be completely new. While the concepts are not difficult, learner anxiety with the vocabulary might impede the learning.

Preparing for this unit...

Review previous grades:
Spatial sense offers a way to interpret and reflect on the physical environment.

- Transformations begin in Grade 4 with symmetry of 2-D shapes
- Grade 7 - Identify and plot points and perform and describe tranformations in all 4 quadrants of a cartesian plane
- Grade 8 - Demonstrate understanding of tesselation

11% Grade 10 Essential Mathematics

Grade 10 outcomes include:

Demonstrate an understanding of transformations on a 2-D shape, including:

- Translations
- Rotations
- Reflections
- Dialations

Grade 11 and 12 outcomes include:

Develop spatial sense involving 3-D objects and polygons

Lesson Plan - Learning About Tessellations

Topic Transformations	**Mathematical Process** Technology, Connecting, Reasoning, Visualization, Communication
Purpose	To introduce transformations through online discovery learning of tessellations. To introduce transformation vocabulary.
Materials	Internet, Task Process Cycle, *Tessellations Learner Page*, Transformer toys (optional)

Method:

1. **Introduce the tessellations activity with a discussion of repeated patterns.**
   - "Where do you see patterns or mirror images in real life?
   - Are you interested in art and in crafts?
   - Have you ever seen: birch bark biting, beadwork on moccasins, aboriginal art, a Ukrainian Easter egg, a voyageur's sash, quilt work, stained glass, an Icelandic sweater, pottery, an Afghani rug, an African mask?
   - If you have any of these items at home, or other works of art, take a look at whether you see repeating patterns or identical images repeated over and over."
     Optional - Pull out a transformer toy. Ask for a volunteer to figure it out. Is the toy symmetrical? (You might have to define this word). Ask how the learner was able to "transform" the toy? "Through movement! It is that movement we will be learning about today."

2. **Explain that today learners will have the opportunity to explore art forms and get a general understanding of transformations.**
   - Learners begin learning about symmetry and motion in Grade 4. The new Grade 10 Essentials Curriculum includes a unit called "Transformations."
     This unit might look challenging because there are a lot of large vocabulary words. After today's activity those words will no longer seem so intimidating when learners transition to high school credit course math.

3. **Watch these two videos. Make sure you turn on the speakers!**
   - Tessellations - 4 minutes http://www.youtube.com/watch?v=7UaORtJnEew&feature=fvw
   - Tessellations slide show - 3 minutes http://www.youtube.com/watch?v=5-3tOa9CPb0&feature=related

4. **Hand out the Tessellation Learner Page.**
   - Have learners read over the task, make a plan, and execute the plan using the *Task Process Cycle* poster.
   - Have learners present their video.
   - Go over the Learner Page and Reflect on Outcomes.
   - Ask if there are students willing and able to bring art from their home that may contain transformations.

Tessellations – Learner Page

For the first <u>five</u> boxes, define the term using words and pictures.

Tessellation	
Symmetry	Line of Symmetry
Rotation	Translation
Reflection	Transformation
Find a Tessellation-themed video to present to the class**.** Write video's name and web address**.**	Write down the name of an artist that uses Tessellations.

Transformations – Links to Websites

Links Learning
http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html
A well explained audio lesson on line symmetry with activities. While the website uses a child's voice in the audio, the lesson shows life examples of symmetry and would be perfect for an anxious learner.

Transforming Triangles: Utah Lesson Plans
http://www.uen.org/Lessonplan/preview.cgi?LPid=15432
Complete lesson plan that includes: kinesthetic activities, worksheets, coordinate plane graphing, and extension activities.

Geometric Thinking: Bundle 5 – Lesson Plan
http://adultnumeracy.terc.edu/TIAN_bundle5.html
Teachers Investigating Adult Numeracy has developed *Geometry and Quilting: Activity 5D*. This activity is on pages 25-35 of Bundle 5 and is well worth printing.

Math Playground
http://www.mathplayground.com/TransformationWorkshop/Workshop.html
In this transformation activity, learners practice reflections, rotations, and translations.
Reflect (flip), rotate (turn), and translate (slide) your way through 18 levels of shape shifting geometry fun!

Slam Ball
http://illuminations.nctm.org/ActivityDetail.aspx?ID=168
Hit tokens, collect points! Slam the ball into the sides of the game board, and use your knowledge of angles, symmetry, and reflections to choose the best path.

Geometry Centre – From Science U
http://www.scienceu.com/geometry/
Explore the Geometry Centre during the first 10 minutes of a few classes. Have learners:
Find two new Vocabulary words each time. Make sure they explain what the word is or sketch an example.
Play, discover and enjoy the activities without the anxiety of knowing they are learning transformations and words that they may likely be very unfamiliar with.
Patterns, Shapes, Symmetry! You will find these themes everywhere in the Geometry Center. Browse through an exhibit, or jump right in and start experimenting!

MathsNet: Interactive Transformations
http://www.mathsnet.net/transform/index.html
This site may be useful for working independently. The learner should read the introduction so that she knows how to move the mouse to do go through the exercises. Learners will be able change various geometric shapes using rotations, reflections, translations or enlargements - and combinations of these transformations.

Patchworkz
www.shockwave.com/gamelanding/patchworkz.jsp
This is a free (and somewhat addictive) shockwave quilting game that works with patterns and symmetry. Just make sure you turn off the volume.

7. Angle Construction

To develop spatial sense

To use direct or indirect measurement to solve problems

Questions to think about...

- Have your learners used a protractor?
- Have they worked with angles, circles, circle graphs, percents, and degrees?

Preparing for this unit...

The numeracy learner can prepare by :

- working with angles and circles.
- using a protractor.
- using proper angle terminology.
- *And by **reviewing Grade 6 & 7** level mathematic.*

Grade 6
Demonstrate an understanding of:

- identifying examples of angles in the environment.
- classifying angles according to measure.
- estimating the measure of angles.
- determing angle measures in degrees.
- drawing and labelling angles when the measure specified.

Grade 7
Demonstrate an understanding of:

- describing the relationships among radius, diameter and circumference of circles.
- relating C to pi.
- determining the sum of central angles.

13% Grade 10

Essential Mathematics

Grade 10 Outcomes

- Demonstrate an understanding of angles through drawing, replicating and constructing, bisecting and solving problems.
- Solve problems that involve parallel, perpendicular and transversal lines, and pairs of angles formed between them.

Lesson Plan – Learning about Angles

Topic Angle Construction	**Mathematical Process** Technology, Connecting, Reasoning, Visualization
Purpose	To introduce learners to online learning. To learn pre-high school credit angle terminology and skills
Materials	Internet - http://www.khanacademy.org/

Method:

- Introduce angles with a discussion of winter driving. How many learners have ever hit ice and spun their car right around? This is called a 360.
    - What do you call it if you hit ice and end up facing the opposite direction - a 180?
    - Draw a circle on the board and discuss what understanding of angles and circles your learners already have.
- Discuss with learners what and why people are choosing to learn online.
    - People use the Internet to learn for fun, to prepare for exams, and even to receive credits for University Masters Courses. Today, they will get the opportunity to try learning online through the Khan Academy.
- Watch the 2:13 minute, introductory video http://www.khanacademy.org/
    - Ask the learners to scroll down to the Geometry section.
- Ask the learners to look at the **Task Process Cycle** poster.

1. **What is the task?** We need to learn what is on the Introduction to Angles video.
2. **Make a plan** – Ideas for learning might include: watch the video twice, get paper and make notes, use the pause button, find a quiet place to study, etc…) Tell the learners to watch the Introduction to Angles video.
3. **Reflect**. Did your plan work out? How do you know?

Khan Academy – Geometry Video Clips:

Introduction to angles
Angles (part 2)
Angles (part 3)
Angles formed between transversals and parallel lines
Angles of parallel lines 2
The Angle Game
Similar triangles
Similar triangles (part 2)
Angle Game (part 2)

Are you prepared to watch the second video "Angles (part2)"?
Would you change the way you study or watch the video this time?
How was your anxiety level?
Did you like the Khan Academy Video?
How or when could you use these videos again?
Would you use them at the Adult Learning Centre, at College, as a refresher, or to help your child with homework?

- Watch the other videos and try The Angle Game.
- Ask learners to do a search and find out what jobs use geometry, as well as where geometry is used in everyday life.
  Examples include:
  http://www.ehow.com/how_4421171_use-geometry-everyday-life.html and
  http://www.ehow.com/about_5414862_types-jobs-use-geometry.html

Notes:

Angle Construction – Links to Websites

Vocabulary Lesson Plan from Utah Education Network

http://www.uen.org/Lessonplan/preview.cgi?LPid=16272

It may help learners to learn kinesthetically (hands on) in order to understand different geometric ideas and concepts. This angle vocabulary lesson plan is excellent. It not only gets learners moving, but it also offers an easy to make concentration vocabulary card game.

Virtual protractors from Ambleside Primary

http://www.amblesideprimary.com/ambleweb/mentalmaths/protractor.html

This site offers ten online activities supporting the teaching and investigating of angles. Some activities include estimating.

http://www.amblesideprimary.com/ambleweb/mentalmaths/angleshapes.html

This link offers twenty interactive investigations using a protractor. Excellent for a smart board, projector, or one-on-one tutoring practice, as it asks great questions, but does not supply the answers.

Innovations Learning

http://www.innovationslearning.co.uk/subjects/maths/activities/year6/angles/home.asp

Angles are very difficult to estimate, although we all know that 90 degrees is a right angle (square corner). Have a go at estimating some of the other angles here. You will score 10 points for a correct answer and you will loose 5 points for a wrong answer.

Hitting the Target

http://www.hittingthetarget.com/

This game was developed to assist learners in learning about angles through the medium of sport**.** If your learner is struggling with the idea of how angles are measured, what's the difference between right angles, acute angles and obtuse angles or how to guess the size of angles - Hitting the Target is the one to try! Snooker – Measuring, Soccer – Right Angles, Tennis – Acute Angles, Cricket – Obtuse Angles

Angles with Attitude

http://www.rblewis.net/technology/EDU506/WebQuests/angles.html

Use this Web Quest with an independent learner, instead of a whole class.

This Web Quest is designed to introduce you to the exciting world of angles. You will apply your knowledge of angles to several fun activities. In order to complete this Web Quest, you will need pencil, paper, protractor, ruler, and a compass. After completing the activities, you will be able to recognize the types of angles and construct your own angles.

Soccer Problem

http://illuminations.nctm.org/ActivityDetail.aspx?ID=158

Learners analyze the best angle for a soccer player to make a goal. The applet allows the learner to investigate this problem by changing the location of the player as well as the distance between the player and the goal posts. The angle changes as the player is moved.

Transitions Related Numeracy Resource List	
Title of Publication/ Website	***Description* of :** **RESOURCES FOR NUMERACY**
Changing the Way We Teach Math - A Manual for Teaching Basic Math to Adults *http://library.nald.ca/item/6562*	**Changing the Way We Teach Math - A Manual for Teaching Basic Math to Adults** by Kate Nonesuch combines best practice adult numeracy methodology with ready to use classroom activities. Worth downloading and keeping in a binder. They may become your favourite resource for teaching fractions, percent and decimals.
Everyday Math Skills Workbooks http://www.nwt.literacy.ca/adultlit_res.htm	**Everyday Math Skills Workbooks** are available to download from the **Northwest Territories Literacy Council** – Adult Literacy Resources **Everyday Math Skills Workbooks series include:** - Home Math Workbook (PDF - 5.0 MB) - Kitchen Math Workbook (PDF - 5.9 MB) - Money Math Workbook (PDF - 5.4 MB) - Simply Math Workbook (PDF - 3.4 MB)
Improving Learning in Mathematics: Challenges and Strategies https://www.ncetm.org.uk/public/files/224/improving_learning_in_mathematicsi.pdf	**The National Centre for Excellence in the Teaching of Mathematics** offers excellent professional development materials such as: Improving learning in mathematics: challenges and strategies. They also now house the Maths4 Life project which combines professional development with great teaching resources. Thinking Through Mathematics is the online version ofthe Maths4Life resource.
Khan Academy http://www.khanacademy.org	**Khan Academy** - With a library of over 2,700 videos covering everything from arithmetic to physics, finance, and history and 240 practice exercise. This excellent resource is a YouTube-based website for learners and teachers at all math levels.

Title of Publication/ Website	*Description* of : RESOURCES FOR NUMERACY
Manitoba Education: Mathematics http://www.edu.gov.mb.ca/k12/cur/math/index.html	**Manitoba Education - What's New** The website provides up to date Mathematics documents from kindergarten to grade 12. • Support documents • Manitoba Curriculum Framework Documents
Manitoba Education Mathematics Resources http://www.edu.gov.mb.ca/k12/cur/math/mathres.html	**Manitoba Education** Mathematics Resources website offers many lessons, games, and activities for download. Some of the templates are available for adaptation in Word.
Manitoba Education Mathematics Resource - Kindergarten to Grade 8 Mathematics Glossary ***http://www.edu.gov.mb.ca/k12/cur/math/glossary_k-8/index.html***	**Manitoba Education** Mathematics Resource website also offers its Kindergarten to Grade 8 Mathematics Glossary - Support Document for Teachers online.
Math Apprentice http://www.mathplayground.com/MathApprentice.html	**Math Apprentice** is an online activity that allows learners to become an apprentice and take a virtual cartoon tour of eight companies. At each company they learn what math is used at the site and do a numeracy activity. Each site visit takes about ten minutes.
Math is Fun http://www.mathsisfun.com/	**Math is Fun** is an excellent interactive math website full of numeracy games, activities, worksheets and ideas for teachers.
Teachers Investigating Adult Numeracy http://adultnumeracy.terc.edu/TIAN_teacher_resources.html	**Teachers Investigating Adult Numeracy** offers five downloadable numeracy bundles that each contains adult numeracy professional development and numeracy lesson plans. The five bundles are: • Number Sense – Flexibility and Fluency • Operation and Symbol Sense • Number Sense – Integers • Algebraic Thinking • Geometric Thinking

Title of Publication/ Website	*Description* of : RESOURCES FOR NUMERACY
The Next Step: Mathematics Applications for Adults *http://library.nald.ca/search?q=Next+step+numeracy&collection=research&collection=learning*	***New Brunswick Community College*** *offers for free* The Next Step *downloads of nine progressively challenging adult numeracy books and one teacher's manual on the NALD website.* *The Next Step: Mathematics Applications for Adults - Book 14011 contains basic whole number numeracy skills* *The Next Step: Mathematics Applications for Adults - Book 14019 (2003) offers the following range:* Number Operations; Fractions, Decimals, and Percent; Percent, Ratio, and Proportion; Geometry; Measurement, Integers; Equations: Equalities and Inequalities; and Personal Finance.