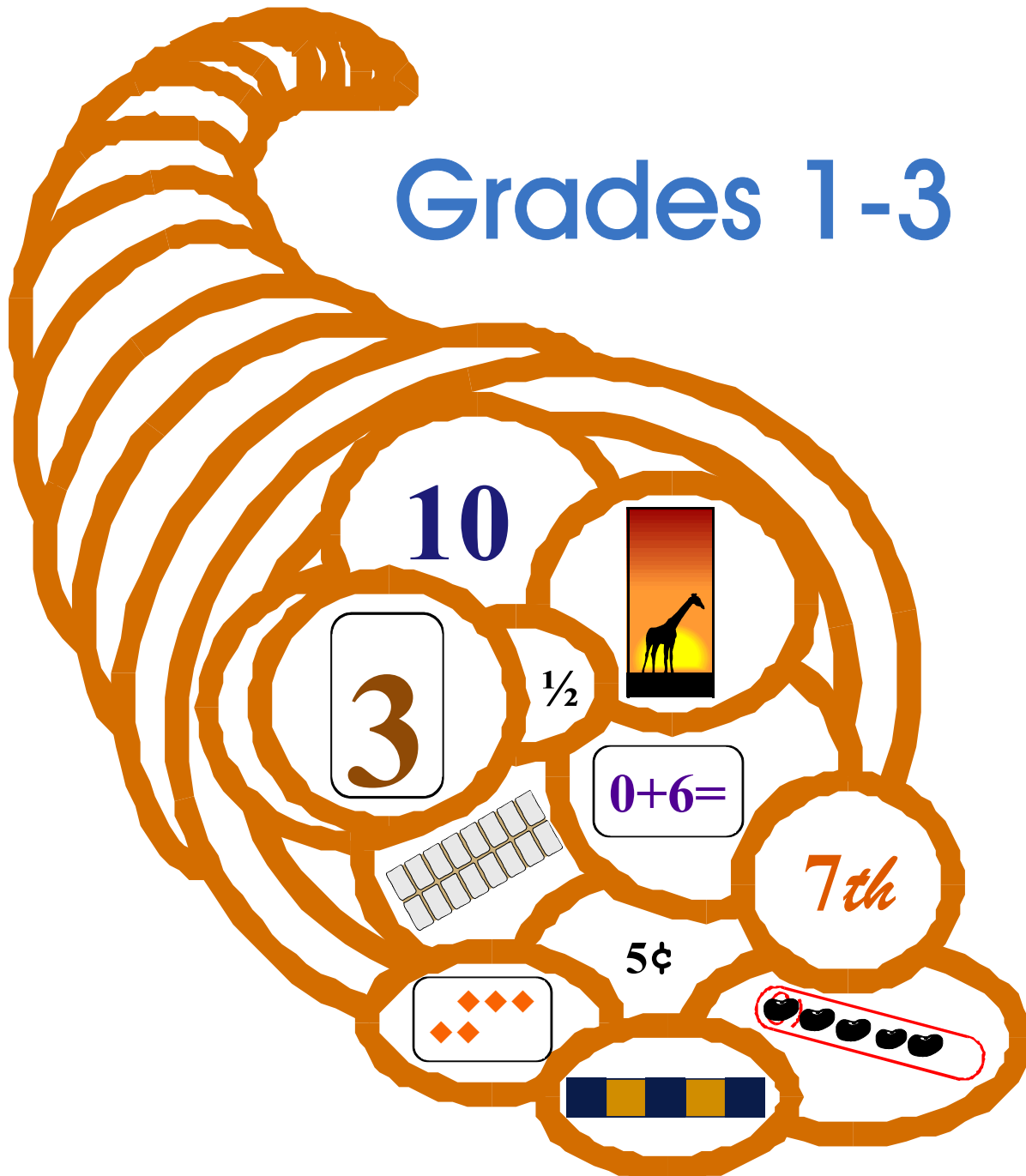




# Mathematics:

## Grades 1-3



### Number Sense and Numeration

# The Ontario Curriculum: Mathematics

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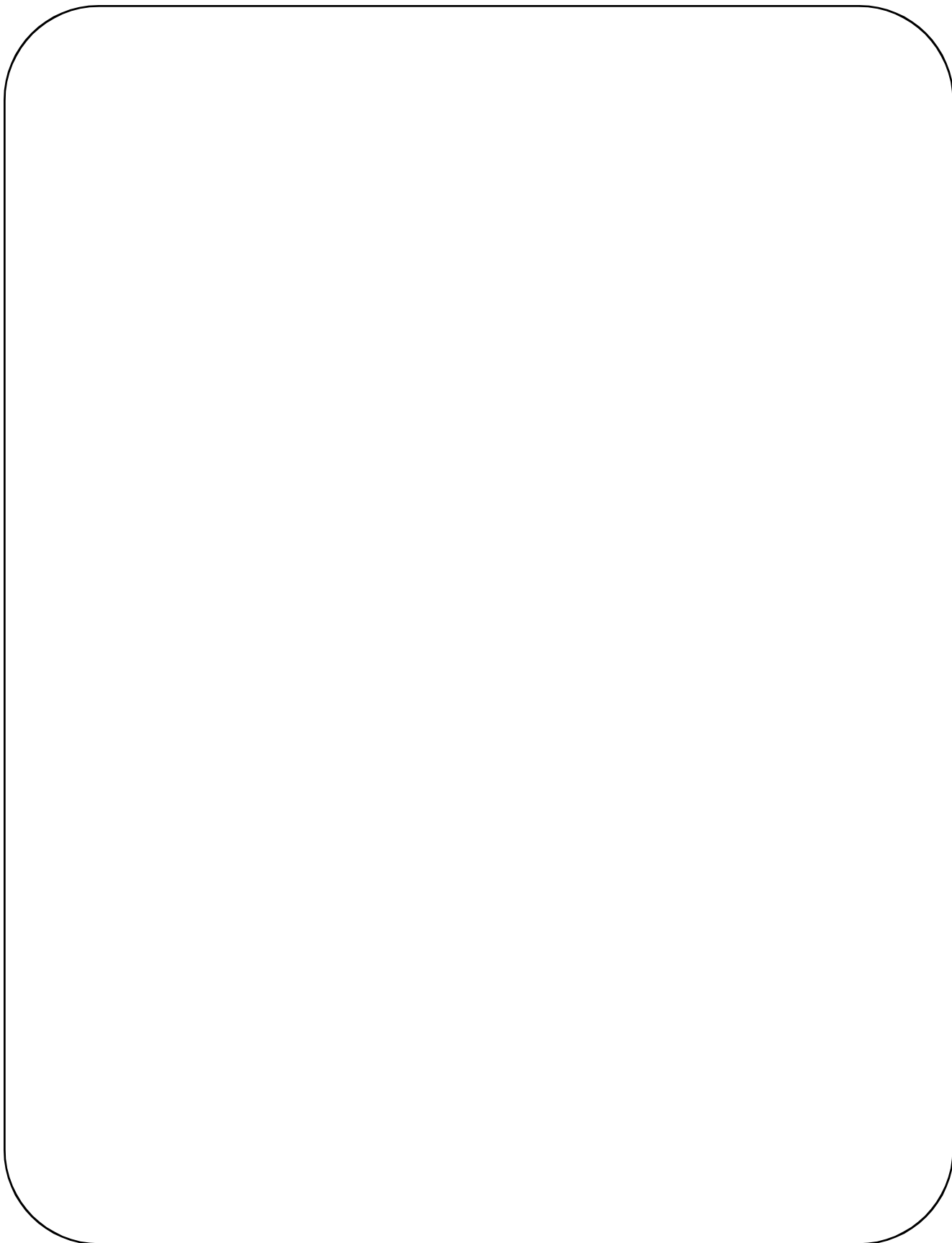
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# Number Sense and Numeration

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# The Ontario Curriculum: Mathematics



# Number Sense and Numeration

## Preface

*It is important for students to develop the mathematical competence that comes from understanding numbers, number systems, and their related operations.*

*The Ontario Curriculum, Grades 1-8, Mathematics, 1997, page 10*

It is difficult to deal with our world without using numbers. In the same way, in our classrooms, most of the mathematical concepts, that teachers present, involve numbers. Students, therefore, need a thorough understanding of numbers and their relationships in order to make sense of their many environments. Such understanding does not *just happen*. Teachers need to teach about numbers and number concepts and to provide related learning experiences in order to develop their students' *number sense*.

**Number Sense and Numeration** is a collection of such lessons and learning experiences aimed at assisting teachers as they address each expectation in this strand of the **Mathematics** curriculum. It consists of a variety of suggestions, for teachers, on how to present specific numerical concepts. Student pages are provided to reinforce the teaching and to give students practice in applying the concepts and procedures. Often students are challenged to increase their understanding through a variety of *Further Challenges* outlined in each lesson.

It is important that young students be allowed to use concrete materials to help them to understand mathematical concepts. Within this curriculum package there are numerous opportunities for students to use manipulatives. As students advance in their understanding of numbers and their relationships, they will move to paper and pencil computations and then to calculators and computers. Teachers are aware that the use of these technologies does not replace the mastery of fundamental mathematical operations.

As teachers in a Catholic school, there are also many opportunities to relate the student's mathematical learning to her/his spiritual development by highlighting the use of numbers throughout Scripture. Many Biblical quotes range from counting to calculating numbers as our story unfolds in the *Old* and *New Testaments*. Needless to say, some of the use of numbers in Scripture is not included for accuracy, but rather for illustrative purposes. Often numbers were used to estimate crowds, just as we do today. Including such quotes in our lessons and pointing out the similarities to our world today will help breathe life into the Scriptures, for our students.

NOCCC would like to acknowledge the many hours of work by our teacher/writers, who have tried to assemble meaningful learning experiences for students as they come to understand numbers and develop their *number sense*.

Special thanks to

**Daphne Brumwell, Team Leader, Northeastern CDSB**  
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**Cathy McLean, Huron-Superior CDSB**  
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**Maria Young, Huron-Superior CDSB.**

Also, NOCCC wishes to recognize **R&D Translation, Elliot Lake**, for its expertise in translating this resource for use in our French Immersion schools.

Hopefully, this resource unit will assist all of our Grades One to Three teachers in the implementation of the *Number Sense and Numeration* strand of the *Mathematics* curriculum. The lessons, and student worksheets, have been coded in such a way that students could be using challenges from another grade, according to their needs, as identified by the teacher. A student would not be aware of what grade level the task has been taken from; whereas, the teacher will be able to identify the level from the list of the expectations on pages x – xvii of the *Introduction*, for example,

Grade One	Lessons P1 to P9
Grade Two	Lessons P10 to P18
Grade Three	Lessons P20 to 35.

Welcome to the wonderful world of numbers!

Carollynn Desjardins  
Executive Director



# Number Sense and Numeration

## Introductory Liturgy

### Opening Songs

*I Will Never Forget You*  
*Be Not Afraid*  
*Jesus Loves The Little Children*  
*You Are A Gift To Me*

### Sign of the Cross and Greeting

**Theme** This is the appropriate point, in the celebration, to establish the theme of the Mass as God's infinite love for us. The students could bring forward symbols such as *paper hearts*, *toys* and *books* with the following words:

We bring forward *hearts* to represent the many ways that we show love to one another.

We bring *toys* to show that we must remember to love each other when we play together.

We bring *books* to indicate that we must remember to love each other while we learn in class.

### Opening Prayer

God of love and mercy, you call each of us by name. You call us your friends. Help us to hear your call everyday. May we stay always in your friendship and infinite love. We ask this through your Son Jesus and the Holy Spirit who live with you forever and ever.

**Amen.**

### Penitential Rite

1. Lord Jesus, by your example, you teach us how to love.  
**Lord have mercy.**
2. Lord Jesus, guide us in your ways so that we may love others as you love us.  
**Christ have mercy.**
3. Lord Jesus, help us to remember that your love for us is infinite and everlasting.  
**Lord have mercy.**

### First Reading *Isaiah 49:15 - 16*

In this reading God reminds us of the maternal nature of His love. He brought us into this world. He knows us. He calls us by name. He will never forget us.



# Number Sense and Numeration

**All:**                   **Thanks be to God.**

**Gospel**           *John 13:33-35*

*“... Little children, I am with you only a little longer. You will look for me; and as I said to the Jews so now I say to you, ‘Where I am going, you cannot come.’ I give you a new commandment, that you love one another. Just as I have loved you, you should love one another. By this everyone will know that you are my disciples, if you have love for one another.”*

The Gospel of the Lord.

**All:**                   **Praise to you, Lord Jesus Christ.**

## **Children’s Creed**

I believe that God is my Father in heaven.

I believe that he made the world  
that he gives me life  
that he helps me grow.

I believe that Jesus is the Son of God and the son of Mary.

Jesus shows me that God is love.  
Jesus lived and died for me.  
Jesus is alive now, alive in me and in my neighbour.

I believe in the Holy Spirit.

who helps me to love others  
who makes me holy  
who helps me to know God better.

I believe in God’s family, the Church.

I believe that I will be happy with God for ever and ever.

Amen.

**Petitions**       The response to the petitions is *Lord hear our prayers.*

1. For the Church, that our leaders, and all of us, show the love of Jesus to sinners. We pray to the Lord.

**R:** *Lord hear our prayers.*

2. For all of us, that each of us may know that Jesus loves us and calls us every day to be his friend. We pray to the Lord.

# The Ontario Curriculum: Mathematics

**R:** *Lord hear our prayers.*

3. For those who are lonely and feel unloved, that someone be sent to them by God. We pray to the Lord.

**R:** *Lord hear our prayers.*

## Preparation of Gifts

At the bringing forward of the bread, water and wine, the students say:

We bring our lives to God in this bread, water and wine.


## The Lord's Prayer

**Closing Prayer** Thank you, God, for your infinite love. Help us to show our love for others by following your example.

## Dismissal

## Sign of the Cross





**Planning  
for  
Teaching  
and  
Assessing**





















# The Ontario Curriculum: Mathematics

## Children's Literature Resources

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# Number Sense and Numeration

## Knowledge/Skills

Level 1

Level 2

Level 3

Level 4

### Problem solving

#### The student solves problems:

- |  |                               |   |  |
|--|-------------------------------|---|--|
| - with assistance                                | - with limited assistance     | - independently                               | - independently  |
| - with a limited range of appropriate strategies | - with appropriate strategies | - by choosing the most appropriate strategies | - by modifying known strategies or creating new strategies |
| - rarely accurately                              | - frequently accurately       | - usually accurately                          | - almost always accurately                                 |

### Understanding of concepts

#### The student shows understanding of concepts:

- |   |   |  |   |
|---|---|--|---|
| - with assistance   | - independently                                     | - independently  | - independently   |
| - by giving partially complete but inappropriate explanations | - by giving appropriate but incomplete explanations | - by giving both appropriate and complete explanations | - by giving both appropriate and complete explanations, and by showing that he or she can apply the concepts in a variety of contexts |
| - using only a few of the required concepts                   | - using more than half of the required concepts     | - using most of the required concepts                  | - using all of the required concepts  |

### Application of mathematical procedures

#### The student applies mathematical procedures:

- |   |   |  |  |
|---|---|--|--|
| - with assistance                                     | - with limited assistance                                   | - independently  | - independently  |
| - that are considered to be basic in solving problems | - that are considered to be appropriate in solving problems | - that are considered to be the most appropriate in solving problems | - that are considered to be the most appropriate in solving problems, and justifies the choice |
| - with major errors and/or omissions                  | - with several minor errors and/or omissions                | - with a few minor errors and/or omissions                           | - with practically no minor errors and/or omissions  |

### Communication of required knowledge related to concepts, procedures, and problem solving

#### The student communicates the required knowledge:

- |   |  |  |   |
|---|--|--|---|
| - with assistance                                   | - independently  | - independently  | - independently   |
| - unclearly and imprecisely                         | - with some clarity and some precision                             | - clearly and precisely  | - clearly, precisely, and confidently                           |
| - rarely using appropriate mathematical terminology | - sometimes using appropriate mathematical terminology and symbols | - usually using appropriate mathematical terminology and symbols | - always using appropriate mathematical terminology and symbols |

*The Ontario Curriculum, Grades 1-8: Mathematics 1997, page 9.*

# The Ontario Curriculum: Mathematics

## Characteristics of Levels

Level 1	Level 2	Level 3	Level 4
assistance is required	limited assistance is required	student works independently	student works independently
limited learning strategies are used	appropriate learning strategies are used	appropriate learning strategies are used	learning strategies are modified and new ones created
only a few of the curriculum expectations are fully or consistently met	more than half of the curriculum expectations are fully or consistently met	most of the curriculum expectations are fully or consistently met	all of the curriculum expectations are fully or consistently met and extended
major errors occur	several minor errors occur	few minor errors occur	few minor errors occur
explanations are partially complete or inappropriate	explanations are incomplete but appropriate	explanations are complete and appropriate	explanations are complete and appropriate with evidence in a variety of contexts
communication is unclear and imprecise	communication has some clarity and some precision	communication is clear and precise	communication is clear, precise and confident
child is struggling and confused	child is learning, but the work is inconsistent	child is learning and the work is consistent	child's learning is complex and extended



# Number Sense and Numeration

## Provincial Guide for Grading

Level	Definition	Grades 1-6 Letter Grade
<b>Level 4</b>	The student has demonstrated the required knowledge and skills. Achievement exceeds the provincial standard.	<b>A+</b> <b>A</b> <b>A-</b>
<b>Level 3</b>	The student has demonstrated most of the required knowledge and skills. Achievement meets the provincial standard.	<b>B+</b> <b>B</b> <b>B-</b>
<b>Level 2</b>	The student has demonstrated some of the required knowledge and skills. Achievement approaches the provincial standard.	<b>C+</b> <b>C</b> <b>C-</b>
<b>Level 1</b>	The student has demonstrated some of the required knowledge and skills in limited ways. Achievement falls much below the provincial standard.	<b>D+</b> <b>D</b> <b>D-</b>
<b>R or below 50</b>	The student has not demonstrated the required knowledge and skills. Extensive remediation is required.	<b>R</b>





# The Ontario Curriculum: Mathematics

## Assessment Rubric for \_\_\_\_\_

Criteria	Level 1	Level 2	Level 3	Level 4



# Number Sense and Numeration

## SPECIFIC COMPUTATIONAL EXPECTATIONS

### To Be Acquired by the End of Grade 6

Student's Name: \_\_\_\_\_

#### *ADDITION*

- knows number facts to 10
- adds two two-digit numbers
- adds two three-digit numbers
- adds a column of two digit numbers
- adds a column of three digit numbers
- adds two four-digit numbers
- adds three four-digit numbers
- adds four three-digit numbers

#### *SUBTRACTION*

- knows number facts to 10
- subtracts two two-digit numbers
- subtracts two two-digit numbers/w/regrouping
- subtracts two three-digit numbers/w/wo/  
regrouping
- subtracts four by three digit numbers/w/wo/  
regrouping
- subtracts two four-digit numbers/w/wo/  
regrouping
- subtracts five by four digit numbers/w/wo/  
regrouping

#### *MULTIPLICATION*

- knows number facts to 5
- knows number facts to 10
- multiplies two by one-digit numbers
- multiplies three by one-digit numbers
- multiplies two two-digit numbers
- multiplies three by two-digit numbers

#### *DIVISION*

- knows number facts to 5
- knows number facts to 10
- divides two by one-digit numbers
- divides three by one-digit numbers
- divides four by one-digit numbers
- divides three by two-digit numbers
- divides four by two-digit numbers

# The Ontario Curriculum: Mathematics

## Grade 3 Mathematics Assessment Scale Strands

- **Number Sense and Numeration**
- **Geometry and Spatial Sense**
- **Data Management and Probability**
- **Patterning and Algebra**
- **Measurement**

**LEVEL 1** Demonstrates and communicates very limited knowledge and understanding.

Uses a few required concepts and procedures by choosing and applying a few simple operations, procedures and problem-solving strategies that rarely lead to accurate solutions. Provides unclear and/or imprecise explanations and justifications.

**LEVEL 2** Demonstrates and communicates limited knowledge and understanding.

Uses some required concepts and procedures by choosing, applying, explaining and justifying some appropriate operations, procedures and problem-solving strategies to complete some tasks with some accuracy, clarity and precision.

**LEVEL 3** Demonstrates and communicates general knowledge and understanding.

Uses most required concepts and procedures by consistently choosing, applying, explaining and justifying appropriate operations, procedures and problem-solving strategies to complete tasks with overall accuracy, clarity and precision.

**LEVEL 4** Demonstrates and communicates an in-depth knowledge and understanding.

Uses all required concepts and procedures by consistently choosing, modifying, creating, applying, explaining and justifying appropriate operations, procedures and problem-solving strategies in a variety of contexts to complete tasks with a high degree of accuracy, clarity and precision.



# Number Sense and Numeration

## Grade 3 Mathematics Assessment Scale Categories

CATEGORIES/CRITERIA	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<b>Problem Solving</b> <ul style="list-style-type: none"> <li>demonstrates understanding of problems by choosing and carrying out appropriate problem-solving strategies</li> <li>applies strategies correctly</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates a very limited understanding of problems by choosing and carrying out a few simple strategies that rarely lead to accurate solutions</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates a limited understanding of problems by choosing and carrying out some appropriate strategies</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates a general understanding of problems by consistently choosing and carrying out appropriate strategies that usually lead to accurate solutions</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates a thorough understanding of problems by choosing and carrying out innovative and appropriate strategies that almost always lead to accurate solutions</li> </ul>
<b>Understanding of Concepts</b> <ul style="list-style-type: none"> <li>uses required concepts</li> <li>demonstrates understanding of concepts by providing explanations that incorporate mathematical ideas and relationships</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates very limited understanding of a few required concepts by providing partial explanations that incorporate a few mathematical ideas and relationships</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates limited understanding of some required concepts by providing appropriate but incomplete explanations that incorporate some mathematical ideas and relationships</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates general understanding of most required concepts by providing appropriate and complete explanations that consistently incorporate mathematical ideas and relationships</li> </ul>	<ul style="list-style-type: none"> <li>demonstrates in-depth understanding of all required concepts by providing both appropriate and complete explanations of mathematical ideas and relationships and by incorporating the concepts in a variety of contexts</li> </ul>
<b>Application of Mathematical Procedures</b> <ul style="list-style-type: none"> <li>selects and accurately applies operations and procedures</li> </ul>	<ul style="list-style-type: none"> <li>selects and applies a few simple procedures and operations with major errors/omissions</li> </ul>	<ul style="list-style-type: none"> <li>selects and applies some of the appropriate procedures and operations with several minor errors/omissions</li> </ul>	<ul style="list-style-type: none"> <li>selects and applies most of the appropriate procedures and operations with few minor errors/omissions</li> </ul>	<ul style="list-style-type: none"> <li>selects and applies almost all of the most appropriate procedures and operations; rarely with any errors/omissions</li> </ul>
<b>Communication of required knowledge related to concepts, procedures and concepts</b> <ul style="list-style-type: none"> <li>justifies the reasonableness</li> <li>provides clear explanations and uses mathematical terminology and symbols correctly</li> </ul>	<ul style="list-style-type: none"> <li>provides justifications that are unclear and/or imprecise and that rarely incorporate mathematical terms</li> </ul>	<ul style="list-style-type: none"> <li>provides justifications that have some clarity and precision by using some appropriate mathematical terms and symbols</li> </ul>	<ul style="list-style-type: none"> <li>provides justifications that are generally clear and precise by usually using appropriate mathematical terms and symbols</li> </ul>	<ul style="list-style-type: none"> <li>provides justifications that are clear and precise by always using a range of appropriate mathematical terms and symbols</li> </ul>

# The Ontario Curriculum: Mathematics

## Problem Solving Checklist

	1	2	3	4
• Demonstrates willingness to try				
• Perseveres				
• Makes an effort to understand a problem				
• Chooses appropriate strategies				
• Successfully carries out strategies				
• Can explain solutions				
• Shows confidence in own abilities				

### Overall Rating

- Level 4** The student has demonstrated the required knowledge and skills achievement exceeds provincial standard.
- Level 3** The student has consistently demonstrated the required knowledge and skills.
- Level 2** The student has demonstrated the required knowledge and skills with teacher support.
- Level 1** The student has demonstrated the required knowledge and skills in limited ways and requires teacher support.



# Number Sense and Numeration

## Problem Solving Rubric

	Level 1	Level 2	Level 3	Level 4
<b>Understanding</b>	I do not understand the problem.	I think that I understand the problem.	I got it! I understand the problem.	I got it! I can prove to you that I'm right. I know that I'm right.
<b>Strategies/ Reasoning/ Procedures</b>	I am not sure how to do it.	I got started. I'm still thinking. I have part of the answer. It would help me to work with someone.	I used a plan to solve the problem.	I can show you several plans to solve this. I can prove to you that my answer is right.
<b>Communication</b>	I have no explanation. I'm not sure which pictures, numbers and words to use.	I can explain some of what I did. I tried to use pictures, numbers and words. My answer might be right.	I can tell you or show you how I got the answer. I used pictures, numbers and words to explain how I solved the problem. You can see how I did it.	I laid out my answer step by step. I used pictures, numbers and words to show exactly how I solved the problem and proved that my answer is right. I can even show you another way to solve it.



# Number Sense and Numeration

Problem-solving Observation Record												
Name Date												
	Usually	Occasionally	Rarely	Usually	Occasionally	Rarely	Usually	Occasionally	Rarely	Usually	Occasionally	Rarely
Demonstrates willingness to try												
Perseveres												
Makes an effort to understand a problem												
Chooses appropriate strategies												
Successfully carries out strategies												
Can explain solutions												
Shows confidence in own ability												
Name Date												
Demonstrates willingness to try												
Perseveres												
Makes an effort to understand a problem												
Chooses appropriate strategies												
Successfully carries out strategies												
Can explain solutions												
Shows confidence in own ability												
Name Date												
Demonstrates willingness to try												
Perseveres												
Makes an effort to understand a problem												
Chooses appropriate strategies												
Successfully carries out strategies												
Can explain solutions												
Shows confidence in own ability												
Name Date												
Demonstrates willingness to try												
Perseveres												
Makes an effort to understand a problem												
Chooses appropriate strategies												
Successfully carries out strategies												
Can explain solutions												
Shows confidence in own ability												



# Number Sense and Numeration

## Activity Evaluation

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. What did you like best about this activity?
2. Did you do the activity independently or in a group? Did you have any problems? Why or Why not?
3. Did you plan your work before you began the activity? Was it a good plan? Why or why not?
4. What would you do differently if you did this activity again?
5. What new skills have you learned?
6. What else would you like to know about this topic?

# The Ontario Curriculum: Mathematics

## *Self-Assessment*

Name: \_\_\_\_\_

Date: \_\_\_\_\_

(Teachers: Insert your own statements from the expectations on number sense and numeration.)



# Number Sense and Numeration

## Math Journal

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Today I Learned:

This is how I can use this information in my life experiences:

**\*Use pictures, numbers and words in your answers.**

# The Ontario Curriculum: Mathematics

## Math Journal

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Math Challenge  
Card**

**What I did  
(describe activity in  
words, numbers, pictures)**

**What I learned.**



# Number Sense and Numeration

## Example

### Modifications for Exceptional Students

CONTENT	PROCESS	PRODUCT	EVALUATION
	<b>Teaching Processes</b>		
~ fewer concepts	~ large group, small group, individual	~ fill-in-the-blank	~ short term
~ concrete level	~ appropriate materials:	~ matching	~ single-concept
~ functional	high interest, low vocabulary	~ labelling	~ mastery
~ slower pace	~ colour code	~ illustration	~ demonstration
	~ multisensory		
~ teach appropriate learning strategies (e.g., notemaking, self-monitoring, self-talk, models, test taking, visualization, mnemonics, relaxations, cooperative learning).	~ break-down task	~ chart	~ conferencing
	~ step-by-step directions on card	~ scribing	~ untimed
	~ overlearning		~ clarify directions
	~ drill, repetition		~ study guide
	~ simplify directions		~ open book
	~ paraphrase		~ cheat sheet
	~ short activities		~ short answer
	~ matrices		~ point form
	~ manipulatives		~ self
			~ co-evaluation
	<b>Learning Strategies:</b>		~ oral testing
	~ study buddy		~ scribing written answers
	~ self-talk		
	~ self-monitoring		
	~ visualization		
	~ mnemonics		
	~ music and rhythm		
	~ relaxation		
	~ assistive devices		
	~ organizational strategies		

# The Ontario Curriculum: Mathematics

## *Program Modifications for Exceptional Students*

	Behavioural: Social/Emotional	Communications	Physically Challenged	Intellectual: Developmentally Gifted/ Delayed	Learning Disabled
CONTENT					
PROCESS					
PRODUCT					
EVALUATION					
ENVIRONMENT					
RESOURCES					

