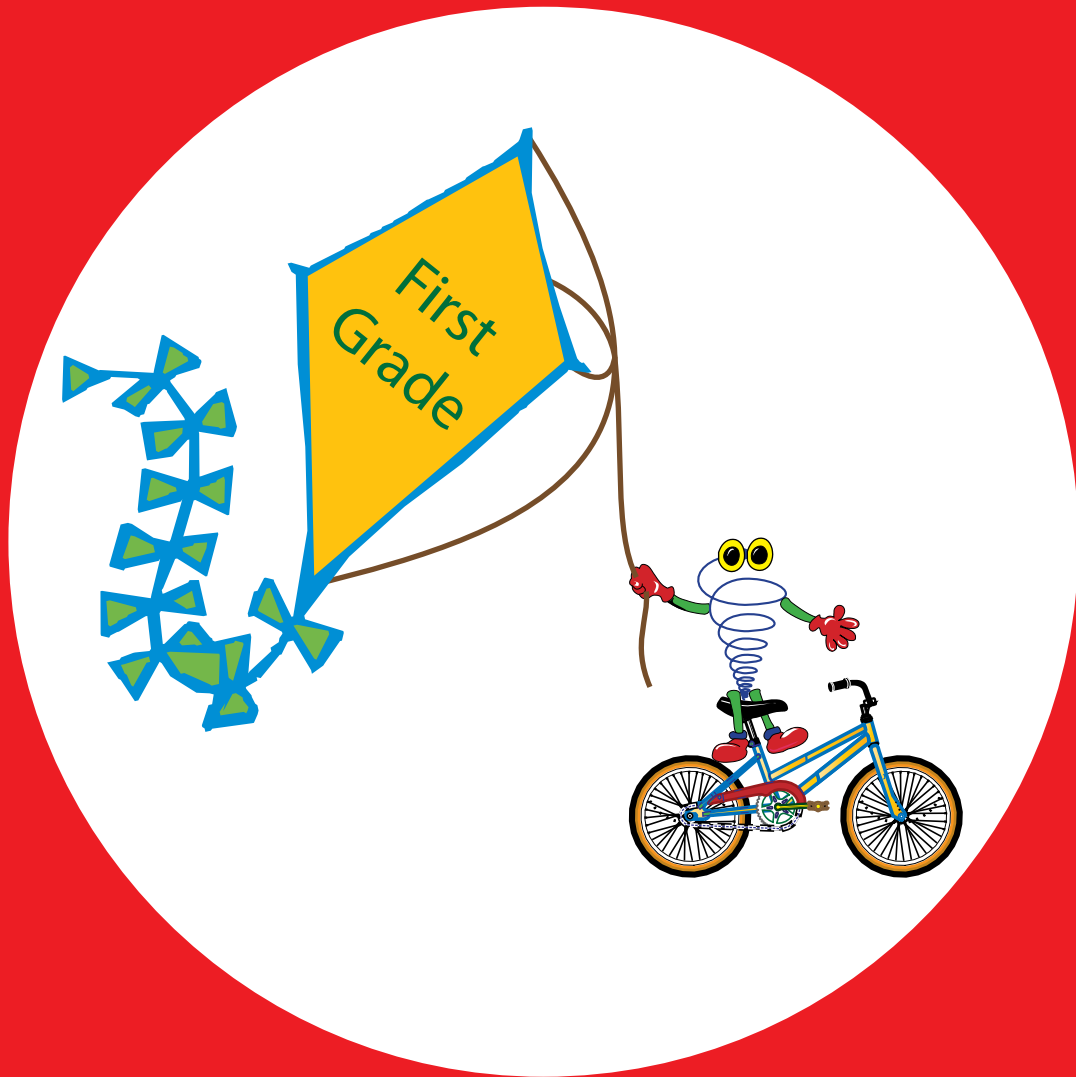
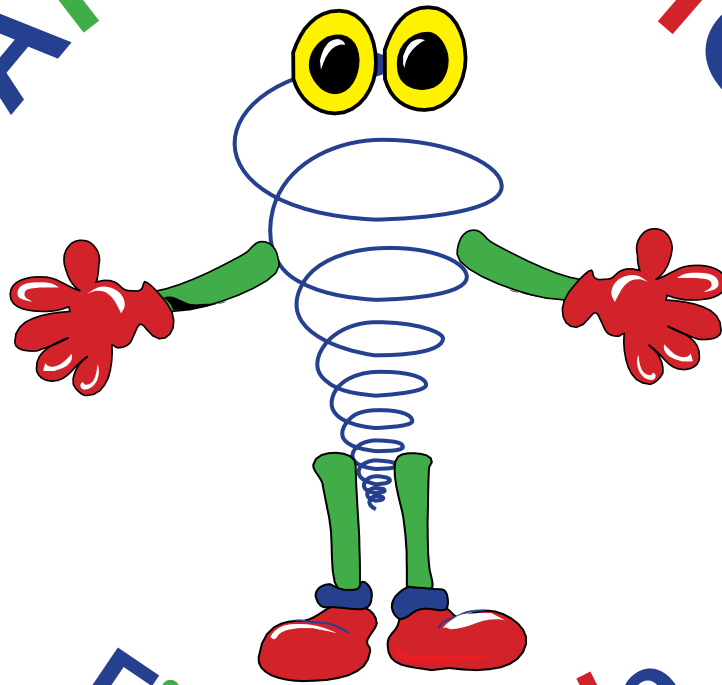


Arithmetic



MORENO

ARITHMETIC



First Grade

José Luis Moreno Aranda



Arithmetic

First Grade

José Luis Moreno Aranda

Grupo Matematiké, SA de CV

Prohibited to Reproduce

All Rights Reserved

Printed in Mexico

2009

ISBN 970-93600-0-0

First Edition in English

Table of Contents

Introduction

The Pedagogy of Saint Ignatius of Loyola Applied to the Teaching of Mathematics	v
Arithmetic. Electronic Teacher's Book	vi
The Mathematiké Pedagogic Games	vi
The Objective of this Book	vii
How this Book is Organized	vii
Levels in the Appropriation of Mathematical Knowledge	vii
Our Web Site	vii

Chapter 1

Basic Dynamic of the Numerical Decimal System	9
Addition	
Subtraction	
Digits from 0 to 9	
Numbers up to 99	
Zero	
Additions up to 18	
Subtractions up to 9	

Chapter 2

Geometry	65
Square	
Rectangle	
Triangle	
Circle	

Chapter 3

Fractions	75
Halves	
Thirds	
Fourths	

Chapter 4	
Application Problems	87
Addition	
Subtraction	
Statistics	
Appendix	
Didactic Material Complement of the Book	103

Introduction

The Pedagogy of Saint Ignatius of Loyola Applied to the Teaching of Mathematics

This textbook has been created using the Pedagogy of *Saint Ignatius of Loyola* applied to the teaching-learning of mathematics. This pedagogy contemplates a humanistic philosophy as a philosophical framework of reference, which is to say, it has as its only objective the promotion of the capacities that identify a human as such: imagination, intelligence, creativity, freedom, etcetera. For that reason, the strategic plan of this textbook has been designed solely so that the children that pass through our classrooms may advance in, and may develop fully, their human potential.

The method of Saint Ignatius for internalizing the experience of God¹, in order to be adapted to the teaching-learning of classroom mathematics as presented here, has been enriched by the epistemology of Bernard Lonergan².

This pedagogical methodology consists of a five-step process that is repeated each time that we introduce a new mathematical concept. This novel methodology is explained in detail in the publication *The Pedagogy of Saint Ignatius of Loyola Applied in the Teaching-learning of Mathematics*³.

The pedagogical strategy consists of five steps:

1. *Contextualize the knowledge.* Clearly explain which mathematical concept we are going to study and place it squarely on the upward spiral of knowledge. We must verify that the student has mastered the necessary previous concepts and knows exactly what the next concept studied will be, for the concepts are not isolated entities that suddenly appear, but are like bricks in a wall that form a solid base upon which others will be placed.

2. *Experience a sensory reality through the use of the senses to help the student understand the concept.* As a result of a proper pedagogical strategy, the student, using his or her senses, would touch, see, hear, smell or taste the concept. By mining the data he or she engages in research and engages the imagination, thereby capturing the intelligible unity of that data and subsequently understanding. Using geometry as a guiding theme in the study of mathematics, we have been able to use images and tangible didactic material for the mastery of the principle concepts of mathematics.
3. *Demonstrate or verify the knowledge gained.* When the student has understood, and subsequently has been able to express the concept in his or her own words, only then can we be assured that the student has truly understood. The student, using the mathematical knowledge that he or she has acquired up to this point, demonstrates complete comprehension of the concept.
4. *Apply the knowledge gained and develop the ability to use it in the resolution of different types of problems.* Upon applying the knowledge, the student develops or creates the algorithm that permits him or her to orderly and efficiently solve problems. However, it is not sufficient that the student simply solve the corresponding algorithm; it is also indispensable that he or she develop the ability and accumulate the necessary experience to be able to set out and to solve this type of problem in general.
5. *Evaluate what was learned and how it was learned.* We evaluate the student in two ways. First we must verify that the student has adequately internalized the mathematical concept studied –has shown sufficient ability– and has practiced enough in the setting out and resolving of problems. Subsequently, we must evaluate the way in which we have exposed the student to the concept, which is to say, our own work as teachers.

Arithmetic. Electronic Teacher's Book⁴

The electronic teacher's book presents, using the pedagogy of Saint Ignatius of Loyola applied to the teaching-learning of mathematics, all of the arithmetical concepts, including basic geometry and its applications, that elementary students should understand, apply and use during their schooling.

This book helps the teacher to develop lesson plans, prepare classes and plan the necessary pedagogical strategies so that the students in his or her class learn and demonstrate the various mathematical concepts. Students should also be able to create algorithms of the basic operations and develop the ability to use them.

The Mathematiké Pedagogic Games

The Mathematiké educational games help the students to use their senses so that they can learn and apply the concepts they study in a simple, engaging and fun way.

The continuous use of games allows the students to develop the skills to apply the concepts.

The Objective of this Book

The objective of this work book is to help children to understand and to prove the arithmetic concepts, to create their own algorithms to solve basic operations and to develop the ability to do operations in their heads as well as using the algorithms that they themselves have built.

How this Book is Organized

This book corresponds to the first and second levels of abstraction, and it is organized by concepts and it is not designed in the order that the student goes through it. According to the teacher's weekly plan, the student simultaneously works on different concepts.

There are some concepts: basic dynamic of the numerical decimal system, addition and subtraction, that are spread throughout the book. In this case the student must first develop the ability to solve problems in the order that the sets of problems appear.

The sets of application problems, as well as the statistics problems are at the end of the book. The students should solve them according to their advancement in the appropriation and application of the concepts.

Levels in the Appropriation of Mathematical Knowledge

The pedagogy of St. Ignatius of Loyola applied to teaching Mathematics, proposes that the students have to consolidate a level of abstraction by understanding, proving, creating and developing the ability. In order to allow the children to penetrate into the fascinating world of mathematical abstraction without jumping ahead and thus enjoying what they achieve, we strongly recommend not to pass to next level of abstraction until the teachers have verified that the students are ready to do so.

Our Web Site

With an aim to maintain direct communication among teachers, students and the research group that has launched this educational initiative, the Mathematiké research project concerning the teaching of mathematics has an internet web site: www.mathematike.org. On this web site we present in much greater detail the pedagogy of Saint Ignatius of Loyola, the complete and up to date list of educational games and the textbooks. We are committed to keeping our educational project up to date, which is why communication with all of you, the teachers, is of vital importance.

1. Obras de San Ignacio de Loyola. Biblioteca de Autores Cristianos. Madrid. 1997
2. Lonergan, Bernard. Collected works of Bernard Lonergan. Insight. Volume 3. University of Toronto Press. 1997
3. Moreno Aranda, José Luis. Pedagogía de San Ignacio Aplicada a la Enseñanza de las Matemáticas. Grupo Mathematiké. 2003
4. Moreno Aranda, José Luis. Aritmética. Libro electrónico del maestro. Grupo Mathematiké, SA de CV. 2006