

**Reflections on
Didactics of Mathematics,
Citizenship Education in
the Information Age and
Educational Reform in
Latin America and paintings
in their steps fractals**

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Educational Reform in Latin America
and paintings in their steps fractals**

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PREFACE

The art organizes everything by parts. The authors of this work are implacable authors of some dawns, evenings and nightfalls that bring a fresh change to the Homo Sapiens at any place of the planet. Their valleys, volcanoes, atmospheres, are not only theirs, they are of all of us. They are of the whole world. They will be of the future world. The future generations will enjoy their discoveries, of what today they copy from the nature that surrounds us. The landscape, suddenly becomes difficult to rescue but with the knowledge and dexterity characteristic of the authors of this beautiful book, one proves that, in all the five continents, new aesthetics and semiology transformations, are generated.

Reflections on Didactics of Mathematics, Citizenship Education in the Information Age and Educational Reform in Latin America and paintings in their steps fractals demands an imagination effort. The authors go developing dimensions with colors and give organic forms arranged to them while they paint. They recognize that the essence of life, increases, it transform and changes in the synergetic objects that they paint in the solid, liquid and gaseous states. They allow in their representations that those parts are logically adequate, so that there is harmony in their painting. The parts that they organize, require a structural setting that is adapted to the variations of functional requests and allows to give extension and relation to the organic structures that the authors paint in the pattern, continuity that they search and study in the nature.

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DEDICATION

To family.

To my brothers, my sister, friends, grand- fathers (Roberto Arturo Vasquez Pereira, Victor Ceron Martinez Madrigal), grandmothers (Laura Escobar Henao, Francisca Rosa Vasquez Perez), great-great-grand-fathers, great-great-grandmothers, relatives, family, humanity, cosmos. To Dr. Fabio Vasquez Escobar To the Most Excellent Bishop Gerardo Martinez Madrigal. To the Most Excellent Bishop Guillermo Escobar Velez. To the Excellent Ambassador Raul Vasquez Velez. To the Excellent Ambassador Lucelly Garcia Tobon.

To Marco Tulio Duque's School, Conrado Gonzalez Institute, IDEM Fray Julio Tobon Betancu, Colombian Polytechnic, National University, Autonomous Latin-American University, SEP, University of Antioch, Bolivian Pontifical University, UNAM, UAG, UNISARC, Sao Paulo University, Free University, Salvador Duque School, University EAFIT, University of Sydney, University of Helsinki, University of Tampere, University of Cape Town, TEC; University of Guadalajara, UCLA, MIT, University of Houston, Harvard University, Yale University, Oxford University, Linguaphone Institute, Cambridge University, Scranton University, UNESCO, DOMETAL, RIOTEX, COLTEPUNTO, Company of Packings S.A., Technological Institute. Pascual Bravo., Modern Institute of Education, ASSTI, ESAP, Colombian Polytechnic Jaime Isaza Cadavid, Montessori School, SENA, University de San Buenaventura, International Center of Cambridge, The St. Lukas Academy, Bamberg University, Pekin Normal University, Who's Who in the World, American Biographical Institute, The Marquis Publications, Editorial Papiro, Colombian Polymers, VIAMACOL, Rotary International, Biographical

Institute of United States of America, Superior Academy of Technical Industrial Services, National Service of Learning, Reforestation Company La Floresta, Casa de Reyes, Engineering School of Antioch, The Southern African Comparative and History of Education Society, University of Paris, Hospital El Carmen de Viboral, Beijing Normal University, Tokyo University, Waseda University. University of Guadalajara.

To the schools, institutions and universities of the five continents that offered me the opportunity to recreate, relearn, reinvent, rethink and study.

And to the whole last, present and future humanity that consecrates the cultivation of the right values, the positive visions, and life, is a great company, the post modernity, the fractality, the harmony of the societies and universal cosmos.

GRATEFULNESS AND RECOGNITIONS

To the whole last and present humanity
and their universal cosmos.

Recognition also to the Dr. Miguel Angel Navarro Navarro, Rector General, U. de G.; Dr. Marco Antonio Cortés Guardado, Rector CUC, U. de G.; to Dr. Remberto Castro Castañeda, U. de G.; to Dr. Jorge Tellez Lopez, U. de G.; to Bachelor Raul Padilla Lopez, U. de G.; Dr. Raul E. Tamayo Gaviria, Professor Vagn Lundsgaard Hansen, Professor Ching-Lin Hu, Professor Byung-Jin Lee, Professor Erwin H. Epstein, Professor Shin'ichi Suzuki, Dr. David Turner, Dr. Medardo Tapia U., MRS. Guadalupe Gonzalez de Turner, M.C. Jesus Cabral, U. de G.; M.C. Maria Morfin, U. de G.; Dr. Maria Antonia Abundis, U. de G.; Bachelor Arturo Fernandez, U. de G.; Bachelor Javier Fernandez, U. de G.; M.C. Patricia Medina, U. de G.; Dr. Alfredo Cesar Dachary, U. de G.; Dr. Stella Arnaiz, U. de G.; to MRS. Barbara Bush, to Dr. Fabio Vasquez E., to Dr. Humberto Martinez V., to Dr. Guillermo Esquivias L., for their observations and comments.

INTRODUCTORY COMMENT

Abstract

The intention of the present paper is to show that people have a series of educational needs in the era of information, so that they can become competent digital citizens. These educational needs are evident in the policies promoted by the United Nations Educational, Scientific and Cultural Organisation, which were well known to Latin American governments of the decades from the 1960s to the 1990s. Therefore, it is to be hoped that the educational reforms of 1990s have elements based on the principles of education that they advanced, which emphasises the preparation of subjects in the digital era, based on advances in information and communication technology, focusing on the teaching and learning of computer science.

Keywords: sociology of education, citizenship, education, information, educational reforms

Introduction

Some explanation is needed of the idea of the information age. The explanation can take as its starting point the proposal of Hung (2009, p.18), that present day society faces a technico-economic paradigm provided by the technological advance of computer science, telecommunications, and micro-technology, among others disciplines. These have given prominence to information and knowledge, and also given rise to a new social paradigm of society, defined by information and communication (Casassus, 1992, p. 4)..

The change in the society has been so overwhelming that, at present, the most important companies in the world are in branch of computer science (Kroll & Miller, 2011, p. 7).

Hung's argument is complemented by the suggestion of Howkins, et al (1997, p.22) who argue that the digital era corresponds to a new type of society in which human activity is transformed, affecting the way we communicate and conduct business. This change is supports a tendency to treat all issues in terms of an economic approach (Castells, 1998, p.14), where value does not reside in tangible things, but in the management and ownership of information. In addition, until the second half of the twentieth century, the majority of the population of the

world lived in the countryside (Ordorica, 2004, p.15), which required a great amount of manpower in order to support human needs. But in the last quarter of a century this has changed dramatically, reversing the location of populations, with most people moving into cities, and fewer living in the rural areas (Ordorica, 2004, p.16).

But the change of human beings from farmers to urban citizens has not been the end of the matter; it has radically changed our relationship with the media, and we are now, in words of Perez (2005, p.7) "settler in the mass media".

The change to being citizens of the mass media in the digital society indicates a transformation of the human species. We are living the transformation from *homo sapiens* to *homo mediaticus* (Perez, 2005. p. 8).

Characterized as a human of the digital era, who cannot think of himself or herself without a mobile phone and a screen to connect to the world. A this produces rapid changes in the fashion, among inhabitants of virtual environments, steeped in consumption (Perez, 2005. p. 9).

Digital divide is accentuated

Digital divide is accentuated in the 1980s, with great trends like neo-liberalism, globalisation, and the information society (Miñana & Rodriguez, 2002, p.17), and the re-engineering of that same society brought about by technological development (Perez, 2005, p.12),

It is also a historical and current problem, as shown by the UNESCO digital divide (UNESCO, 2012).

In the 1970s, McLuhan had already introduced the idea of the classroom without walls, in the sense that the media had become an inexhaustible source of information, which previously had come from paper in school, and before that the church and medieval monasteries (McLuhan, 2009, p.15).

The profound influence of the IBI is evident in the formulation of policies that have been adopted by Latin American countries associated with UNESCO (UNESCO, 1980,p.5). For example, in the 1970s, the IBI financed and established two professional education centres computer science, based in Madrid and Mexico City, which marked the beginning of that branch of study in Latin America.

Some Latin America Countries

Some Latin American countries are prominent in the activities of the IBI, as in the meeting on Computer Science, Development and Peace, held in Acapulco in 1981 and the meeting on Computer Science and Sovereignty held in the city of Cali in May 1984, convened by the then president of the Republic of Colombia, Belisario Betancourt and the director of the IBI, Bernasconi.

The motto of the meeting was, *Computer science: a strategy for regional integration. The atmosphere of this meeting was dominated by the fact that the majority of the Latin American countries are passive receivers of computer science, acting as simple markets or users* (Carnota, 2008, p.9).

Also there were at this meeting denunciations on the digital divide, Dependency implies domination. The computer science that could accelerate communication between the men, appears to be an instrument that moves towns apart from each other (Carnota, 2008, p.11).

Quite apart from the provision of grants, the IBI was well known to the authorities in Latin American in the years before the 1970s, in which great educational reforms were organized. The white and green books on the information society were published by the European Commission in this same decade in which attention was drawn to the changed surroundings and the rise of the Information society (IS) as it was described. An outstanding example of this increased awareness stands out from the Green Book:

The importance of the information society (IS) is that it forces positive change, as emphasized in White Book of the Commission of 1993, Growth, competitiveness and employment (European Commission, 1996, p.16).

Starting from the information contained in the White Book, together with the subsequent report, Europe and the global information society, an important series of initiatives was established, with the complete endorsement of the European Council, to help form and promote the IS in Europe. (European Commission, 1996, p.18).

The report of the European Commission of 1993, published in Copenhagen, emphasises the direct role played by

developments in information and communication technology (ICT) in improving the quality of life of European citizens (European Commission, 1993,p.5).

In the body of ideas developed about the meaning of the digital era, it is to be hoped that educational reforms would be based on a thoughtful interpretation of the paradigm of what the citizen of the digital era must face. That is to say, the educational reforms of the 1990s had to be directed to prepare to the citizens in the handling information and communication technology, as Collins observes:

The school cannot prepare citizens to live in the twenty first century with tools of the nineteenth century

Collins (1997, p.5).

With this idea as a starting point, an exploration of the educational reforms in Latin American countries can be undertaken to evaluate whether the aims of the education considered the goal of preparing citizens for the digital age.

In Argentina, Federal Law of Education No. 24195 was enacted in 1993, and Article 1 set out the general aim, which was to ensure the integration and coherence of the National System of Education (Congress of Argentina, 1995, p.2). In Article 6, the law sets out more specific aims, including the aesthetic, ethical and religious development of the people of the country. In relation to education, it argued that,

The educational system will make possible the integral and permanent development of every man and woman, with devotion to national, regional and continental development and universal vision, so that people are recognised as having cultural and social dimensions, the ability to develop their capacities, guided by the values of life, liberty, health, the rule of law, peace, solidarity, tolerance, equality and justice (Congress of Argentina, 1995, p.3).

As can be observed, no mention is made of computer science or technology. Only in Section (i) of Article 53 is there the any indication that the relevant ministry will offer support and technical assistance to coordinate the system in the provinces and municipalities of the city of Buenos Aires.

In Bolivia, the Law of Educational Reformation, was passed by the National Congress on 7 July 1994 July. In that law, computer science is not mentioned, but it establishes that one of the aims of Bolivian education is,

To stimulate attitudes and aptitudes towards art, science, technique and technology, promoting the capacity to face, creatively and efficiently, the challenges of local, departmental

and national development (National Congress, 1994, Article 2, Section 5, p.3).

The President of the Republic of Brazil promulgated Law No. 9394 on 20 December, 1996, which established the directives and foundations for the national education system. In Article 32, Section II, it sets down that education will cover, "The understanding of the natural and social environment, of the political system, of technology, of the arts and of the values on which society is based" (Presidência da Republic, 1996, p.14)

In Chile one can find Law No. 18962, described as the Constitutional Statutory Law of Education, promulgated on 10 March, 1990. In Article 13, Section (f) it establishes the intention,

To make aware of the importance of participating actively in expressions of culture related to art, science and technology, and secure harmonious physical development (Ministry of Education of Chile, 1990, p.12).

In the General Law of Education, approved in 1994, the aim of education is set down in Article 5, Section 13,

To promote in the person, and in society the capacity to create, to investigate, and to adopt the technology that is required in the processes of development of the country, so that he or she is able to enter to the productive sector (Congress of the Republic of Colombia, 1994, p.4).

In the Statutory Law of Education of the Dominican Republic, in relation to the subject in hand, it sets down in Article 99, Section (g) that the aim is,

To promote the establishment of incentives and stimuli to generate the capacity for science and technology on the part of the private sector, of the public sector, and of the educational institutions in particular (National Congress (Dominican Republic), 1997, p.39).

In the Law on National Education of the Republic of Guatemala, by means of Legislative Decree 12-91, it establishes in Article 2, Section 5, that the aim of education is, *To drive forward education in the knowledge of science and modern technology as a means to preserve the ecological environment, or to modify it, in a planned and measured way, to the advantage of people and society* (Congress of the Republic of Guatemala, 1991, p.2).

In Law 34 of 1995 adopted by the Legislative Assembly of the Republic of Panama, in Article 9, Section 5 it establishes the

aim of education as,

To stimulate development, knowledge, abilities, attitudes and habits toward research, and scientific and technological innovation, as the basis for the progress of society and the improvement of the quality of life (Legislative Assembly Republic of Panama, 1995,p.3).

In the Statutory Law on Education of the Republic of Venezuela, Article 27, Section 2 describes the aim as being,

To promote research into new knowledge and to push forward the progress of science, technology, letters, arts and other creative manifestations of the spirit, to the benefit and the well-being of human beings, society and the independent development of the nation (Congress of the Republic of Venezuela, 1980, p.15).

In Law No. 127 adopted by the National House of Representatives of the Republic of Ecuador on 15 April, 1983 (also known as the Law of Education), no mention is made of the subjects of computer science and technology. The same is true of the General Law of Education passed under Decree No. 917 of 1997 by the Legislative Assembly of the Republic of El Salvador, of the General Law of Education adopted by the Congress of the United States of Mexico and published on 13 July, 1993 in the Official Newspaper of the Federation, of Law 23384, the General Law of Education of the Government of Peru, and of the Law of Education No. 15739 of the Republic of Uruguay.

Governmental responsibility for information and communication technology will not promote fairness, participation or employment, unless the governments implant suitable policies (Howkins, et al, 1997, p.15).

Despite efforts worldwide, the global gap in Internet use by men and women increased from 11% in 2013 to 12% in 2016, (UNESCO, 2017, p.1).

Conclusion

At the conclusion of this paper, the following point can be made: Colombia and the countries of Latin American generally, experienced transformations imposed from outside in the 1980s and 1990s, as part of the project of the modernisation, evident in different fields, but especially strong in the economic and

social structures, that were reflected in the educational field in the educational reforms that were implemented at that time.

Of the educational reforms in the region, only those of Colombia and the Dominican Republic consider the need to be creative in the field of technology and computer science; the others focus on the appropriation of knowhow.

In this panorama it is possible to be concluded that: The Latin American educational reforms of the 1990s, in spite of having the knowledge and of having participated in the formulation of the policies of the IBI that drew attention to the preparation of people to deal with information and communication technology, did not pay attention to those areas at all, and restricted themselves in the laws on education to the promotion of consumption. This is unlike developed countries, where education is based on the production of knowledge and technology around the information and communication technologies that are fundamental in the preparation of the citizens of the information age, to promote the advance of their countries.

In spite of the above, the historical problem of the digital divide is followed.

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Note: To page 28 to 72, the reader is left between the mentioned interpretation and paints for the reader to generate their own ideas and creative about. This is an exercise in creative writing and painting to generate new ideas.

OBSERVATION:

Rhochrematic process in electromagnetism pedagogy.

Discreet Variable

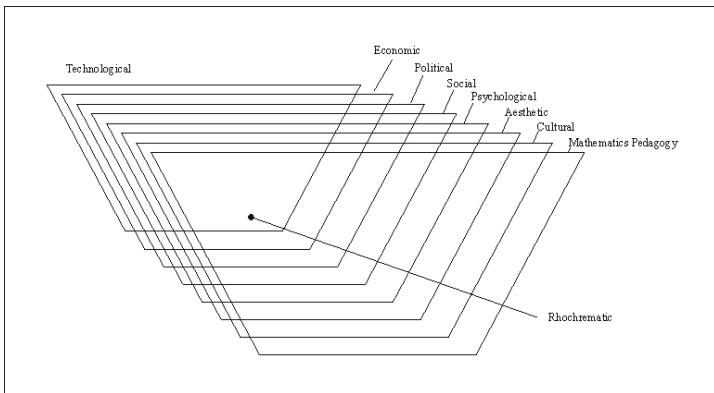
$$\sum_{b1}^{a1} x1 + \sum_{b2}^{a2} x2 + \dots + \sum_{bn}^{an} xn + \dots + \sum_{bk}^{ak} xk$$

Continuous Variable

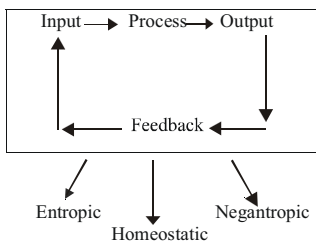
$$\int_{b1}^{a1} x1 + \int_{b2}^{a2} x2 + \dots + \int_{bn}^{an} xn + \dots + \int_{bk}^{ak} xk$$

Integrating the Rhochrematic process in electromagnetism pedagogy.

Integration System



Rhochrematic → The Process of Reprocess
Process System



$n_1 \dots n_2 \dots n_n \dots n_k$ with Discreet Variable and
Continous Variable in the System

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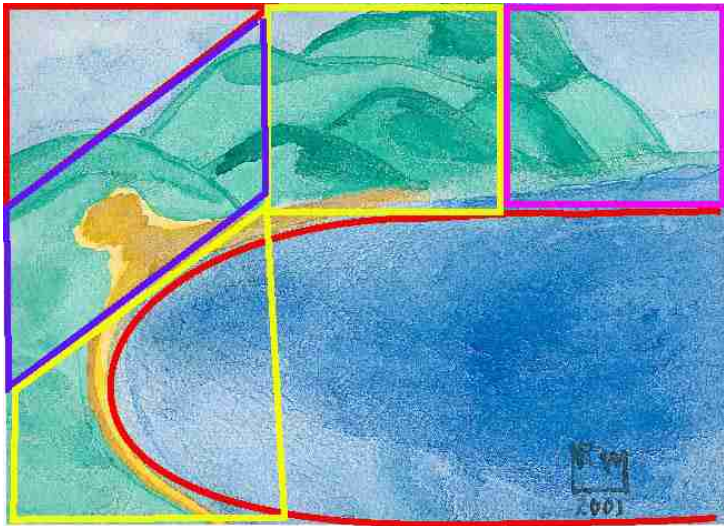
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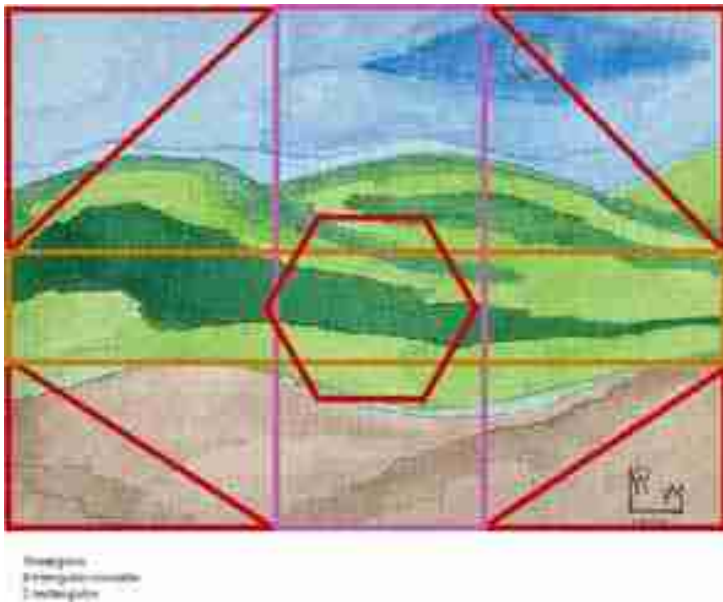
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2 cuadrados
1 triangulo escaleno
1 ovalo
1 trapesio isosceles

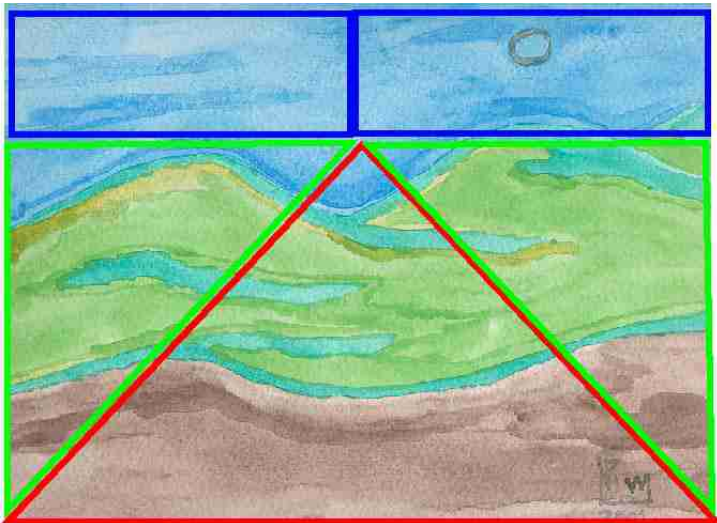
Phase 1

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Phase 3

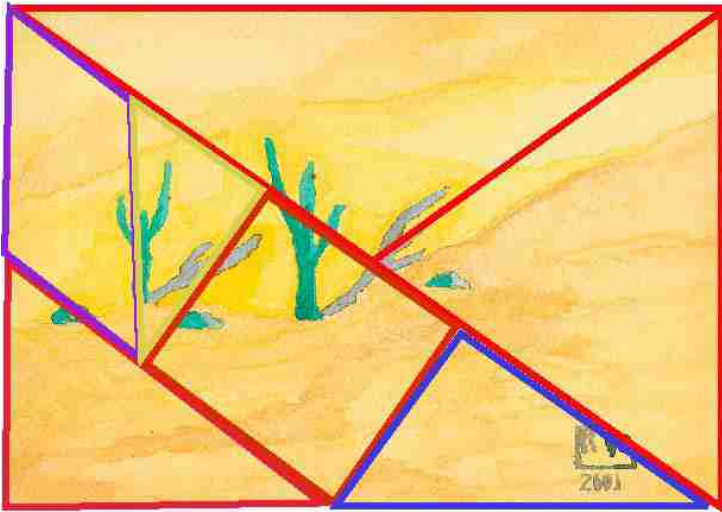
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1 triángulo equilátero
2 triángulos escalenos
2 rectángulo

Phase 4

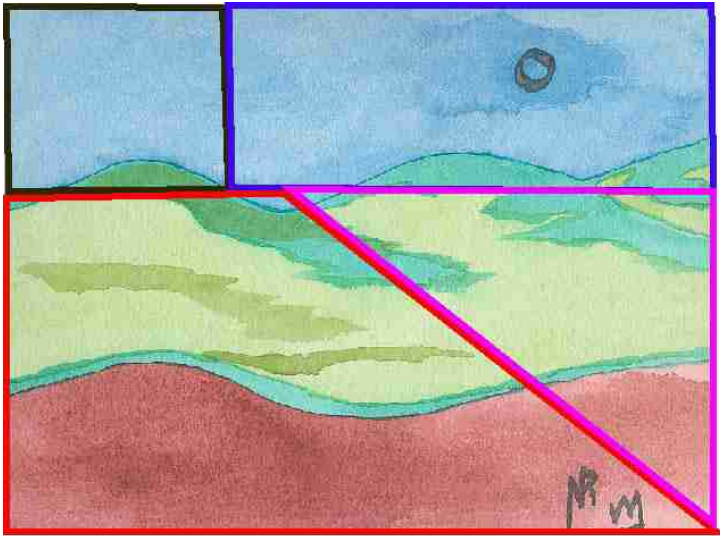
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1 triângulo equilátero
4 triângulos isosceles
1 romboide
1 quadrado

Phase 5

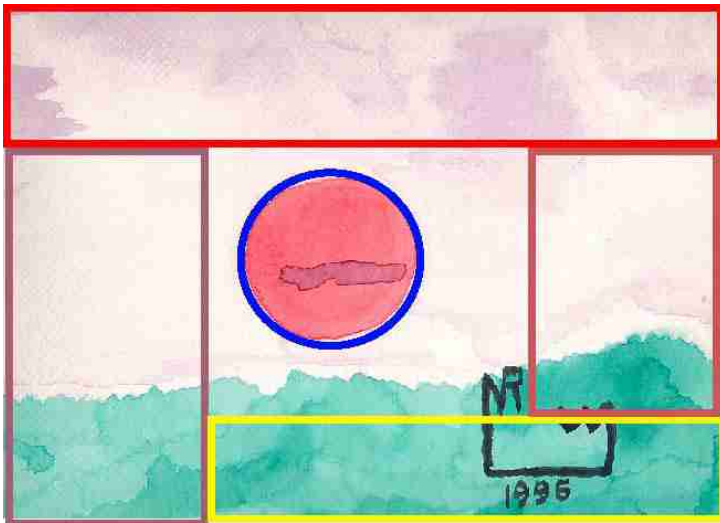
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1 cuadro
1 rectángulo
1 pentágono regular
1 triángulo isósceles

Phase 6

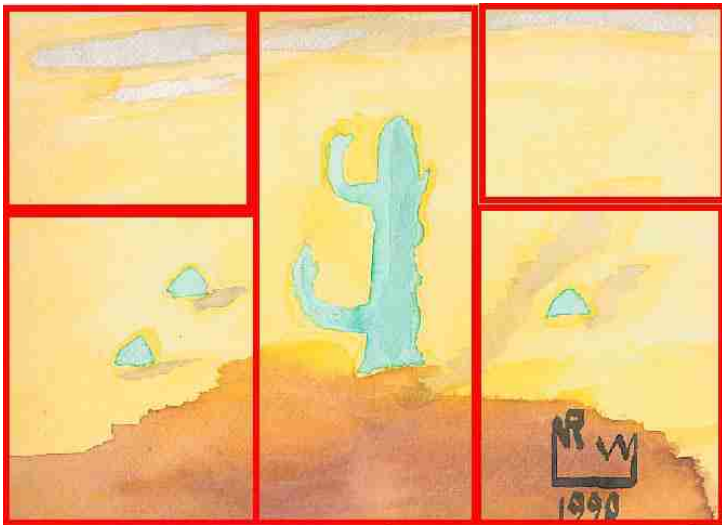
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- 4 rectángulos
- 1 círculo
- 4 triángulos isósceles

Phase 7

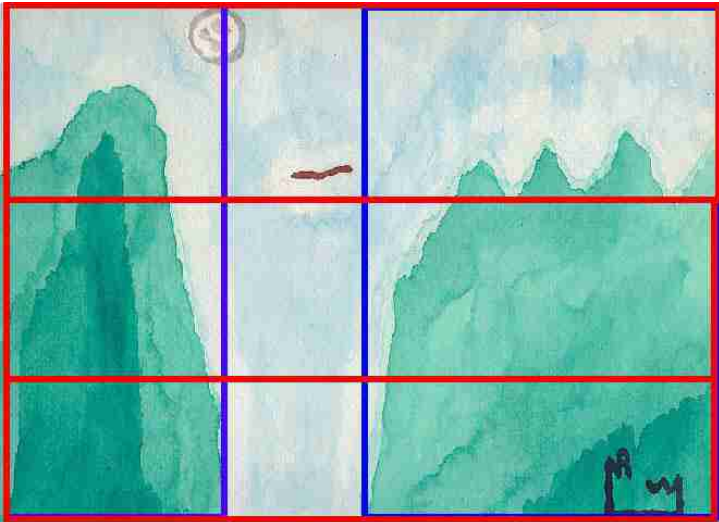
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2 cuadrados
3 rectangulos

Phase 8

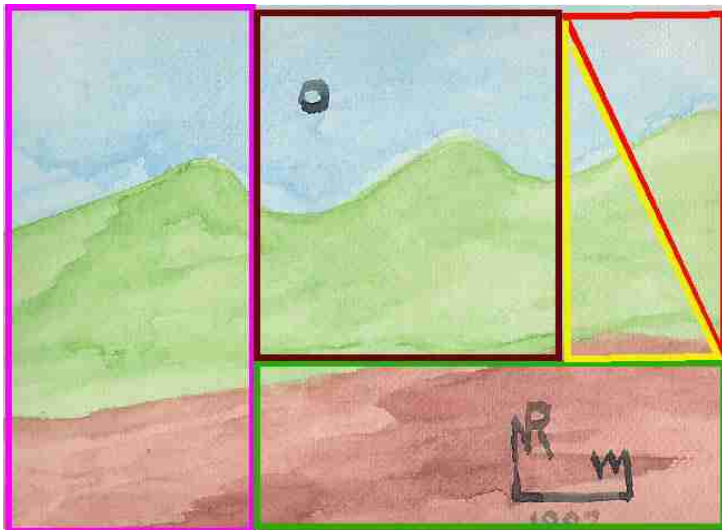
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3 cuadrados
6 rectangulos

Phase 9

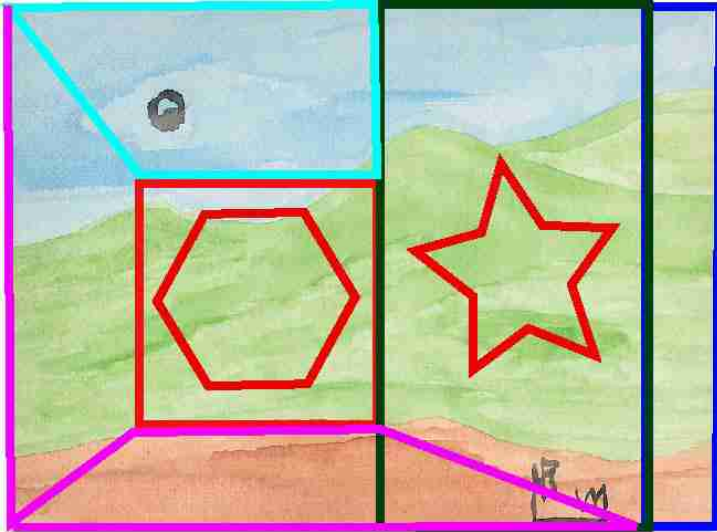
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2 rectángulos
1 cuadrado
2 triángulos escalenos

Phase 10

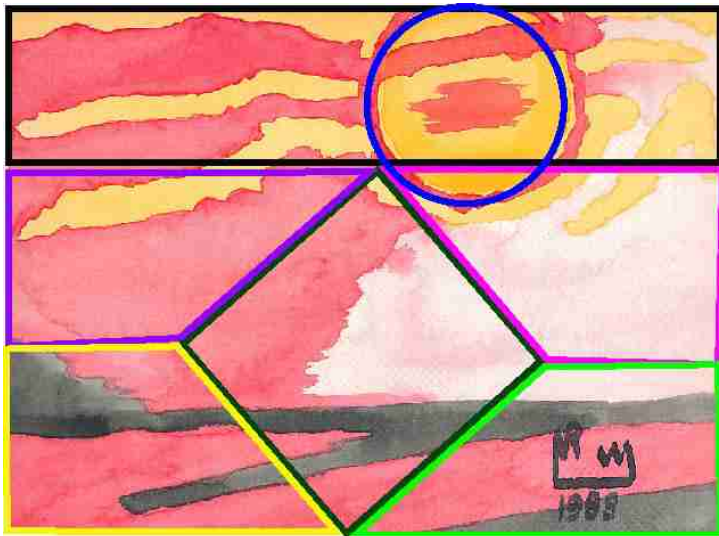
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1 HEZAGONO
1 ESTRELLA
1 RECTANGULO
1 TRAPESOIDE
1 TRIANGULO ISOSCELES
2 TRAPESIOS ISOSCELES

Phase 11

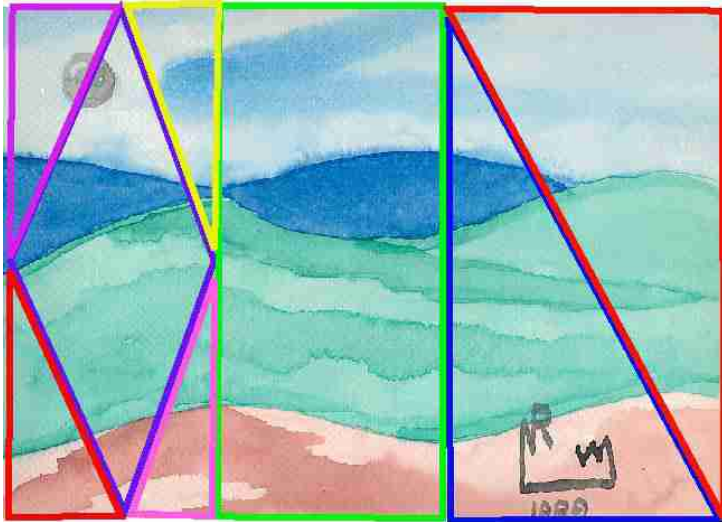
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1 rectángulo
1 rombo
4 trapezio rectangulos

Phase 12

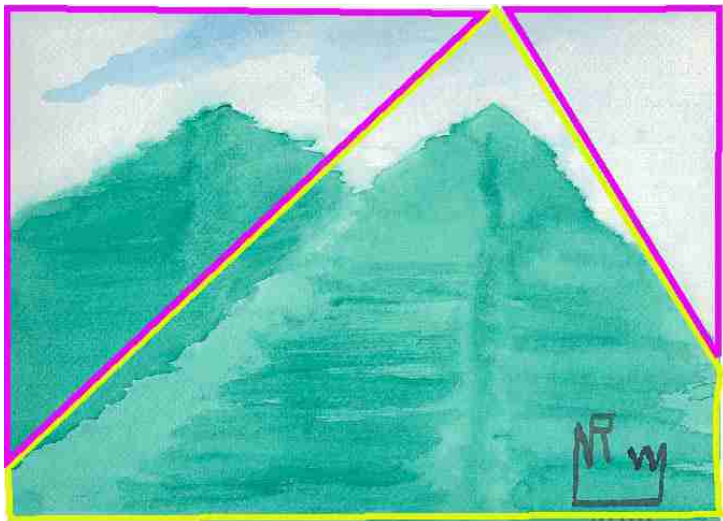
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6 Triangulos escalenos
1 romboide
1 rectangulo

Phase 13

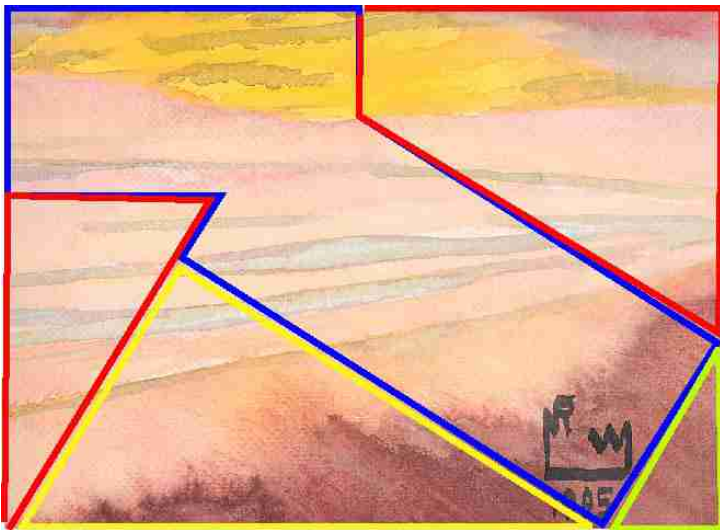
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3 TRIANGULOS ESCALENOS

Phase 14

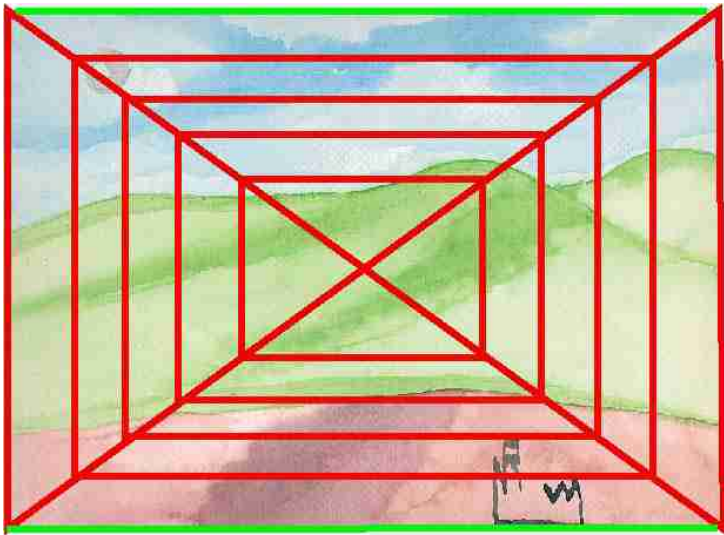
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2 RECTANGIULOS
3 TRIANGULOS ESCALENOS
1 TRAPESIO ISOSCELES

Phase 15

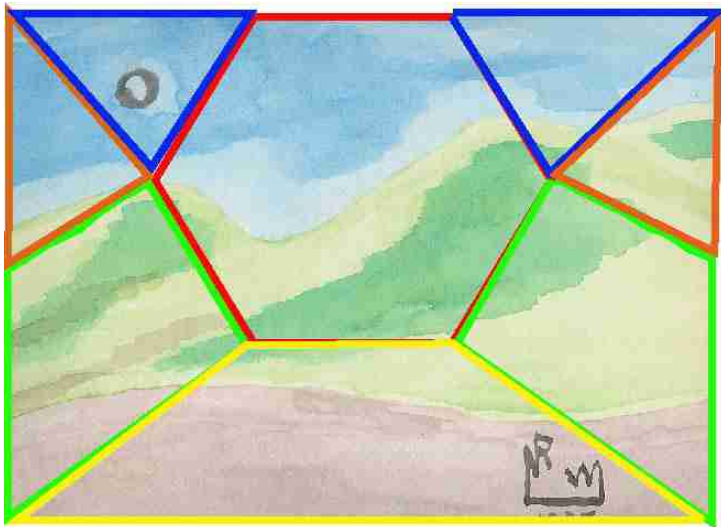
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1 PIRAMIDE

Phase 16

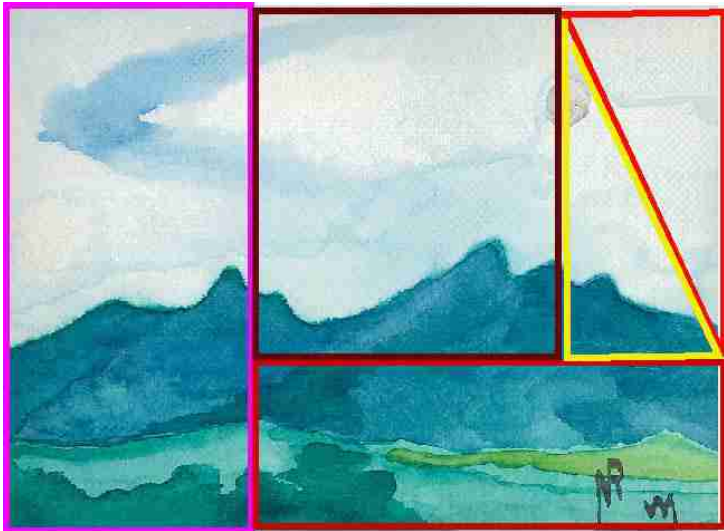
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4 triángulos isosceles
1 hexagono
2 trapezio isosceles
1 trapezio

Phase 17

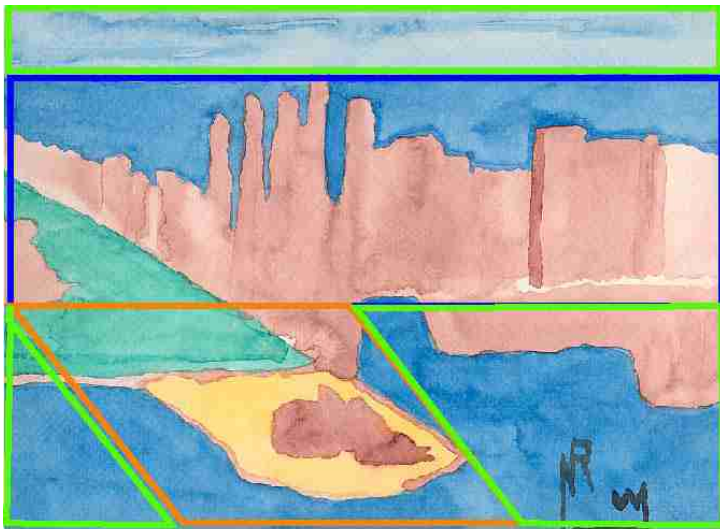
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2 rectángulos
1 cuadrado
2 triángulos escalenos

Phase 18

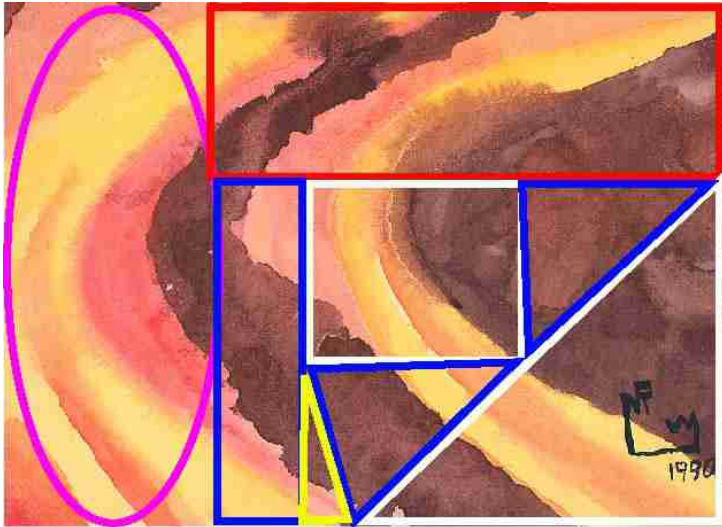
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2 RECTANGULOS
1 TRIANGULO ESCALENO
1 ROMBOIDE
1 TRAPESIO RECTANGULAR

Phase 19

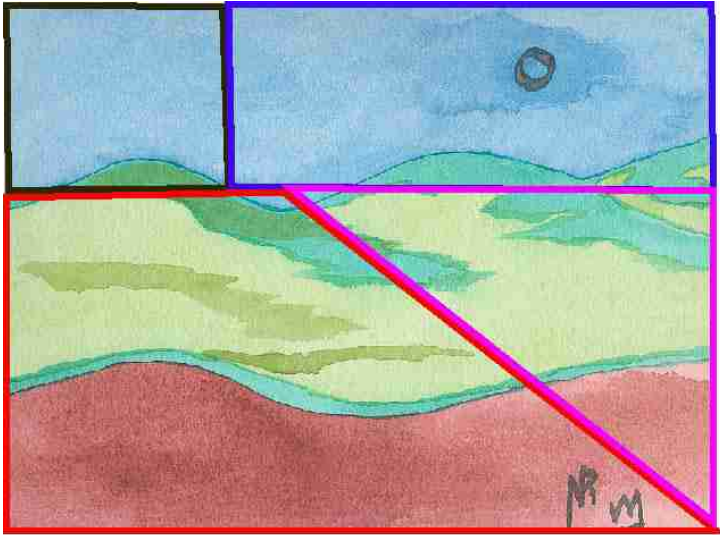
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1 círculo
5 triángulos escalenos
3 triángulos isosceles
2 rectángulos
1 cuadrado

Phase 20

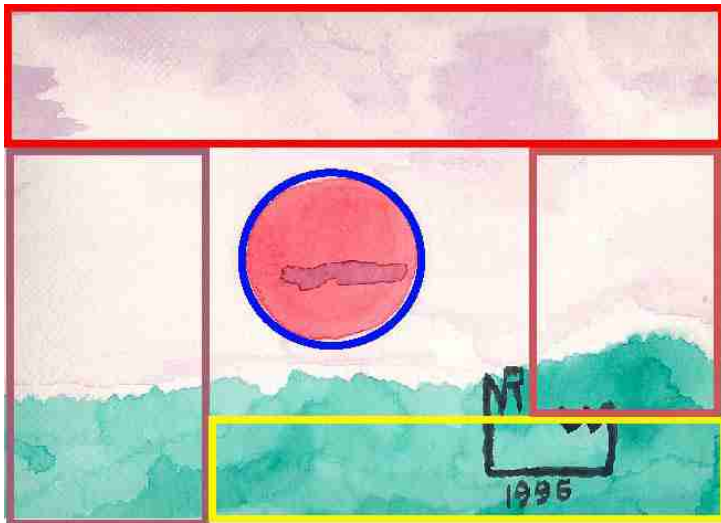
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1 cuadro
1 rectangulo
1 pentagono regular
1 triangulo isosceles

Phase 21

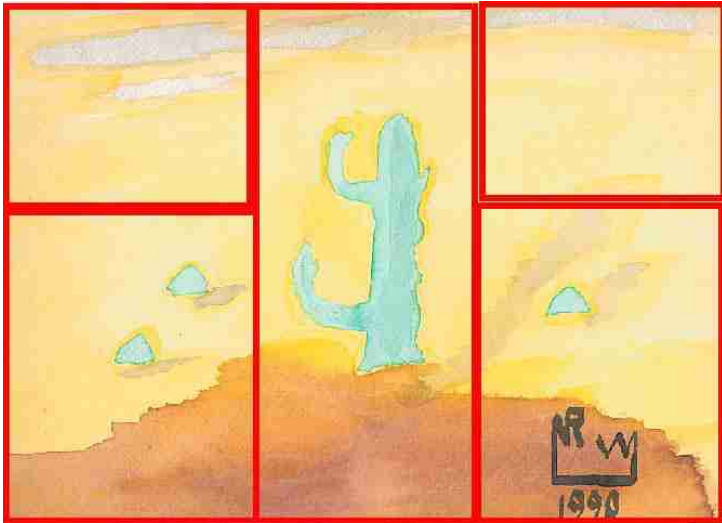
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- 4 rectángulos
- 1 círculo
- 4 triángulos isósceles

Phase 22

Reflections on Didactics of Mathematics,
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2 cuadrados
3 rectangulos

Phase 23

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States, 1994; "Cypress", Cambridge, England, 1992; "Shadow of the tree", Sao Paulo, Brazil, 1995; "Moon and Venus", Guadalajara, Jalisco, Mexico; "Eucalyptus", Sydney, Australia, 1990; "Five Trees", Johannesburg, South Africa, 1992; "Two Trees", Tokyo, Japan, 1988; "Hudson River", New York, United States, 1991; "Many Pine Trees", Augusta, Maine, United States, 1991; "Several Trees", Washington, D.C., United States 1992; "Several Mountains", Denver, Colorado, United States, 1988; "To Start the Day with the Sun", Charlottesville, North Carolina, United States, 1990; "Volcano and Peak", Purace, Cauca, Colombia, 1990; "The Beginning of the Day with Cyresses", Spokane, Washington, United States, 1989; "Mountains with clouds", Cheyenne, Wyoming, USA, 1988 "To Happen in the late Afternoon in the Beach" Miami, Florida, United States, 1989; "Part of the universe", Boston, Massachusetts, United States, 1989; "Lake and Trees", Duluth, Minnesota, United States, 1989; "To Start the Day with Trees", Scranton, Pennsylvania, United States, 1988; "Five Mountains", Knoxville, United States, 1988; "Volcano and Clouds", Purace, Cauca, Colombia, 1994; "Mountains and Clouds", Lincoln, Nebraska, United States, 1994; "The Beginning of the Day and Clouds", Birmingham, Alabama, United States, 1993; "Three Pine Trees", Rochester, New York, United States, 1992; "The Desert", Tucson, Arizona, United States, 1990; "Volcano and Mountain", Purace, Cauca, Colombia, 1991; "To Start the Day and, Trees", Hartford, Connecticut, United States, 1988; "Desert and Clouds", Tucson, Arizona, United States, 1988; "Moon and Cyresses", Guadalajara, Jalisco, Mexico, 1989; "To Start the Day and Clouds" Miami, Florida, United States, 1988; "Lake and Moon", Chapala, Jalisco, Mexico, 1990; "Mountains and Lake", Denver, Colorado,

United States, 1995; "Volcano and Brimstone", Purace, Cauca, Colombia, 1991; "To Happen in the late afternoon and Sea", West Palm Reach, Florida, United States, 1994; "Volcano and Clouds", Purace, Cauca, Colombia, 1992; "Lake, Moon and Trees", Chapala, Jalisco, Mexico, 1993; "Mountain and Gases", Tacoma, Washington, United States, 1993; "Volcano and Gases", Purace, Cauca, Colombia, 1994; "Desert and Shadow", Tucson, Arizona, USA, 1995, "Desert and Gases", Tucson, Arizona, USA, 1991, "Volcano and Trees", Purace, Cauca, Colombia, 1990, "Everest mount", Nepal, 1988; "Pine Trees, Lake and Mountains", Denver, Colorado, United States, 1989; "Mountains and Moon", Guadalajara, Jalisco, Mexico, 1989; "To happen in the Late Afternoon and Sea", St. Petersburg, Florida, United States, 1995; "Desert and Heat", Tucson, Arizona, United States, 1991; "Lake, Moon and Clouds", Chapala, Jalisco, Mexico, 1988; "The Beginning the Day, Gases and Trees", New York, United States, 1992; "The Beginning of the Day, Clouds and Trees", New York, United States, 1989; "Lake and Vegetables", Denver, Colorado, United States, 1988; "Sea and Mountains", Vancouver, Canada, 1989; "Sea and Gases", Eureka, California, United States, 1990; "Shadows and Desert", Tucson, Arizona, United States, 1993; "To Start the Day and thunderstorm clouds", New Haven, Connecticut, United States, 1992; "Lake, Thunderstorm and clouds and Moon" Chapala, Jalisco, Mexico, 1994; "To Happen in the Late Afternoon and Beach", Galveston, Texas, United States, 1991; "Mount Everest", Nepal, 1998; "Pines, Lake and Mountains", Denver, Colorado, United States, 1989; "Mountains and Moon", Guadalajara, Jalisco, Mexico, 1989; "To Happen in the Late Afternoon and Sea", St. Petersburg, Florida, United States, 1995; "Deserted Heat", Tucson, Arizona, United States, 1991; "Lake, Moon and Clouds", Chapala, Jalisco, Mexico,

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