Regional Project
“¡Me gusta Matemática!”

Teachers’ Guidebook
(Sample in English)

PROMETAM/Honduras

COMPRENDO–JICA/El Salvador

PROMECEM/Nicaragua

GUATEMATICA/Guatemala

PROMASAN/Dominican Republic

¡Me gusta Matemática!

PROYECTO REGIONAL
PROMETAM FASE II

CONTENTS

Regional Project"¡Me gusta Matemática!"
Project for the Improvement of Teaching Method
in Mathematics (PROMETAM) Phase II
March, 2008
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INTRODUCTION

Facing the fact that Mathematics is one of the major reason for repetition of a grade and drop out in primary education, a regional project named “¡Me gusta Matemática!”, which means “I like Mathematics!” in Spanish, is being carried out in 5 countries of Central America and the Caribbean in collaboration with Japan through its governmental agency for development assistance, Japan International Cooperation Agency (JICA).

One of the main products of this collaborative work is Students’ Workbook and Teachers’ Guidebook, which is designed to allow students to learn systematically solving adequate problems, and to help teachers give well-structured lessons following the national curriculum of the country. Original versions of these materials were developed through the Project for the Improvement of Teaching Method in Mathematics (PROMETAM) in Honduras. Adapting the method and practice in Japan, a team of Honduran and Japanese experts elaborated the Students’ Workbook and Teachers’ Guidebook for the 1st to 6th grade in accordance with new Honduran curriculum. They first served as training materials for in-service teachers, then authorized and distributed nation-wide as government-designated textbook and guidebook for primary education.

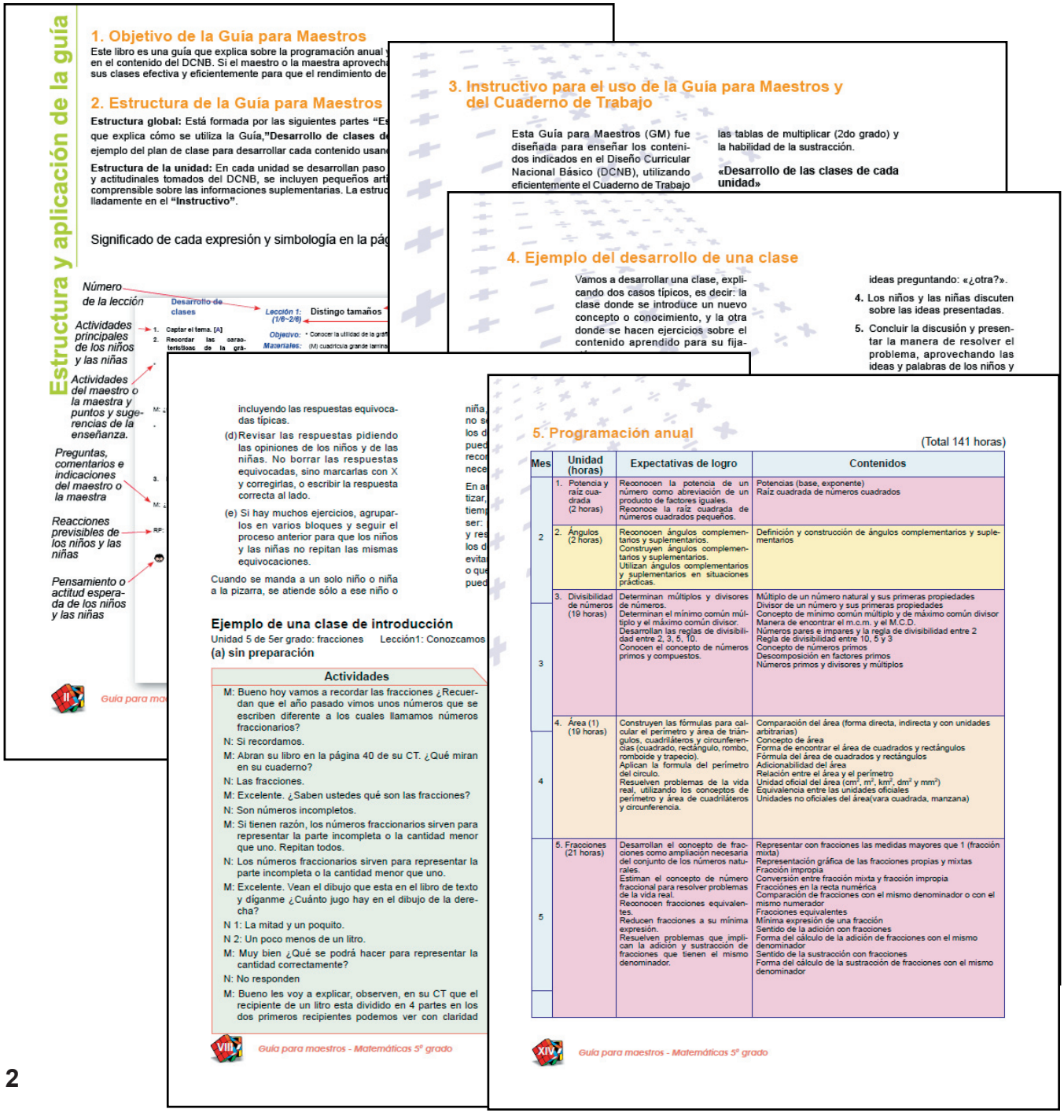
Recognizing the impact of PROMETAM, Guatemala, El Salvador, Nicaragua and the Dominican Republic, launched similar projects and formed a regional alliance among them. Sharing experiences and products, i.e. Students’ Workbook and Teachers’ Guidebook, these countries have been developing its own versions of the materials. In order to revise the materials and further improve teaching method, second phase of PROMETAM was started too.

This document is a sample in English of the Teachers’ Guidebook, which is excerpted and translated form the original version in Spanish developed by PROMETAM in Honduras.

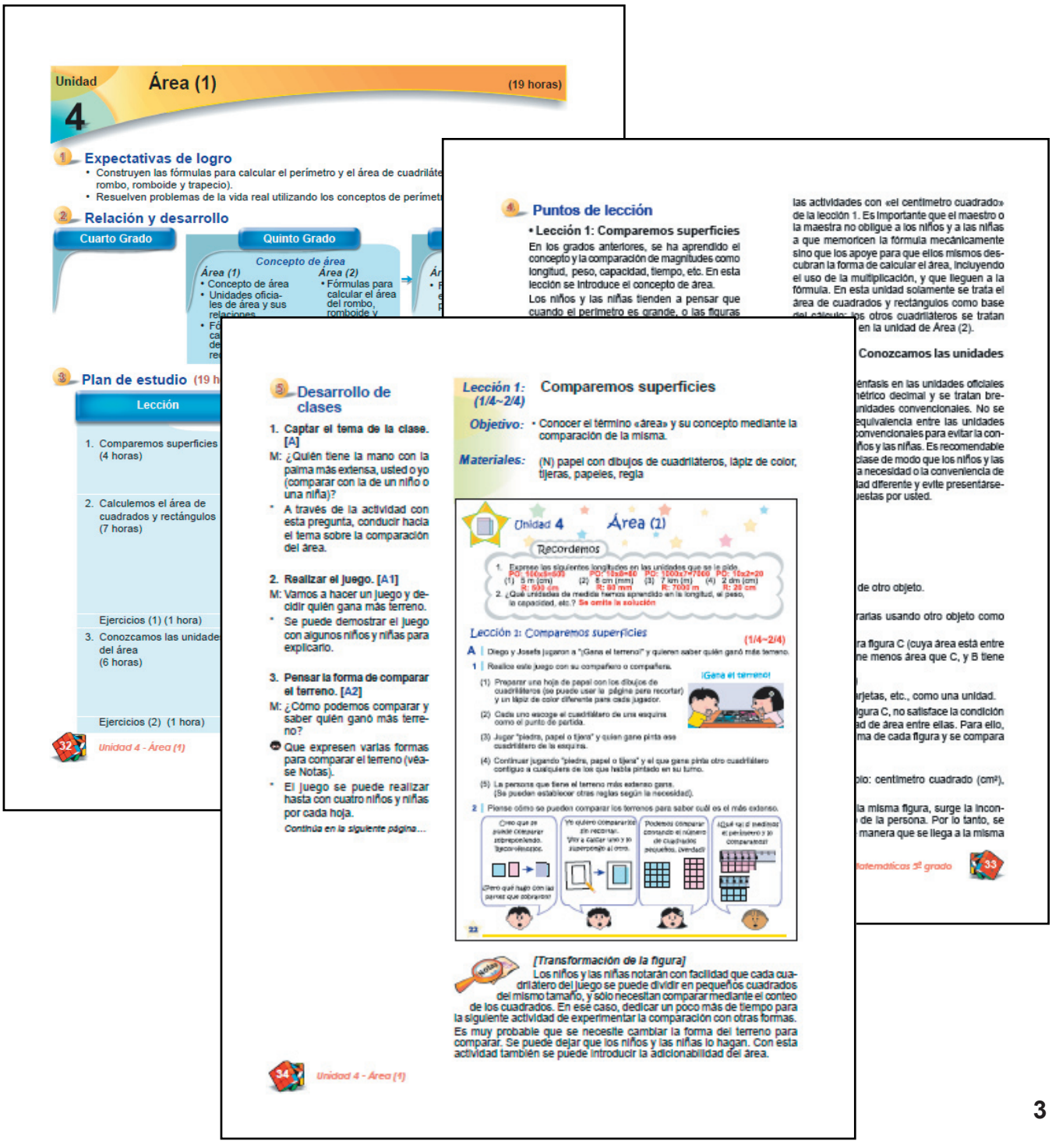
OUTLINE OF THE TEACHERS' GUIDEBOOK

The Teachers' Guidebook was composed of two major parts.

One is "Structure and Application of the Guidebook", which explains the objective, structure and instruction on the use of the Guidebook. It also contains examples of lesson plan and annual program.



The other part is “Development of classes”. In this part, expected achievements, study plan, lesson points and other important information are explained unit by unit. A process of each lesson is also described using the copies of the relevant pages of the Students’ Workbook, or Textbook. It contains the theme of the lesson, allocated time, goal, teaching materials, main activities, and other important information or supplementary exercises.


Unidad 4 Área (1) (19 horas)

1 Expectativas de logro
• Construyen las fórmulas para calcular el perímetro y el área de cuadriláte
rombo, romboide y trapecio).
• Resuelven problemas de la vida real utilizando los conceptos de perímet

2 Relación y desarrollo
Cuarto Grado
Quinto Grado
Concepto de área
Área (1)
• Concepto de área
• Unidades oficiales de área y sus relaciones
Área (2)
• Fórmulas para calcular el área del rombo, romboide y

3 Plan de estudio (19 h
Lección
1. Comparemos superficies (4 horas)
2. Calculemos el área de cuadrados y rectángulos (7 horas)
Ejercicios (1) (1 hora)
3. Conozcamos las unidade del área (6 horas)
Ejercicios (2) (1 hora)
32 Unidad 4 - Área (1)

4 Puntos de lección
• Lección 1: Comparemos superficies
En los grados anteriores, se ha aprendido el concepto y la comparación de magnitudes como longitud, peso, capacidad, tiempo, etc. En esta lección se introduce el concepto de área.
Los niños y las niñas tienden a pensar que cuando el perímetro es grande, o las figuras
las actividades con «el centímetro cuadrado» de la lección 1. Es importante que el maestro o la maestra no obligue a los niños y a las niñas a que memoricen la fórmula mecánicamente sino que los apoye para que ellos mismos descubran la forma de calcular el área, incluyendo el uso de la multiplicación, y que lleguen a la fórmula. En esta unidad solamente se trata el área de cuadrados y rectángulos como base del cálculo; los otros cuadriláteros se tratan en la unidad de Área (2).
Conozcamos las unidades
énfasis en las unidades oficiales
métrico decimal y se tratan bre-
unidades convencionales. No se
equivalencia entre las unidades
convencionales para evitar la con-
ños y las niñas. Es recomendable
clase de modo que los niños y las
a necesidad o la conveniencia de
lad diferente y evite presentárse-
estas por usted.
de otro objeto.
rarlas usando otro objeto como
ra figura C (cuya área está entre
ne menos área que C, y B tiene
irjetas, etc., como una unidad.
igura C, no satisface la condición
ad de área entre ellas. Para ello,
ma de cada figura y se compara
olo: centímetro cuadrado (cm²).
la misma figura, surge la incon-
de la persona. Por lo tanto, se
manera que se llega a la misma
Matemáticas 5º grado 33

5 Desarrollo de clases
1. Captar el tema de la clase. [A]
M: ¿Quién tiene la mano con la palma más extensa, usted o yo (comparar con la de un niño o una niña)?
* A través de la actividad con esta pregunta, conducir hacia el tema sobre la comparación del área.
2. Realizar el juego. [A1]
M: Vamos a hacer un juego y decidir quién gana más terreno.
* Se puede demostrar el juego con algunos niños y niñas para explicarlo.
3. Pensar la forma de comparar el terreno. [A2]
M: ¿Cómo podemos comparar y saber quién ganó más terreno?
Que expresen varias formas para comparar el terreno (véase Notas).
* El juego se puede realizar hasta con cuatro niños y niñas por cada hoja.
Continúa en la siguiente página...

Lección 1: (1/4~2/4) Comparemos superficies
Objetivo: • Conocer el término «área» y su concepto mediante la comparación de la misma.
Materiales: (N) papel con dibujos de cuadriláteros, lápiz de color, tijeras, papeles, regla

Unidad 4 Área (1)
Recordemos
1. Expresa las siguientes longitudes en las unidades que se la pide.
(1) 5 m (cm) PD: 5*100=500 R: 500 cm
(2) 8 cm (mm) PD: 10x8=80 R: 80 mm
(3) 7 km (m) PD: 1000x7=7000 R: 7000 m
(4) 2 dm (cm) PD: 10x2=20 R: 20 cm
2. ¿Qué unidades de medida hemos aprendido en la longitud, el peso, la capacidad, etc.? Se omite la solución
Lección 1: Comparemos superficies (1/4~2/4)
A | Diego y Josefa jugaron a "¡Gana el terreno!" y quieren saber quién ganó más terreno.
1 | Realice este juego con su compañero o compañera.
¡Gana el terreno!
(1) Preparar una hoja de papel con los dibujos de cuadriláteros (se puede usar la página para recortar) y un lápiz de color diferente para cada jugador.
(2) Cada uno escoge el cuadrilátero de una esquina como el punto de partida.
(3) Jugar "piedra, papel o tijera" y quien gane pinta ese cuadrilátero de la esquina.
(4) Continuar jugando "piedra, papel o tijera" y el que gana pinta otro cuadrilátero contiguo a cualquiera de los que había pintado en su turno.
(5) La persona que tiene el terreno más extenso gana.
(Se pueden establecer otras reglas según la necesidad).
2 | Piense cómo se pueden comparar los terrenos para saber cuál es el más extenso.
Creo que se puede comparar superponiendo. Recortándolos.
¿Pero qué hago con las partes que sobraron?
Yo quiero comparar sin recortar. Voy a cortar uno y lo superpongo al otro.
Podemos comparar contando el número de cuadrados pequeños. (verdad)
¿Qué tal si medimos el perímetro y lo comparamos?
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Notas [Transformación de la figura]
Los niños y las niñas notarán con facilidad que cada cuadrilátero del juego se puede dividir en pequeños cuadrados del mismo tamaño, y sólo necesitan comparar mediante el conteo de los cuadrados. En ese caso, dedicar un poco más de tiempo para la siguiente actividad de experimentar la comparación con otras formas.
Es muy probable que se necesite cambiar la forma del terreno para comparar. Se puede dejar que los niños y las niñas lo hagan. Con esta actividad también se puede introducir la adicionabilidad del área.
34 Unidad 4 - Área (1)

Teachers' Guidebook
(Sample in English)

5th Grade Unit 4

"Project for the Improvement of Teaching Method in Mathematics in Honduras"
Phase II

PROMETAM Phase II

NOTES

Since this material has been developed originally in Spanish according to the National Curriculum Design of Honduras(DCNB), on referring this material please consider the followings:

- There are some images or texts (including the names of the characters) left in Spanish like "Notas", "varas", "manzanas", etc.
- Large numbers are represented without commas, like "10000", "500000", etc.
- Materials developed in other countries may differ in contents depending on the curriculum of respective countries.

Unit 4

Area (1) (19 hours)

1 Expected Achievements

- Students can formulate an expression to calculate the perimeter and the area of a quadrilateral (square, rectangle, rhombus, rhomboid, and trapezoid).
- Students can solve real-life problems using the concepts of perimeters and areas of quadrilaterals.

2 Relationship and Development

4th Grade

5th Grade

Concept of Area

[Area (1)]
- Concept of area
- Standard units of area and their interrelationships
- Formulas to calculate the area of squares and rectangles

[Area (2)]
- Formulas to calculate areas of rhombus, rhomboid and trapezoid
- Formulas to calculate the area of triangles

6th Grade

Areas
- Formulas to calculate the areas of circles and regular Polygons

3 Study Plan (19 hours)

Lesson	Allocated Time	Contents
1. Compare surfaces (4 hours)	1/4~2/4	• Comparison of area: direct or indirect strategies using arbitrary units • Concept of area
	3/4~4/4	• Comparison using a standard unit (cm²)
2. Calculate the areas of squares and rectangles (7 hours)	1/7~2/7	• Ways to find the areas of squares and rectangles • Formulas for the areas of squares and rectangles
	3/7	• Areas of squares and rectangles around us
	4/7 ~5/7	• Area of compound figures • Adding areas
	6/7	• Calculation of area knowing the perimeter
	7/7	• Calculation of perimeter knowing the area
Exercises (1) (1 hour)	1/1	• Exercises for Lessons 1 and 2
3. Understand units of area (6 hours)	1/6 ~2/6	• Standard units of area (m²)
	3/6	• Standard units of area (km²)
	4/6	• Standard units of area (dm², mm²)
	5/6	• Standard unit equivalents
	6/6	• Non-standard units of the area (square,vara, manzana)
Exercises (2) (1 hour)	1/1	• Unit exercises

4 Lesson Points

• Lesson 1: Compare surfaces

In earlier grades, students learned the concepts of length, weight, volume/capacity and time. They also learned how to measure and compare length, weight, volume/capacity and time. In this lesson, the concept of area is introduced.

Students tend to think that, when a perimeter is larger or figures are longer, the area is greater. In order for them to firmly grasp the concept of area and discover a way to find the area on their own, it is important to follow four steps: (1) direct comparison, (2) indirect comparison, (3) comparison using arbitrary units, and (4) comparison using standard units. In this lesson steps, (1) through (3) will be covered.

• Lesson 2: Calculate the areas of squares and rectangles

In this lesson, the way to find the area is shifted from counting to calculating, based on activities involving "square centimeters" in Lesson 1. It is important for the teacher to not have the students memorize the formula, but to encourage them to discover, by themselves, the formulas to find area, including how to use multiplication, to arrive at the formula. This unit deals only with the areas of squares and rectangles; other quadrilaterals are covered in the unit of Area (2).

• Lesson 3: Familiarize students with the units of area

Here an emphasis is placed on standard units of the metric system and the conventional units are discussed briefly. Equivalence between the standard and conventional units is not mentioned so that the students will not be confused. It is recommended that a class be planned so that the students can benefit from having a different unit, and avoid having the teacher impose the unit upon the students.

Column

[Four steps to compare area]

1. ***Direct comparison***

   Compare the surface area of an object by superimposing the area onto the area of another object.

2. ***Indirect comparison***

   If two surface areas cannot be compared directly, compare them using an intermediary object.

   To indirectly compare the area of Figures A and B, Figure C whose area is between A and B is prepared. A and C are compared, then B and C. Therefore, A has a smaller area than C and B has a larger area than C, forming the relationship, "A has a smaller area than B." A<C, C<B, therefore A<B

3. ***Comparison using arbitrary units (individual units)***

   Compare areas using a difference in quantity of bricks, cards, etc., as a unit.

   No indirect comparison can be made when the intermediary, Figure C, does not meet the condition that it be situated between A and B, or when you want to know what difference in quantity lies between A and B. For this, bricks or cards, called arbitrary units, are placed on top of each figure, and the areas of A and B are compared with the quantity of arbitrary units.

4. ***Comparison using standard units***

   Compare using units that are common to us, such as square centimeter (cm^2) and square meter (m^2).

   When the area of a figure is compared using arbitrary units, even though it is the same figure, each person may come up with a different answer depending upon which arbitrary unit each person used. Therefore, the universal units, which are common to all, are used to make comparisons so that the same measurement is adopted. These types of units are called standard units.

5 Process of Lessons

1. Understand the theme of the class [A]

Teacher: Who has the larger palm? (Teacher's palm is compared with a student's palm.)

* Through this activity, the theme of the comparison of area is introduced.

2. Play a game [A1]

Teacher: Let's play a game and see who wins by having the most land.

* The game can be explained by demonstrating using some students.

3. Think about the steps used to compare land [A2]

Teacher: How can we compare and know who has the most land?

Student: Student should express several ideas to compare the area (See Notes).

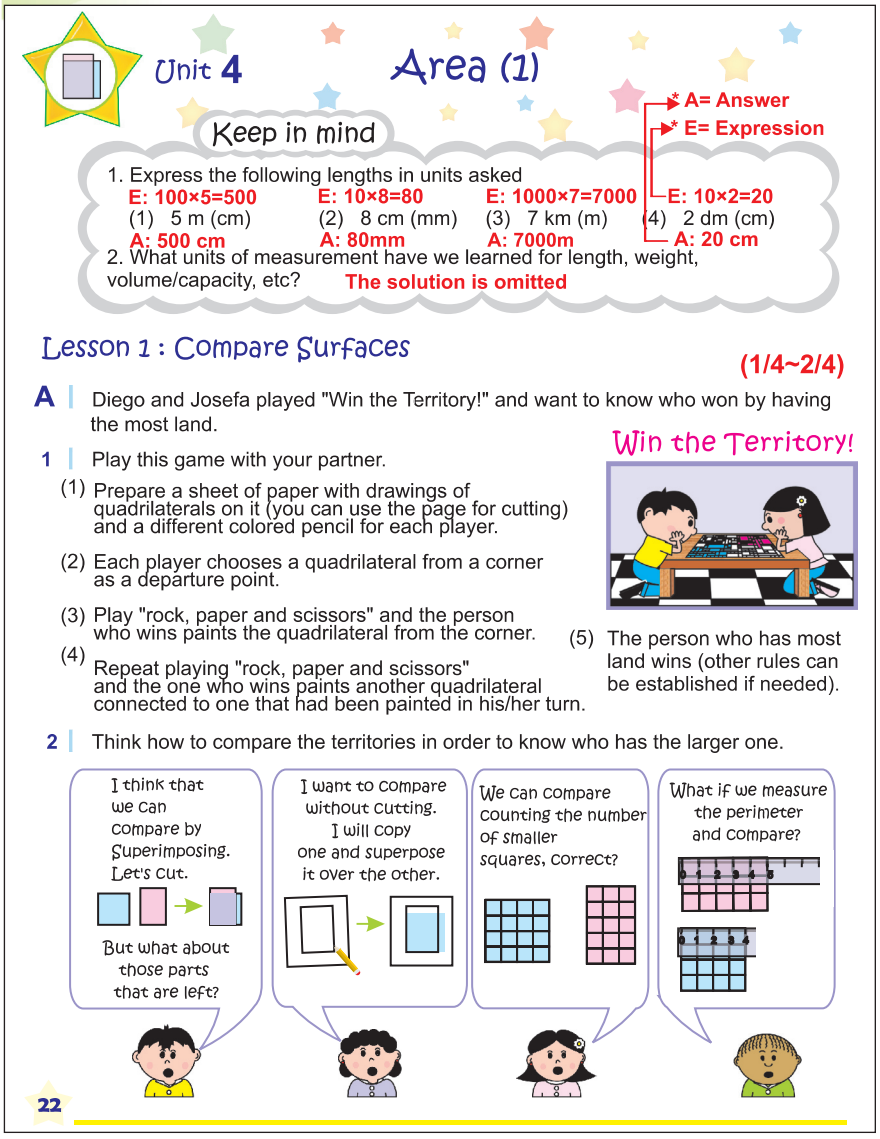
* The game can be played by two to four students for each sheet.

To be continued to the following page…

Lesson 1: (1/4~2/4) Compare surfaces

Goal: • Become familiar with the term and concept of "area" by comparing areas.

Tools: **Student**: Paper with drawings of quadrilaterals on it, colored pencils, scissors, paper, ruler



Unit 4 Area (1)

A= Answer
E= Expression

Keep in mind

1. Express the following lengths in units asked
(1) 5 m (cm) E: 100×5=500 A: 500 cm
(2) 8 cm (mm) E: 10×8=80 A: 80mm
(3) 7 km (m) E: 1000×7=7000 A: 7000m
(4) 2 dm (cm) E: 10×2=20 A: 20 cm
2. What units of measurement have we learned for length, weight, volume/capacity, etc? The solution is omitted

Lesson 1 : Compare Surfaces (1/4~2/4)

A Diego and Josefa played "Win the Territory!" and want to know who won by having the most land.

1 Play this game with your partner.

(1) Prepare a sheet of paper with drawings of quadrilaterals on it (you can use the page for cutting) and a different colored pencil for each player.

(2) Each player chooses a quadrilateral from a corner as a departure point.

(3) Play "rock, paper and scissors" and the person who wins paints the quadrilateral from the corner.

(4) Repeat playing "rock, paper and scissors" and the one who wins paints another quadrilateral connected to one that had been painted in his/her turn.

Win the Territory!

(5) The person who has most land wins (other rules can be established if needed).

2 Think how to compare the territories in order to know who has the larger one.

I think that we can compare by Superimposing. Let's cut. But what about those parts that are left?

I want to compare without cutting. I will copy one and superpose it over the other.

We can compare counting the number of smaller squares, correct?

What if we measure the perimeter and compare?

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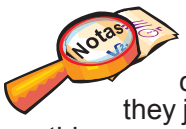


[Transforming the Figure]

Students may notice that each quadrilateral in the game can be divided into smaller squares of equal size, and that they just need to compare them by counting those squares. In this case, a little more time should be spent in the next activity, i.e., to experiment comparing using other steps. It may be necessary to change the shape of the figure in order to make a comparison. Teachers can let students do so on their own and find out for themselves. In this activity, the concept of adding area can be introduced.

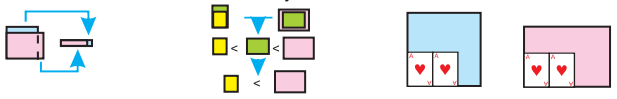
Lesson 1: (1/4~2/4) Compare surfaces

[Continuation]

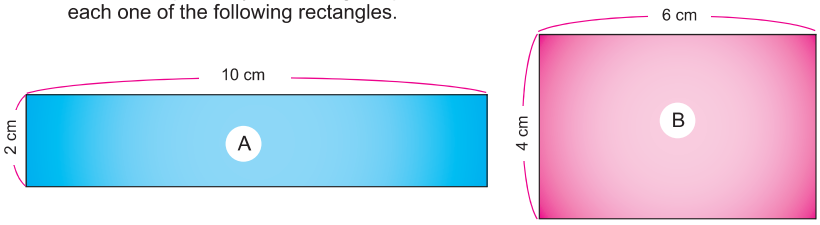
3 Using any strategy you want, compare your colored land with your partner's, to see who won.
If you have time, compare using other strategies. (1/4~2/4)

The dimension of the surface is called area.
As with length, weight and volume/capacity, area can be measured in several ways.

Superimposing | Using an object as intermediary | Using an object as a unit of measurement



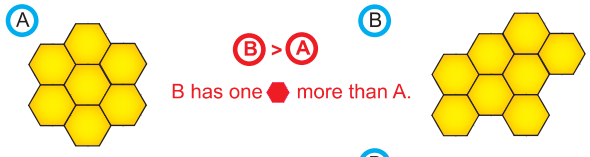
4 Which rectangle has the largest area?
Investigate using a method for finding area if areas can be compared by measuring the perimeter of each one of the following rectangles.



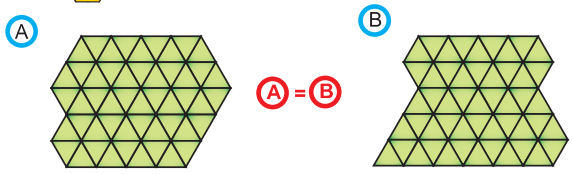
✓ The area cannot be compared by measuring the perimeter, for there are cases where the rectangle has longer perimeter but smaller area.

1 Which has larger area A o B ? How much larger?

(1)



(2)



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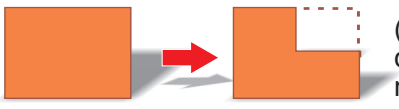
[Example of the Explanation]

This content can be explained using the following drawings (or a string) to understand better.



(The perimeter does not change, but the area diminishes)

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4. **Compare the land [A3]**

* Suggest students to guess who won before making the comparison.

5. **Become familiar with the term "area" and reinforce the steps or methods used to compare area.**

* Use student presentations to reinforce the three steps or strategies used to make comparisons. If necessary, the teacher will demonstrate.

6. **Study the rectangular area relating it to with the perimeter [A4]**

* Help students that are having difficulty by advising them to use the strategies they learned to compare area.

* Conclude that the area is not determined by the length of the perimeter (See Notes)

7. **Solve 1.**

1. **Understand the theme of the class [B]**

* Review by putting the drawings of the land on the blackboard.

2. **Think about difficulties of using arbitrary units [B1]**

3. **Familiarize students with the standard unit of "the square centimeter" [B2]**

* If students want to use common units, introduce 1cm².

* Ask what the area of a square centimeter looks like.(see Notes).

4. **Compare the area of the shapes by counting the square centimeters [B3]**

* Use several exercises of counting square centimeters to find the areas of rectangles and squares.

To be continued to the following page …

Lesson 1: (3/4~4/4) Compare surfaces

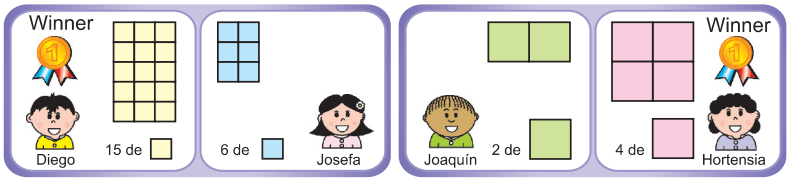
Goal: • Become familiar with the standard unit of area << the square centimeter >> and use it to express area

Tools: **Teacher**: Drawings of land from the workbook by four students for the blackboard, laminated graph paper for the blackboard, ruler

Student: Graph paper, ruler

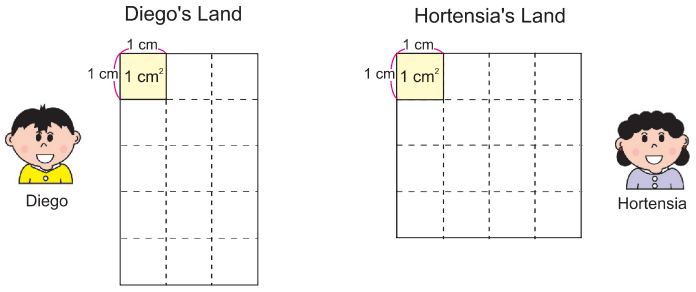
B Diego and Josefa compared their lands from the game using small squares. Joaquin and Hortensia compared their lands with small squares, too. **(3/4~4/4)**

The winners from each team want to know who had the most land.



1 The area of Diego's land is 15 small squares. Hortensia's is 4 small squares. Can you say that Diego had more area than Hortensia? Why?

2 What is needed in order for them to compare the area?



Just like in the units that dealt with length, weight volume/capacity, etc. There are standard units for area.

Square centimeter is a unit of area.It is a square that is 1 centimeter on each side and it is symbolized "**cm²**".

3 Copy in the notebook Diego and Hortensia's lands shown above. Trace the lines so that each area is divided into 1cm²

(1) How many squares of 1cm² fit in each area?

Diego's area: 15 squares of 1 cm²

Hortensia'sarea: 16 squares of 1cm²

(2) How big is the area of each area, in square centimeters?

Diego's area: 15 cm² **Hortensia's area: 16 cm²**

(3) Who had the larger area? By how much?

Hortensia had 1cm² more area than Diego

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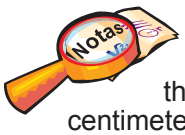


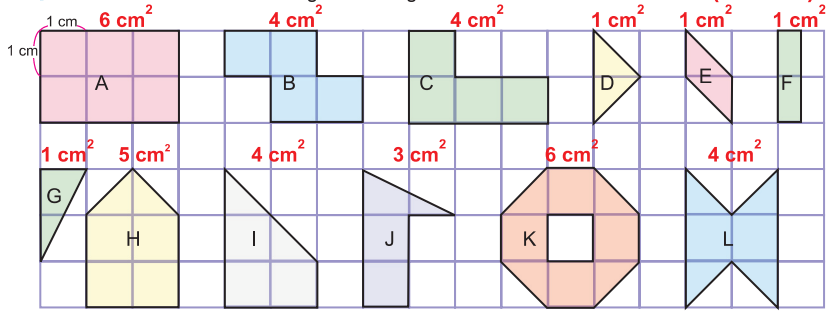
[Perception of area]

* For students to understand a square centimeter, have them look for any objects whose area looks like a square centimeter, e.g., the nail of the thumb, the button of the uniform, etc.

Lesson 1: (3/4~4/4) Compare surfaces

[Continuation]

4 | Find the area of the following colored figures. (3/4~4/4)

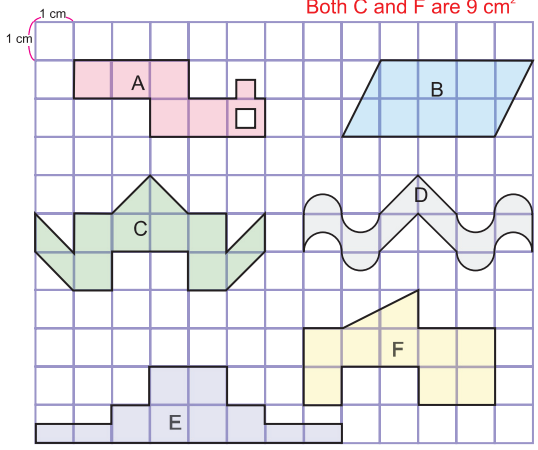


5 | Compare your A and how you found it with your partner.

If figures cannot be divided into complete small squares, their area can be found by transforming necessary parts into squares.
There are several figures that have the same area.

2 Which figures have the same area?

Both A and D are 6 cm²
Both B and E are 8 cm²
Both C and F are 9 cm²



3 In your notebook make graphs like the one above (you can use the page for cutting)
Draw and colored several figures whose area is 6 cm²
The solution is omitted.

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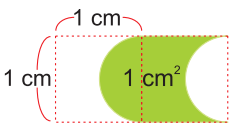
[Transformation of figures]

A figure that is not a square can be transformed into a square by cutting and moving necessary parts. B4 deals only with those polygons that can be easily transformed. In 2, a curved figure appears. If any student has difficulty how to do the transformation, help the student by showing the part with the curved line and thinking together of the way to cut and move it in order to form a square.



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5. Present the area in square centimeters. [B4]

* There are figures whose parts are squares. Encourage students to think about the way to find the area (see Notes).

6. Compare the result. [B5]

* After students have exchanged their results and ideas for finding the area, come up with a generalization for finding the area together.

Teacher: Figure D is not a square. How did you find the area?

Teacher: Which figure has the same area as Figure D?

* Taking advantage of the students' responses, reinforce the idea that the figures can be transformed without changing their areas, that is to say, there are several figures with the same area.

7. Solve 2 and 3 .

1. **Understand the theme of the class. [A]**

Teacher: It is hard for me to trace the lines in the square and divide it into smaller squares of 1cm². Counting the number of squares is also a hassle.

¿Could we find an easier way to calculate the area?

2. **Think about the strategy to find the area of the square by calculating it. [A1~3]**

Teacher: What would we need to know in order to find the area of a square without counting the number of the small squares?

Teacher: How can we find the area through calculation?

* Allow enough time for students to solve the problems independently.

3. **Express the idea to find the area.**

* Designate several volunteers and have them express on the blackboard their own ways to find the area by means of calculation.

4. **Formulate an expression.**

* Asking what each number that appears in the E means, introduce the formula.

5. **Solve 1.**

To be continued to the following page…

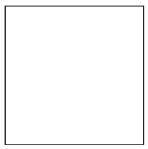
Lesson 2: (1/7~2/7) Calculate the area of squares and rectangles

Goal: • Calculate the area of squares and rectangles using set formulas.

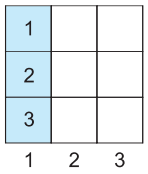
Tools: **Teacher**: ruler
Students: ruler

Lesson 2: Calculate the area of squares and rectangles.

A | Let's find the area of squares by calculating **(1/7~2/7)**



1 | What would we need to know in order to find the area of a square without having to count the number of small square of 1cm²?
Measurement of the sides
2 | Measure the length of the side of the shown square and draw it in the square.
The solution is omitted
3 | Think of a way to find the area through calculation and explain it.



(1) How many 1 cm² squares are there in a column?
Three small squares
(2) How many columns are there?
Three columns
(3) How many 1 cm² small squares are there in all?
Write down the Expression and the Answer in your notebook.
E: 3 × 3 = 9 A: 9 small squares of 1 cm²
(4) What is the area of this square?

✓ The area of this square is: E: 3 × 3 = 9 R: 9 cm²

For calculating the area of a square the length of a "side" is multiplied by the length of the other "side."
Area of a square = side × side
This type of E that uses words is called **formula.**

With the formula it is easy to remember how to calculate, isn't it?

1 Calculate the area of the following squares.

(1) 2 cm, 2 cm
E: 2x2=4
A: 4 cm²

(2) 4 cm, 4 cm
E: 4x4=16
A: 16 cm²

(3) A square whose sides are 15 cm long
E: 15x15=225
A: 225 cm²

(4) A square whose sides are 20 cm long
E: 20x20=400
A: 400 cm²

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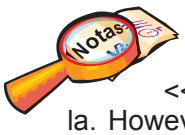


[Formula to find the area]

Some students can say the way to find the area using <<side multiplied by side>>, or they may know the formula. However, the majority of them cannot explain why. It is very important for them to make sense of the formula. When formulating an expression, it would be better to present several squares and have the students reach the conclusion in an inductive manner.

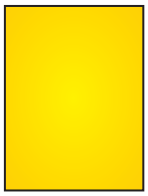
Lesson 2: (1/7~2/7) Calculate the area of squares and rectangles

[Continuation]

Goal: (3/7) • Calculate the area of squares and rectangles around us.

Tools: **Teacher**: ruler; **Students**: ruler

B | Let's find the area of rectangles by means of calculation.



1 | What do we need to know in order to find the area of a rectangle?
The measurement of the height and the base.

2 | Measure the length of the height and the base of the rectangle shown and draw it in the notebook.
The solution omitted

3 | Find the area of each rectangle applying what has been learned and explain your calculation.

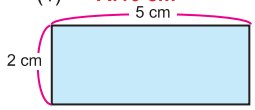
✓ Like squares, the area of rectangles is found by considering how many small squares of 1cm² fit into the figure.

The area of this rectangle is: C: 4×3=12 A: 12cm²

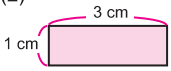
To calculate the area of a rectangle, the "length" is multiplied by the "width."
area of rectangle = length × width

2 Calculate the area of the following rectangles:

(1) **E: 5x2=10** **A:10 cm²**



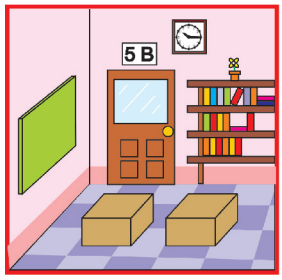
(2) **E: 3x1=3** **A: 3 cm²**



(3) A rectangle whose length is 10cm and width 7cm
E: 10x7=70 **A: 70 cm²**

(4) A rectangle whose width and length are 8cm and 15cm, respectively
E: 8x15=120 **A: 120 cm²**

C | Let's study the area of the square and rectangular objects in the classroom using "cm²". **(3/7)**



- Estimate the area of the objects before measuring.
- If there is a length in millimeters, round the measure up to centimeters.
- If the corners of the objects are curved, get an approximate measurement.
- Record the result in the notebook.

The solution is omitted

Object	Length (cm)	Width (cm)	Area

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...continued from the previous page

6. Think about the strategy to find the area of a rectangle by using calculation. [B1~3]

Teacher: Then, how can we find the area of the rectangle?

Students: Applying the same idea used for the square.

7. Express the idea for finding the area.

8. Formulate an expression.

* Confirm that both <<length × width>> and <<width × length>> give the same result.

9. Solve 2 .

[Up here 1/7~2/7]

[From here 3/7]

1. Understand the theme and familiarize students with the process of the activity. [C]

* Explain the activity. If necessary, give several examples at each session.

2. Study the area of square and rectangular objects.

* The use of a calculator can be allowed.

3. Share the results and the insights from the activity.

1. **Read the problem and understand the theme [D].**

2. **Think about how to find the area [D1].**

* Indicate that the students find the area using their own ideas

* Help those who have difficulty by using the drawing in the workbook.

3. **Explain the idea and the A.**

4. **Use another idea to calculate the area [D2].**

Teacher: How did Josúe and Elena find the area?

* Have the students explain the two ideas shown in the workbook. (see Notes).

* Indicate that the students calculate the area using the two ideas in the workbook. If other strategies were suggested in the previous activity, the teacher can have the students calculate using those ideas, as well.

* Explain the order of the operation, if necessary.

- When there are parentheses, complete the operation enclosed in them first.
- Multiplication and division are executed from the left to the right before addition and subtraction.

5. **Find the areas that can be added.**

6. **Solve 3 to 5 .**

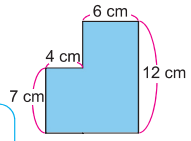
Lesson 2: (4/7~5/7) Calculate the area of squares and rectangles

Goal: • Calculate the area of combined figures by applying the formulas for the areas of squares and rectangles.

Tools: **Teacher**: a ruler
Students: a ruler

D In the "Win the Territory!" game, Josúe won a land that looks like the drawing shown. **(4/7~5/7)**

What is the area of Josúe's land?



1 Think about how to calculate the area.

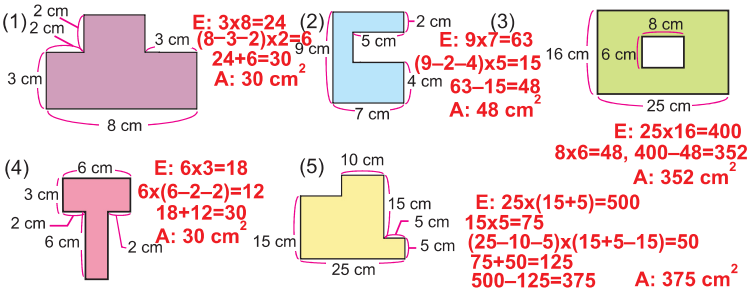
2 Calculate the area with the two ideas shown above.

Josué E: 7 x 4 = 28, 12 x 6 = 72, 28 + 72 = 100 A: 100 cm^2.

Elena E: 12 x (4 + 6) = 120, (12 - 7) x 4 = 20, 120 - 20 = 100 A: 100 cm^2.

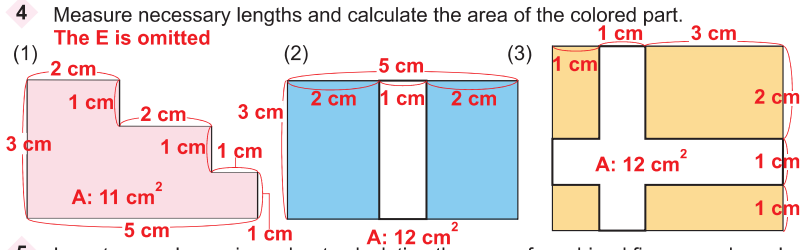
When two areas are combined, the total can be found by addition.
When a part of the area is taken off, the remaining area can be found by subtraction.

3 Calculate the area of the following figures. **There are several ways of solving. It is important that students generate the calculation, so that they can demonstrate their thinking.**



4 Measure necessary lengths and calculate the area of the colored part.

The E is omitted



5 Invent several exercises about calculating the area of combined figures and resolve them. **The solution is omitted.**

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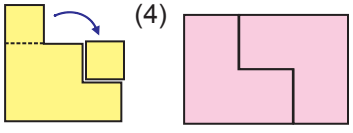
[Area of combined figures]

In the workbook, two principal ideas (or formulas) to find the area are presented among others: (1) First, the area is divided into parts, then these parts are put back together; (2) First, the area of the bigger figure is calculated including the open space, then the space portion is subtracted.

Depending on the type of the figure, other forms can be applied.
For example: (3) Form a rectangle (or square) transferring some part of the figure, (4) Form a rectangle (or square) uniting the 2 or more of the same figure, then divide it.



Lesson 2: (6/7) Calculate the area of squares and rectangles

Goal: • Calculate the area of combined figures knowing the perimeter.

Tools: **Teacher**: ruler
Students: ruler

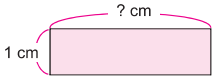
E Inés drew a figure that can be a square or a rectangle, whose perimeter is 16cm. **(6/7)**

Can the area of this figure be determined?

1 In the notebook create squares and rectangles whose perimeters are 16cm.

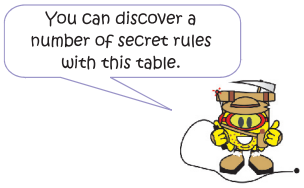
(1) When the length (or width) is 1cm, how long is the width (length)?

(2) When the length (or width) is 2cm, how long is the width (length)?



2 In the notebook copy and complete the following table with your solutions.

Length (width) cm	1	2	3	4
Width (length) cm	7	6	5	4
Area (cm²)	7	12	15	16



3 State what you noticed with the table.

Several rectangles can be created combining the same perimeter with different areas, depending on the length of the height and base.
However, only a single square exists with a given perimeter, which determines only one area.

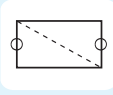
4 Calculate the area of a rectangle created in the previous activity, whose length is 6cm.

(1) What is the width?

(2) What is the area?

✓ (1) E: 16 ÷ 2 - 6 = 2 A: 2 cm

(2) E: 6 x 2 = 12 A: 12 cm²



The length and width of a rectangle is found dividing the perimeter by two.

Then, the width is found by subtracting "the length" from the divided perimeter.

The side of a square is found by dividing the perimeter by four.

6 In the notebook, create rectangles and squares with a perimeter of 12cm. Using the table, investigate the area of each figure.

The solution is omitted.

7 Calculate the area of the following figures:

(1) A square whose perimeter is 24cm

E: 24÷4=6, 6x6=36 A: 36 cm²

(2) A rectangle whose perimeter is 20cm and whose length is 7cm

E: 20÷2–7=3, 7x3=21 A: 21 cm²

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[Squares and rectangles with equal perimeters]
When the length (or width) of a rectangle varies while constantly maintaining a certain perimeter, the area is maximum when the length and width are equal, in other words, when it is a square.

If students discover this rule, they can accept it. Nevertheless, it is better for them to study the cases of other rectangles with different perimeters, so that they come to understand that in a scientific procedure several cases have to be examined in order to prove a discovery.

1. **Read the problem and understand the theme [E].**

Teacher: Let's examine if the area of the figure can be determined when its perimeter is known.

2. **Create several squares and rectangles with the same perimeter [E1].**

* Help students who have difficulty finding the length (or width) of the figure with the drawing in the workbook.

* Mention that, although there are many more figures, here they are to create those whose measurements of the length and width are natural numbers in centimeters.

3. **Complete the table with the correct measurements [E2].**

4. **Analyze the results [E3].**

Teacher: What did you discover from the results?

* Taking advantage of students' feedback, conclude that the area of rectangles cannot be determined if just the perimeter is known. On the other hand, the area of squares can certainly be determined (see Notes).

5. **Find the area of a rectangle knowing the height [E4].**

* Generalize the formula together.

6. **Solve 6 and 7.**

1. **Read the problem and understand the theme [F].**

Teacher: Let's examine if the perimeter of a figure can be determined when its area is known.

2. **Calculate the perimeter knowing the area [F1].**

* Indicate that students write down the results of their calculations in the table.
* There are cases where the quotient is not a natural number. In this case, students can stop dividing the quotient into units and write it in the table. Otherwise, the use of a calculator can be allowed and they can round the quotient up to the units.

3. **Create several squares and rectangles with the same area [F2].**

4. **Analyze the results [F3].**

Teacher: What did your results tell you?

* Taking advantage of students' feedback, conclude that the perimeter of a rectangle cannot be determined although the area is known. On the other hand, the perimeter of a square can certainly be determined.

5. **Calculate the perimeter of a square when the area is known. [F4].**

* Generalize the formula together.

6. **Resolve 8 and 9.**

Lesson 2: (7/7) Calculate the area of squares and rectangles

Goal: • Calculate the perimeter of squares and rectangles knowing the area.

Tools: **Teacher**: ruler
Students: ruler

F Inés drew another figure, either a square or rectangle, with an area of 36cm². Can the perimeter be determined? **(7/7)**

1 In the notebook complete the table using the results of your calculations.

Length (width) cm	1	2	3	4
Width (length) cm	36	18	12	9
Perimeter (cm)	74	40	30	26

(1) When the length (or width) is 3cm, what is the width (or length)?

(2) What is the perimeter?

(1) E: 36 ÷ 3 = 12
A: 12 cm

(2) E: (3+12) x 2 = 30
A: 30 cm

The formula for finding the area of a rectangle is: Area =length × width
Then, to find the length (or width) knowing the area, simply divide the area by the width (or length).
Length (width) = area ÷ width (or length)

2 Create in the notebook some squares and rectangles found in the table.
The solution is omitted.

3 Reveal what you found in the table and figures created.

Several rectangles can be created with the same area and different perimeters, depending on the length and width.
However, only a single square exists with a given area, which determines only a single perimeter.

4 Find the perimeter, if Inés drew a square.

The area of the square can be found by: side × side, in other words, the same number has to be multiplied.

If the area is 36cm², a number that is square root of 36 is sought.

If the area of a square is known, the perimeter of a square is found this way: First find the square root of the area. That is the measurement of the side of the square. Then, as there are four sides, the square root (the side) is multiplied by four to find the perimeter.
E: $\sqrt{36} = 6$ 6 x 4 = 24 A: 24 cm.

8 In the notebook draw a rectangle and a square whose areas are 16cm².
The solution is omitted.

9 Calculate the perimeter of the following figures.

(1) Rectangle: 4 cm, 24 cm²
E: 24÷4=6
(6+4)x2=20
A: 20 cm

(2) Square: 25 cm²
E: $\sqrt{25}$ =5
5x4=20
A: 20 cm

(3) Rectangle: 7 cm, 35 cm²
E: 35÷7=5
(5+7)x2=24
A: 24 cm

(4) Square: 64 cm²
E: $\sqrt{64}$ =8
8x4=32
A: 32 cm

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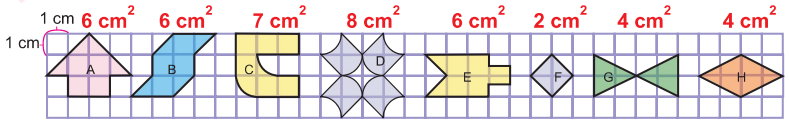
Unit 4: (1/1) Exercises (1)

Goal: • Review what was learned in Lessons 1 and 2.

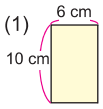
Tools:

Ejercicios (1) (1/1)

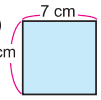
1 Find the area of the following colored figures.



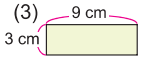
2 Calculate the area of the following quadrilaterals.

(1) 

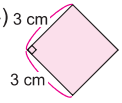
E: 10x6=60 A: 60 cm²

(2) 

E: 7x7=49 A: 49 cm²

(3) 

E: 9x3=27 A: 27 cm²

(4) 

E: 3x3=9 A: 9 cm²

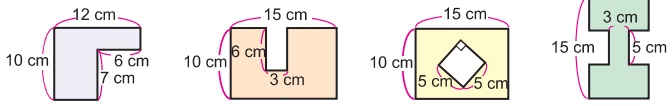
(5) A square whose side is 12cm
E: 12x12=144 A: 144 cm²

(6) A square whose side is 6cm
E: 6x6=36 A: 36 cm²

(7) A rectangle whose length is 10cm and width is 9cm
E: 10x9=90 A: 90 cm²

(8) A rectangle whose width and length are 1cm and 10cm, respectively
E: 10x1=10 A: 10 cm²

3 Calculate the area of the following figures



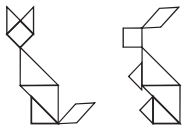
4 Solve the following problems.

(1) Denis has a rectangular flowerbed, 100cm in width, and completely fenced with an 800 cm-long wire. How many square centimeters of nylon does he need to completely cover the flowerbed?
E: 800÷2−100=300, 300x100=30000 A: 30000 cm²

(2) Pamela made a square tablecloth of 81cm². How many centimeters of trimming does she need to decorate the edges? E: $\sqrt{81}$ =9, 9x4=36 A: 36 cm

For Fun

Which has the larger area, the cat or rabbit?



The answer is, they are of the same size.

Both figures are made of a square divided into several parts, called a tangram

With a tangram, several figures can be formed without changing the area. Let's create a tangram and make several figures.

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The problems deal with:

1 Expressing the area using square centimeters.

2 Calculating the area of squares and rectangles using the formulas.

3 Calculating the area of combined figures

Solutions:

(1) E: 12 x 10 = 120
7 x 6 = 42
120 - 42 = 78
A: 78 cm²

(2) E: 15 x 10 = 150
6 x 3 = 18
150 - 18 = 132
A: 132 cm²

(3) E: 15 x 10 = 150
5 x 5 = 25
150 - 25 = 125
A: 125 cm²

(4) E: 15 x 9 = 135
5 x (9 - 3) = 30
135 - 30 = 105
A: 105 cm²

4 Calculation of the area (or the perimeter) in relation to the perimeter (or the area)

[For fun]

Preparation: Cardboard paper, ruler, triangle, scissors

Create the tangram and form several figures with the same area (see Appendix)

You can spend an additional hour to complete the activities.

1. **Read the problem and understand the theme. [A]**

Teacher: How are this problem and what you have already learned different?

Students: Students should notice that the unit of measurement is different.

2. **Calculate the area with square centimeters. [A1]**

Students: Students should feel the need to use another unit.

3. **Familiarize students the unit of << square meter >> [A2]**

Teacher: What unit could you imagine to use for this problem?

A: Square meter.

* Explain the square meter.

4. **Calculate the area using square meters. [A3]**

* Review the calculation after students solve the problem independently.

5. **Solve 1 .**

6. **Understand the area of 1m².**

* Make sure students have sufficient time for the activity.

* Indicate that students keep a newspaper of 1m² for the activity in the 4/6 class of this lesson.

To be continued to the following page…

Lesson 3: (1/6~2/6) Become familiar with the units of the area

Goal:
- Become familiarize with a standard unit of area, << square meter >>
- Establish equivalence between << cm² >> and << m² >>

Tools: **Teacher**: ruler, measuring tape

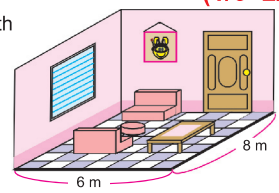
Students: ruler, six sheets of newspaper, masking tape, measuring tape

Lesson 3: Become familiar with the units of area (1/6~2/6)

A The living room of Amadeo's house is 8m in length and 6m in width. What is the area?

1 Calculate the area, turning meters into centimeters. **E: 8 m = 800 cm, 6 m = 600 cm**

800x600=480000 A: 480000 cm²



2 Can you think of a unit of area that can be used to make the calculation easier?

To express the measurement of a large surface, like that of a room, classroom, garden, etc., the area of square whose side is 1 m is used as a standard unit.

This unit of area is called **"square meter"** and is symbolized as **"m²"**

3 Calculate how many squares of 1m per side fit in Amadeo's living room. Show the A with the unit of square meters.

✓ E: 8 x 6 = 48 A: 48 m²

1 Find the area of the following rectangles and squares.

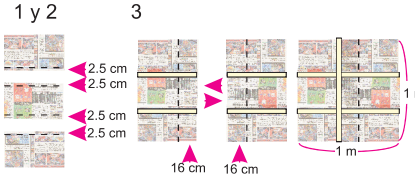
(1) The area of a soccer field whose length is 40m and width 20cm

E: 40x20=800 A: 800 m²

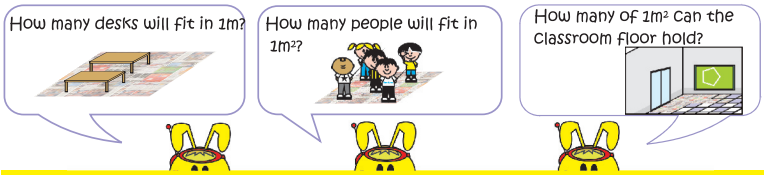
(2) The area of a square garden filled with flowers whose side is 5m

E: 5x5=25 A: 25 m²

B Let's create a square of 1m² with 6 sheets of newspaper.



1. Put together three sheets of paper and make a sheet with a 2.5 cm-wide flap.
2. Put together the other three sheets in the same way.
3. Combine the two parts and make a sheet with a 16 cm-wide flap.



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Lesson 3: (1/6~2/6) Become familiar with the units of the area

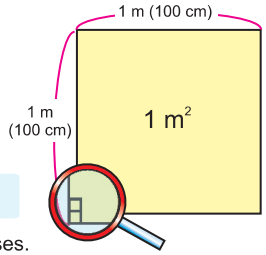
[Continuation]

C | Let's study to how many square centimeters are equal to 1m².

1 | How many squares of 1cm² fit in a column?
100 squares.

2 | How many columns are there?
100 columns.

3 | To how many square centimeters are equal to 1m²?



100 x 100 = 10000 **1 m² = 10000 cm²**

2 Express the following areas in the units in parentheses.

It is recommended that students make an expression using relations among the units; in this case 1m² = 10000cm²

(1) 2 m² (cm²)
E: 10000x2=20000
A: 20000 cm²

(2) 5 m² (cm²)
E: 10000x5=50000
A: 50000 cm²

(3) 10 m² (cm²)
E: 10000x10=100000
A: 100000 cm²

(4) 30000 cm² (m²)
E: 30000÷10000=3
A: 3 m²

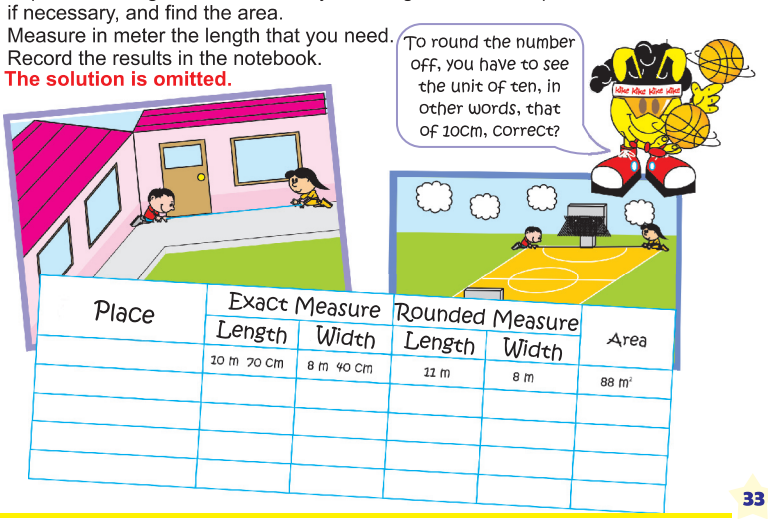
(5) 90000 cm² (m²)
E: 90000÷10000=9
A: 9 m²

(6) 180000 cm² (m²)
E: 180000÷10000=18
A: 18 m²

D | Let's study, in groups, the areas of several rectangular and square places in the school.

- Estimate the area of the places before measuring them.
- Express the length and the width by rounding centimeters up to meters, if necessary, and find the area.
- Measure in meter the length that you need.
- Record the results in the notebook.

The solution is omitted.



Place	Exact Measure		Rounded Measure		Area
	Length	Width	Length	Width	
	10 m 70 cm	8 m 40 cm	11 m	8 m	88 m²

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...continued from the previous page

7. Study the relationship between <<cm²>> and << m²>>. [C]

* Review 1m² = 10000 cm².

8. Solve 2 .

9. Study the areas of square and rectangular objects and places. [D]

* The use of a calculator can be allowed.

* If there is no measuring tape, a metric tape can be made with newspaper, but it would be ideal if students invent their own instruments or to use any objects around them to measure

10. Share the results and insights from this activity.

1. **Read the problem and understand the theme. [E]**

Teacher: How are this problem and what has already been learned different?

Students: Students should notice that the unit of measurement is different.

2. **Familiarize students with the unit of << the square kilometers >>. [E1]**

Teacher: What unit could you think of to use for this problem?

A: Square kilometer.

* Explain square kilometer.

* Show a map or photo of a community or city so that students get the perception of 1 km².

3. **Calculate the area using square kilometers. [E2]**

* Review the calculation, after students solve the problem independently.

4. **Solve 3 .**

5. **Study the relationship between <<km²>> and <<m²>>. [F 1~3]**

* Review 1km² = 1000000 m².

6. **Solve 4 .**

Lesson 3: (3/6) Become familiar with the units of the area.

Goal:

- Become familiar with a standard unit of area, << square kilometer >>.
- Establish equivalence between <<km²>> and <<m²>>.

Tools: **Teacher**: map or photograph

E | Miguel's community is a rectangle, stretching 3 km from north to south, and 2 km from east to west.

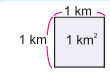
What is the area of this community?

(3/6)

1 | What unit of area do you think you can use to make the calculation easier?

To express the measure of very large areas, e.g., that of cities, or countries, the area of square whose side is 1 km is used as a standard unit.

This unit of the area is called "square kilometer," symbolized as "km².”



2 | Calculate how many square kilometers is Miguel's community.

✓ E: 3 x 2 = 6 A: 6 km²

3 | Find the following areas.

(1) The area of a field whose length and width are 8km and 5km, respectively.

E: 8x5=40 A: 40 km²

(2) The area of a square-shaped city whose side is 15km.

E: 15x15=225 A: 225 km²

F | Let's study to how many square meters are equal to 1km².

1 | How many squares of 1m² fit in a column?

1000 squares

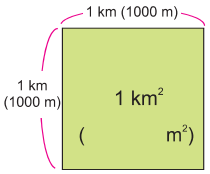
2 | How many columns are there?

1000 columns

3 | How many square meters are equal to 1km²?

1000 x 1000 = 1000000

1 km² = 1000000 m²



4 | Express the following area in the units in parentheses.

(1) 3 km² (m²)
E: 1000000x3=3000000
A: 3000000 m²

(2) 7 km² (m²)
E: 1000000x7=7000000
A: 7000000 m²

(1) 12 km² (m²)
E: 1000000x12=12000000
A: 12000000 m²

(4) 2000000 m² (km²)
E: 2000000÷1000000=2
A: 2 km²

(5) 5000000 m² (km²)
E: 5000000÷1000000=5
A: 5 km²

(6) 25000000 m² (km²)
E: 25000000÷1000000=25
A: 25 km²

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[Supplementary activity]

The class hour can be extended by an hour or two for the perception of 1km².

For instance, using the map, study the area of a community, island, mountain, lake, etc.

Also, you can have students investigate what the area of 1km² is like using the map or taking a tour around the community.

Lección 3: (4/6) Become familiar with the units of area

Goal:
- Become familiar with standard units of area <<millimeter square>> and <<decimeter square>>.
- Establish equivalence between <<mm²>> and <<cm²>>, <<dm²>> and <<cm²>>, <<m²>> and <<dm²>>.

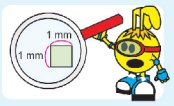
Tools: **Teacher**: ruler

Students: ruler, paper, 1m² square made of newspaper created during the class hours 1/6~2/6

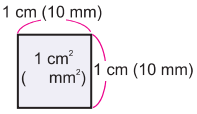
G | Let's familiarize ourselves with other standard units of area. **(4/6)**

1 | What unit would you use for an area smaller than 1cm²?

In order to express the measure of a smaller surface, a square whose side is 1mm is used a standard unit. This unit of area is called "**square millimeter**" and symbolized as "**mm²**."



2 | To how many square millimeters are equal to 1cm?



10 x 10 = 100 **1 cm² = 100 mm²**

5 Express the following areas in the units in parentheses.

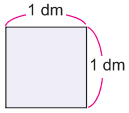
(1) 2 cm² (mm²) **E: 100x2=200 A: 200 mm²**

(2) 6 cm² (mm²) **E: 100x6=600 A: 600 mm²**

(3) 900 mm² (cm²) **E: 900÷100=9 A: 9 cm²**

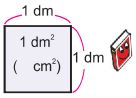
(4) 4300 mm² (cm²) **E: 4300÷100=43 A: 43 cm²**

3 | What would you call the measure of the area of the square below?



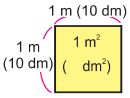
The area of a square whose side-length is 1dm can be used to measure surfaces. This unit of area is called "**square decimeter**" and is symbolized as "**dm²**".

4 | (1) How many square centimeters are equal to 1dm² equivalent?



10 x 10 = 100 **1 dm² = 100 cm²**

(2) To how many square decimeters are equal to 1m²?



10 x 10 = 100 **1 m² = 100 dm²**

6 Express the following area in the units in parentheses:

(1) 4 dm² (cm²) **E: 100x4=400 A: 400 cm²**

(2) 10 dm² (cm²) **E: 100x10=1000 A: 1000 cm²**

(3) 700 cm² (dm²) **E: 700÷100=7 A: 7 dm²**

(4) 1200 cm² (dm²) **E: 1200÷100=12 A: 12 dm²**

(5) 2 m² (dm²) **E: 100x2=200 A: 200 dm²**

(6) 8 m² (dm²) **E: 100x8=800 A: 800 dm²**

(7) 300 dm² (m²) **E: 300÷100=3 A: 3 m²**

(8) 4600 dm² (m²) **E: 4600÷100=46 A: 46 m²**

5 | Make a 1cm² square and another square of 1dm² using paper.

(1) Draw a 1mm² square inside the 1cm² square. Compare the areas and see if 1cm² is equal to 100 mm².

(2) Place the 1cm² square on top of the 1dm² square. Compare the areas and see if 1dm² is equal to 100 cm².

(3) Place the 1dm² square on top of the 1m² square created before. Compare the areas and see if 1m² is equal to 100 dm².

The solution is omitted.

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1. **Understand the theme. [G]**

2. **Familiarize students with the unit of <<square millimeter>>. [G1]**

Teacher: What unit could be used to express an area smaller than 1cm²?

A: Square millimeter.

* Explain the square millimeter.

3. **Study equivalence between <<mm²>> and <<cm²>>. [G2]**

* Review 1cm² = 100 mm².

4. **Solve 5 .**

5. **Understand the unit of <<square decimeter>>. [G3]**

Teacher: (On the blackboard draw a square with a side of 1dm) What would you call the measure of the area of this square?

A: Square decimeter.

* Explain the square decimeter.

6. **Study the relationship between <<dm²>> and <<cm²>>, and <<dm²>> and <<m²>>. [G4]**

* Confirm 1dm² = 100 cm², 1m² = 100 dm².

7. **Solve 6 .**

8. **Understand 1mm²and 1dm². [G5]**

1. **Read the problem and understand the theme.**

Teacher: How are this problem and what you have already learned different?

Students: Students should grasp that measurements are expressed in two types of units.

2. **Calculate the area of a rectangle that is measured in different units.**

* Decimal multiplication (a natural or a decimal multiplied by a decimal) is yet to be covered. Therefore, importance should be placed on changing <<m²>> to <<cm²>>. Furthermore, the formula to transform <<cm²>> into <<m²>> is presented, so that the E can be <<decimal × natural>>.

* Review that in order to calculate the area, the units must be the same.

3. **Solve 7 and 8 .**

4. **Play <<For Fun>>**

* The activity can continue with different partners.

Lesson 3: (5/6) Become familiar with the units of the area

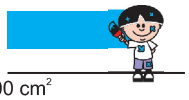
Goal: • Calculate the area of rectangles and squares whose sides are different units.

Tools: **Teacher**: ruler

Students: ruler, dice or hexagonal pencil

H Felipe painted a wall which was 3 meters long and 60 centimeters wide. **(5/6)**

What is the area of Felipe's wall?



✓ The units must be the same.

Ⓐ E: 3 m = 300 cm 300 x 60 = 18000 A: 18000 cm²

Ⓑ E: 60 cm = 0.6 m 0.6 x 3 = 1.8 A: 1.8 m²

7 Find the area.

Ⓐ E: 2 m = 200 cm
200x90=18000
A: 18000 cm²

Ⓐ E: 1 m = 100 cm
100x600=60000
A: 60000 cm²

Calculating after unifying the units is the same as estimating length, weight, volume/capacity, etc.

(1) 90 cm, 2 m

Ⓑ E: 90 cm = 0.9 m
0.9x2=1.8
A: 1.8 m²

(2) 600 cm, 1 m

Ⓑ E: 600 cm = 6 m
6x1=6
A: 6 m²

(3) 3 m, 3 m, 50 cm, 1 m

Ⓐ E: 3 m = 300 cm
300x300=90000
100x50=5000
90000−5000=85000
A: 85000 cm²

Ⓑ E: 50 cm = 0.5 m
1x0.5=0.5 3x3=9
9−0.5=8.5
A: 8.5 m²

(4) A rectangle whose length is 140mm and width 6cm

Ⓐ E: 140 mm = 14 cm, 14x6=84 A: 84 cm² Ⓑ E: 6 cm = 60 mm, 60x140=8400 A: 8400 mm²

(5) A field whose length and width are 2km and 1500m, respectively

Ⓐ E: 2 km = 2000 m, 2000x1500=3000000 A: 3000000 m²

Ⓑ E: 1500 m = 1.5 km, 1.5x2=3 A: 3 km²

(6) A tablecloth whose length is 4m and width 20 dm

Ⓐ E: 4 m = 40 dm, 40x20=800 A:800 dm² Ⓑ E: 20 dm = 2 m, 2x4=8 A: 8 m²

8 There is a garden whose length is 3 m and width 70 cm.

What is the area, in square meters, of this garden? E: 70 cm = 0.7 m, 0.7x3=2.1

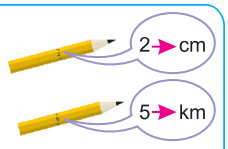
What is the area, in square centimeters, of this garden? A: 2.1 m²

E: 3 m =300 cm, 300x70=21000 A: 21000 cm²

For Fun

1. Have a die or a hexagonal pencil ready. Put numbers (1-6) on each face.
2. A person throws it twice and tells the other the units that correspond to the numbers.
3. The other person does the same.
4. Each player makes up and solves an area problem using the two units given.
5. Exchange the notebooks and check to see if your partner solved the problem correctly.
6. A point is earned if the solution is correct.

número	unidad
1	mm
2	cm
3	dm
4	m
5	km
6	free



"Free" means that you can select any unit that you wish.

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[Supplementary activity]

Exercises can be done using the result of the measurements (exact measure expressed by two units) of the surrounding places and objects performed during the class hour 1/6~2/6 in this lesson.

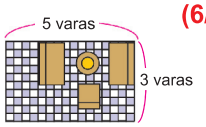
Lesson 3: (6/6) Become familiar with units of area

Goal:
- Become familiar with units of area that are not standard "square vara" and "manzana"
- Establish equivalence between "square varas" and "manzanas".

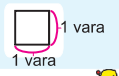
Tools: **Teacher**: ruler
Students: ruler

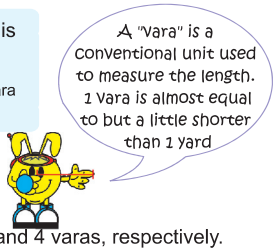
I Let's familiarize ourselves with another type of unit of area (6/6)

1 Yolanda's room is a rectangle.
The length is 5 varas and the width is 3 varas.
What is the area?



The area of a square whose side-length is 1 vara is called a **"square vara."**
It is used as a unit of area.





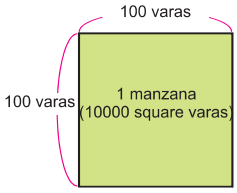
P E: 5×3 = 15 A: 15 square varas

9 Find the area.
(1) A rectangle whose length and width are 8 varas and 4 varas, respectively.
E: 8x4=32 A: 32 square varas
(2) A square whose side is 12 varas.
E: 12x12=144 A: 144 square varas

2 The Jaimes have a square cattle ranch whose side is 300 varas.
What is the area?

To express the measure of a larger surface a unit called "**manzana**" is used. It is the area of a square whose side-length is 100 varas.
100×100 = 10000

1 manzana = 10000 square varas.



E: 300×300 = 90000 90000 square varas = 9 manzanas
A: 9 manzanas

10 How many manzanas is a farm that is 200 varas in width and 800 varas in length?
E: 200x800=160000 A: 16 manzanas
160000÷10000=16

11 Express the following area in the units in parentheses:
(1) 15 manzanas (square varas) (2) 80000 square varas (manzanas)
E: 10000x15=150000 E: 80000÷10000=8
A: 150000 varas cuadradas A: 8 manzanas

Try this!
Look around for any unit of the area and tell your classmates how it is used.

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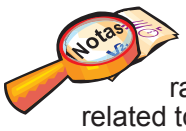


[Square vara and manzana]
These are conventional units frequently used in Honduras and the Central American region. Another unit, closely related to these, is cuadra, which is used as a unit for measuring the length. There is no symbol or official abbreviation for them.

<< 1 cuadra = 100 varas >>

<< 1 manzana = 1 square cuadra= 10000 square varas >>

1. **Understand the theme. [I]**

2. **Familiarize students with the unit of <<square vara>>. [I1]**

Teacher: How are this problem and what you have already learned different?

Students: Students should perceive that the unit of length <<vara>> comes out, which does not belong to the decimal metric system.

* Explain the <<vara>>.

Teacher: What unit of the area would you be able to use for this problem?

A: Square vara.

* Explain the square vara.

3. **Solve 9 .**

4. **Understand the unit of <<manzana>>. [I2]**

* After the students find a solution independently using square varas, explain <<manzana>> and the relationship between them: 1 manzana = 10,000 square varas.

5. **Solve 10 and 11 .**

6. **Investigate << Try this! >>**

* If there is enough time, do this activity. You can add an additional hour for this activity.

These problems deal with:

1. Selecting appropriate units.
2. Finding relationships among the units
3. Calculating the areas of squares and rectangles, including using measures with different units.
4. Calculating the area of a square and a rectangle in relationship to the perimeter.
5. Calculating the perimeter of a square and a rectangle in relationship to the area.
6. Calculating the area of combined figures.

To be continued to the following page…

Lesson 4: (1/1) Exercises (2)

Goal: • Review what has been learned in Unit 4

Tools:

Exercises (2) (1/1)

1 Tell which are the most appropriate metric units for measuring the following:

(1) Honduran territorial area **km^2**

(2) Area of a soccer field **m^2**

(3) Classroom floor **m^2**

(4) Area of a notebook on a desk **cm^2**

2 Express the following areas in the units in parenthesis

(1) 4 m^2 (cm^2) **40000 cm^2**

(2) 2300 mm^2 (cm^2) **23 cm^2**

(3) 12000 dm^2 (m^2) **120 m^2**

(4) 2.6 km^2 (m^2) **2600000 m^2**

(5) 8000 cm^2 (m^2) **0.8 m^2**

(6) 4.7 dm^2 (cm^2) **470 cm^2**

(7) 625000 m^2 (km^2) **0.625 km^2**

(8) 37.65 cm^2 (mm^2) **3765 mm^2**

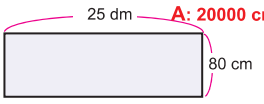
(9) 0.2 m^2 (dm^2) **20 dm^2**

(10) 590 cm^2 (dm^2) **5.9 dm^2**

(11) 415000 square varas (manzanas) **41.5 manzanas**

3 Find the areas of the following figures:

(1)

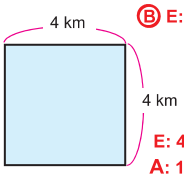


Ⓐ E: 25 dm = 250 cm
250x80=20000
A: 20000 cm^2

(2) An 18mm by 18 mm square
E: 18x18=324 A: 324 mm^2

(3) A rectangle 1 km in length and 0.8 km in width
E: 0.8x1=0.8 A: 0.8 km^2

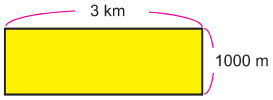
(4)



Ⓑ E: 80 cm = 8 dm
25x8=200
A: 200 dm^2

E: 4x4=16
A: 16 km^2

(5)



Ⓐ E: 3 km = 3000 m
3000x1000=3000000
A: 3000000 m^2

Ⓑ E: 1000 m = 1 km
3x1=3
A: 3 km^2

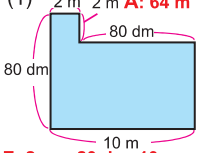
4 Calculate the area of a square farm with a side of 250m

E: 250x250=62500 A: 62500 m^2

5 Calculate the perimeter of a garden, which is 80cm in width and 1.2m^2in area

E: 1.2 m^2=12000 cm^2, 12000÷80=150, (80+150)x2=460 A: 460 cm

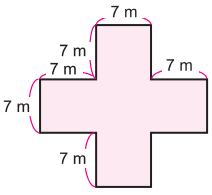
6 (1)



Ⓐ E: 8 dm = 8 m
8x10=80, 8x2=16
80–16=64
A: 64 m^2

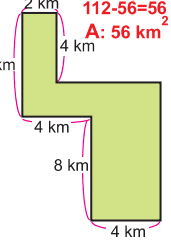
Ⓑ E: 2 m = 20 dm, 10 m = 100 dm
80x100=8000, 80x20=1600
8000–1600=6400
A: 6400 dm^2

(2)



E: 7x7x5=245
A: 245 m^2

(3)



E: (6+8)x(4+4)=112
4x8+4x(4+4–2)=56
112-56=56
A: 56 km^2

Lesson 4: (1/1) Exercises (2)

[Continuation]

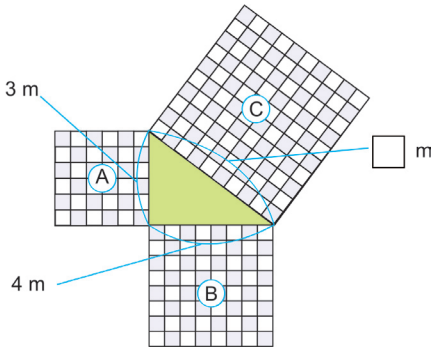
(1/1)

7 Juan's house has an interesting shape as shown below. It has three square rooms situated by the side of a triangular patio. Each side of the triangular patio is a side of each room. Juan knows that the area of the room C is equal to the combined areas of rooms A and B. If the side of the rooms A and B is 3m and 4m, respectively, what is the length of the side of room C?

E: 3x3+4x4=25

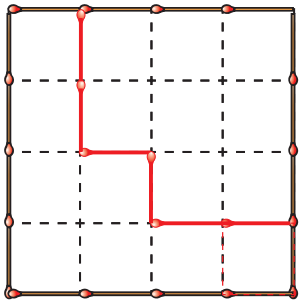
$\sqrt{25}=5$

A: 5 m

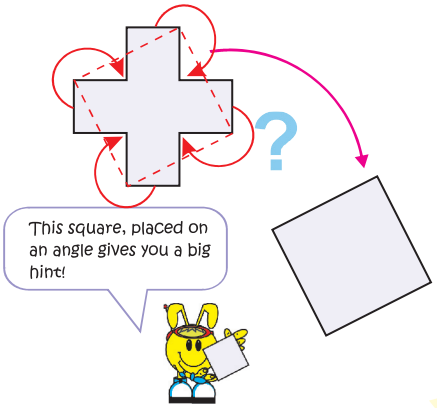


Try this!

1. There is a square created with 16 matches.
Can you make another figure half of the area of the original square, moving no more than 6 matches and having no match outside the new square.?



2. A cross is transformed into a square if some parts are cut and moved. There are several forms to cut and relocate. Try to find the form using the least amount of cutting.



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...continued from the previous page

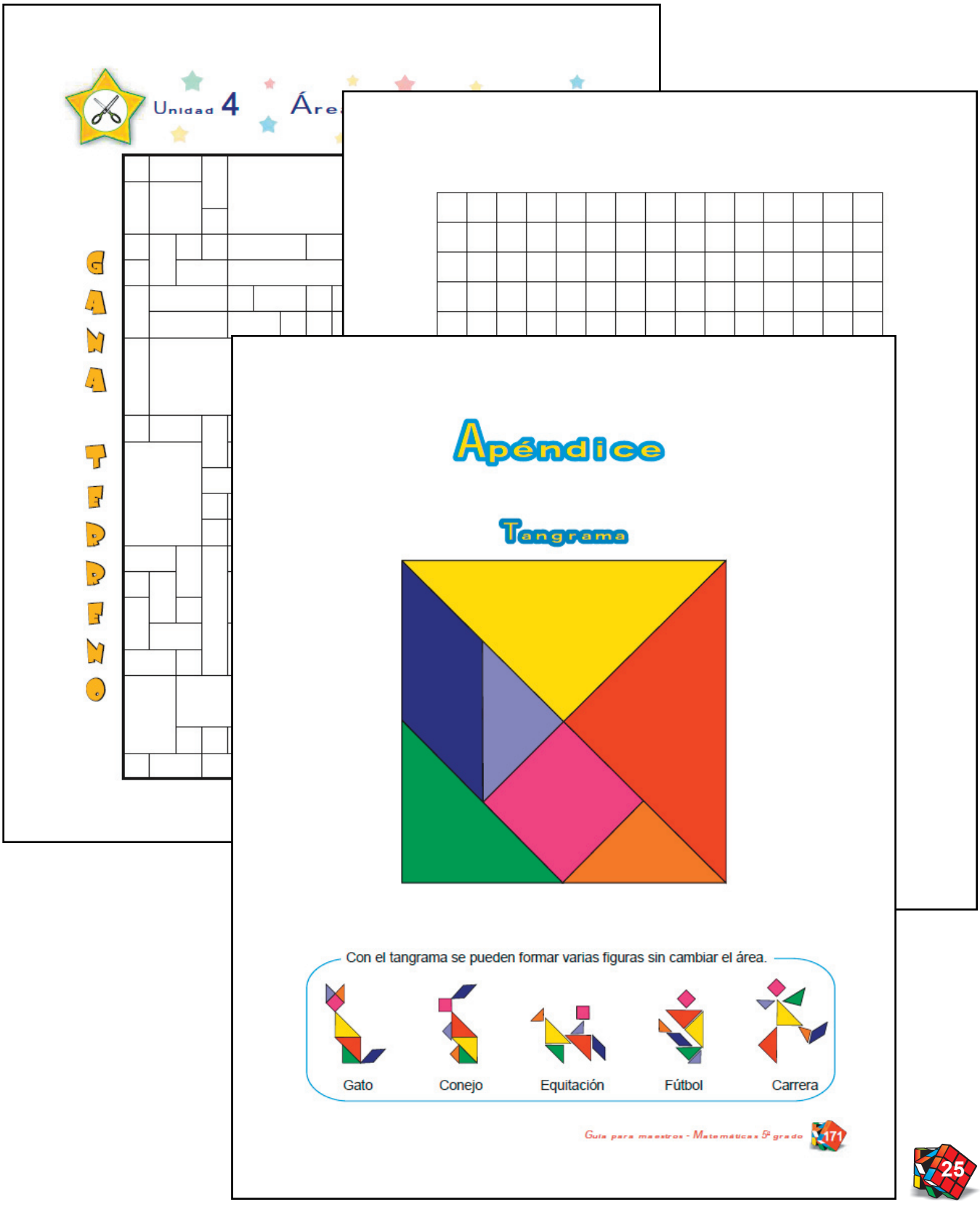
7 Combined calculation of the area and the side of a square

[Try this!]

Changing the area of a square without altering the perimeter.

Changing the figure without altering the area.

Page for cutting and Appendix



For a better tomorrow for all.

Japan International Cooperation Agency