VII. FINDING THE AREA OF A RHOMBUS WITH KNOWN DIAGONALS
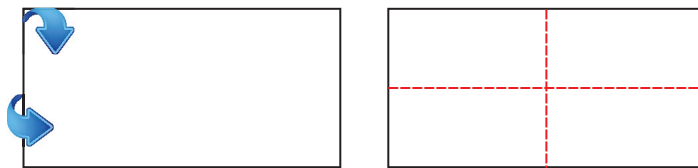
Material:

- Some rectangular paper
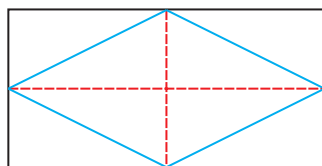
- Scissors

- Felt-tipped pens

- Labels

Presentation:
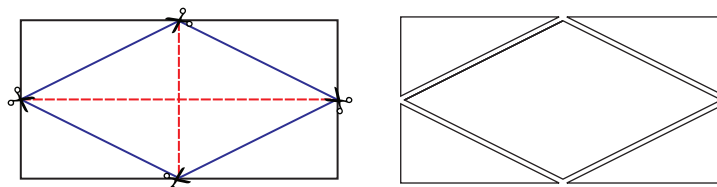
Preparing the figure:

1. Review nomenclature, using the classified nomenclature if necessary.

2. Ask the child to fold the paper, lengthwise and crosswise. Take colored pens and mark these two folds.
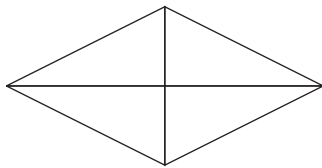

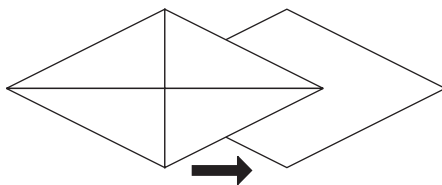3. Draw lines with different colors joining the midpoints of the sides.

4. Cut along these last lines. The resulting figure is a rhombus. Review nomenclature.

5. Line up the cut-off pieces. They form a second rhombus.

6. Superimpose these pieces on the inner rhombus to see that they are equal. We have formed two rhombi.

7. Place the two rhombi side-by-side and repeat the nomenclature.

Rebuild the Rectangle:

We can say: A rhombus is equivalent to 1/2 a rectangle which has as a base the minor diagonal and as a height the major diagonal of the rhombus.

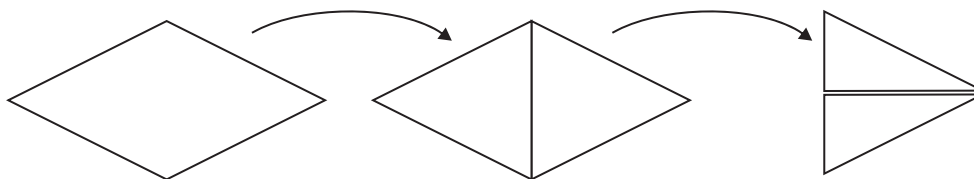1. Area of one rhombus:

$$A = \frac{Dd}{2}$$

2. Set out the labels A, D, d. Set out the formula:
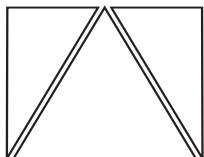
$$A = (D \times d) \div 2$$

$$A = (Dd) \div 2$$

$$A = \frac{Dd}{2}$$

3. Set aside the second rhombus. Cut the first rhombus along the minor diagonal. Separate the pieces. Cut one of these pieces along the major diagonal.
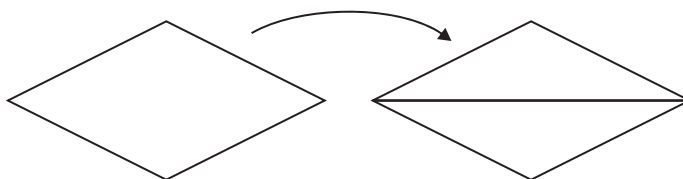

4. Place these cut pieces so as to form a rectangle.

5. The rhombus is equivalent to a rectangle having as its base the minor diagonal and as its height 1/2 the major diagonal of the rhombus.
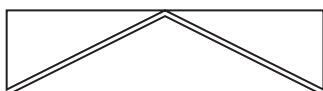
    Formula: $A = d \times \dfrac{D}{2}$

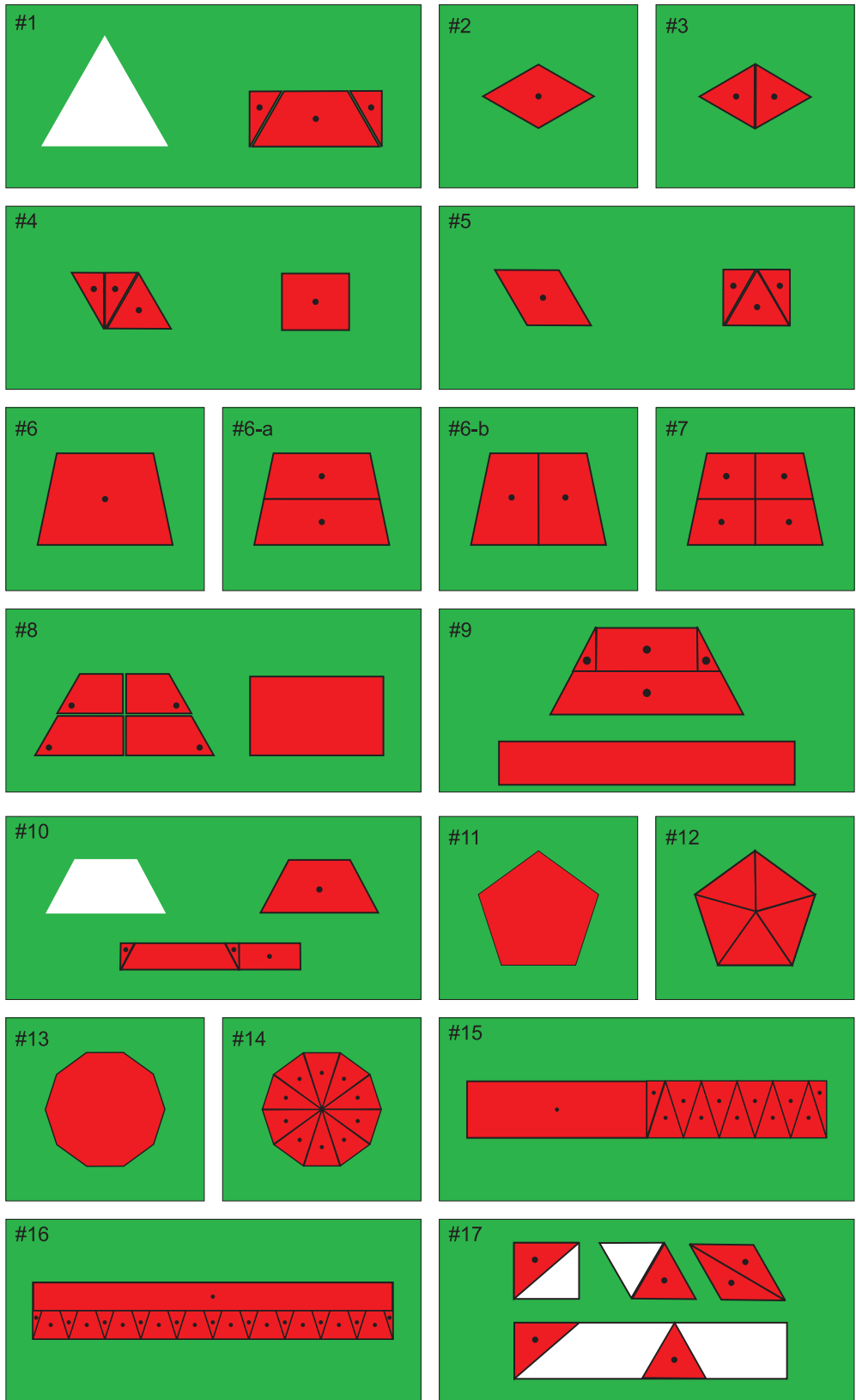6. Cut the remaining rhombus along the major diagonal. Place the piece thus:

7. The rhombus is equivalent to a rectangle having as its base the major diagonal and as its height 1/2 the minor diagonal.

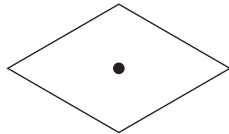   Formula: $A = D \times \dfrac{d}{2}$

INSETS GUIDE - INSETS #1 - #17

#1

#2

#3

#4

#5

#6

#6-a

#6-b

#7

#8

#9

#10

#11

#12

#13

#14

#15

#16

#17

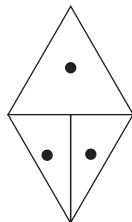# VIII. AREA OF THE RHOMBUS USING THE INSETS

Material:

- Metal Insets #2, #4, #17

Presentation: We can demonstrate the second and third formula with the insets for equivalence.
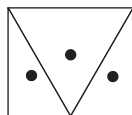
1. Recognize the rhombus in Inset #2.

2. Change the pieces from Inset #2 and #4. Place the whole triangle in the upper part and the two small triangles in the lower part.

3. Nomenclature.

4. Rearrange the pieces to form a rectangle. We have formed a rectangle having as its base the minor diagonal and as its height 1/2 the major diagonal.
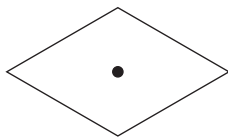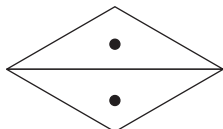

$$A = d \times \frac{D}{2}$$

5. Move these pieces into the rectangle Inset #4. Have the children make the insets out of paper.
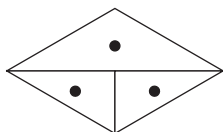
Part Two:

1. Use the rhombus from inset # 2

2. Exchange for the pieces in the third inset of #17.

3. Remove the lower triangle, substitute the two small triangles from Inset #4.

4. Nomenclature. Form a rectangle. We have formed a rectangle having as its base the major diagonal and as its height 1/2 the minor diagonal of the rhombus.
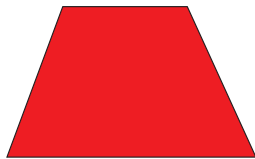
    $$A = D \times \frac{d}{2}$$

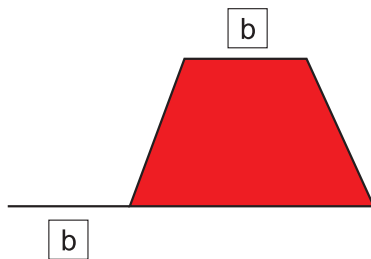# IX. EQUIVALENCE IN MODERN GEOMETRY TEXTS: TRAPEZOID

In some modern geometry texts, the trapezoid is not made equivalent to the rectangle but equivalent to the triangle. Then the triangle is shown equivalent to the rectangle.
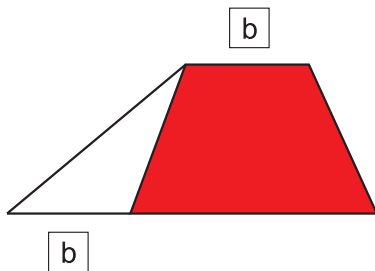
Example:

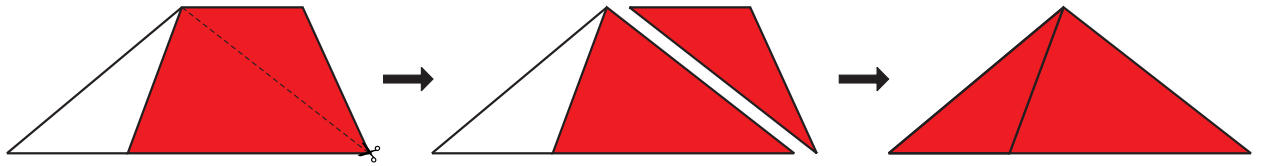1. Take any trapezoid. The scalene is more general.

2. Extend the line of the major base the same lenght as the minor base.

3. Construct a line from the vertex of the angle to the end of this line.

4. Draw a diagonal line (in the original trapezoid) and cut the newly formed triangle from the top of the trapezoid and place it along the extended base.

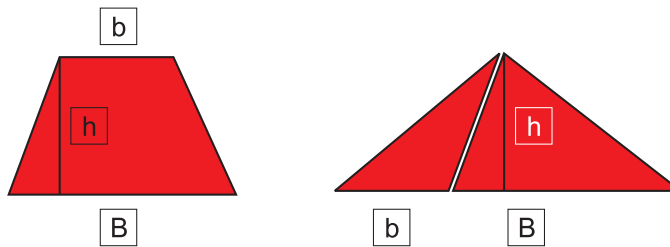5. Review the nomenclature of the new triangle.

   The height of the triangle is the same as the height of the original trapezoid.

   The base of the triangle equals the sum of the bases of the trapezoid.

   The area of the triangle equals the base x height.

$$A = \frac{(B + b) \times h}{2} \qquad \begin{aligned} &\textbf{B = major base} \\ &\textbf{b = minor base} \end{aligned}$$

Note on Constructive Triangles

Dr. Montessori indirectly prepared for this step.

1. Take the two pieces from the first box of constructive triangles (red or blue) to form a trapezoid.

2. Turn over the small piece and place it with the upper base in a line with the major base.