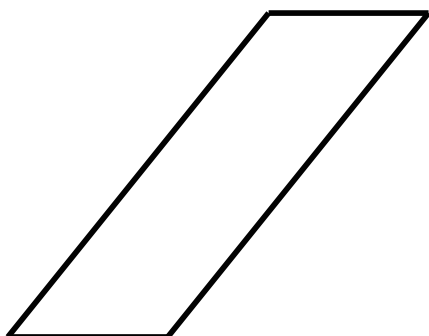


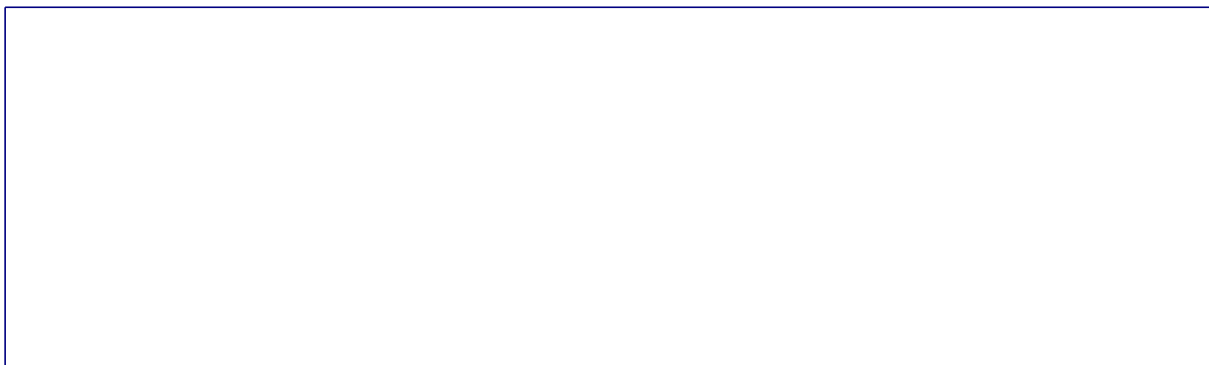
c) How can you be sure your final shape has the properties of a rectangle? Write a convincing mathematical explanation.

d) Will your method work for a parallelogram that looks like this? If not, what changes do you need to make in the description of your method? (There is a larger replica of this shape attached.)



e) Will your method allow you to transform **any** parallelogram into a rectangle? Explain.

2. Find a way to cut the rectangle below into pieces you can rearrange to form a right triangle (final page of this problem contains a copy of this rectangle for you to cut). Be sure to use all of the pieces when creating the right triangle.



- a) Use pictures and words to describe where you decided to cut and how you rearranged the pieces.

- b) List the properties of the rectangle that changed and properties that stayed the same when you changed it into a triangle.



c) How can you be sure your final shape has the properties of a right triangle? Write a convincing mathematical explanation.

d) Will your method allow you to transform **any** rectangle into a right triangle? Explain.

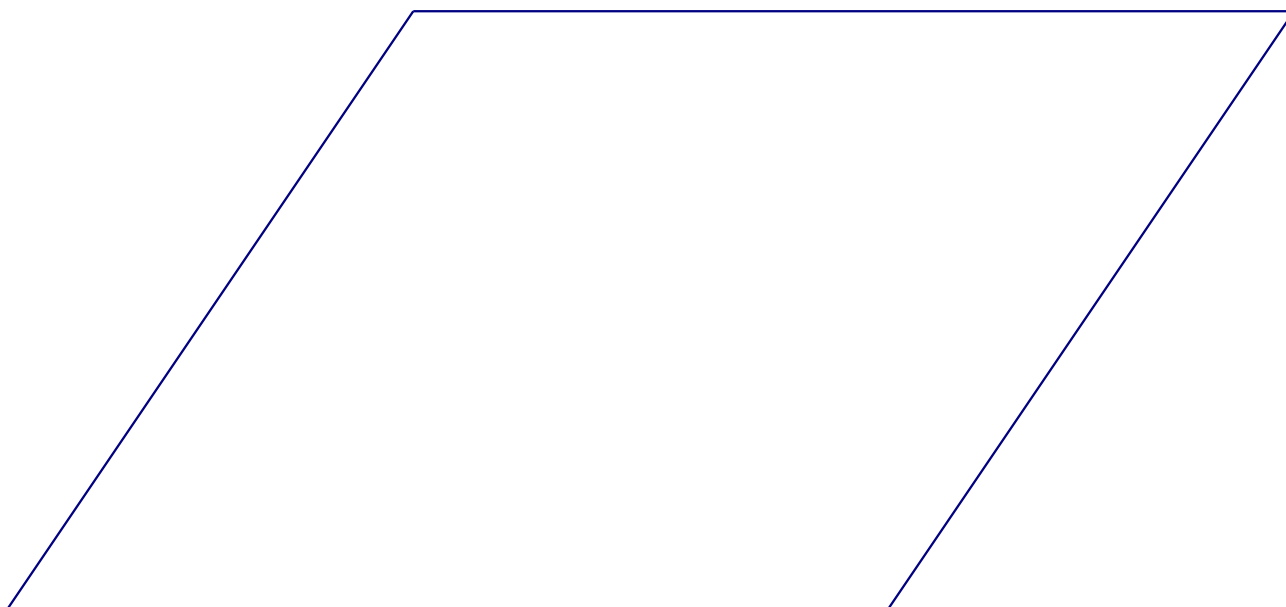
Extension

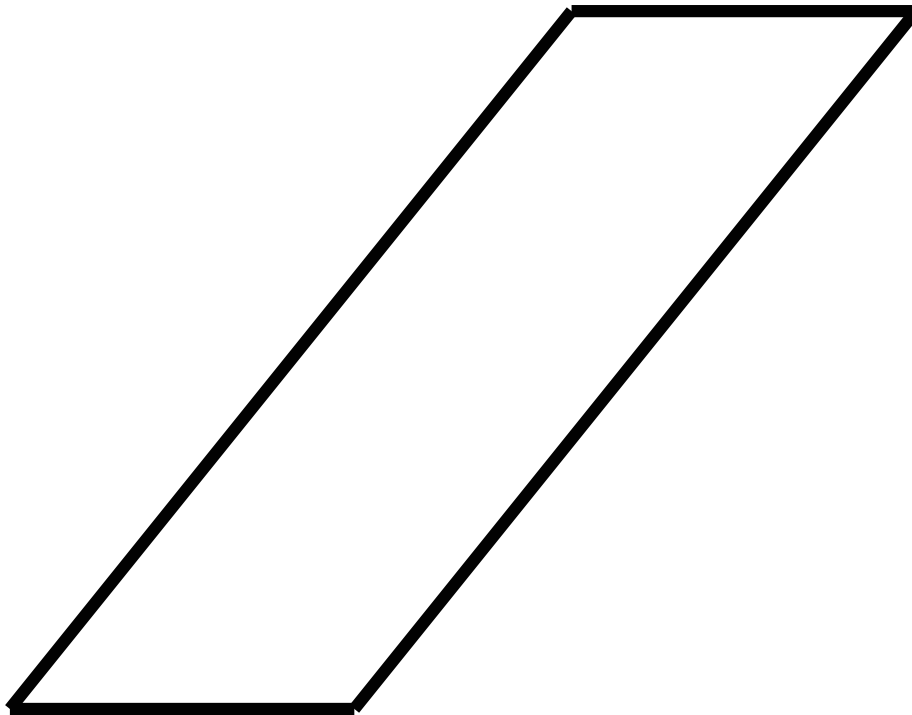
You already cut a parallelogram into pieces you rearranged to form a rectangle. Can you cut a parallelogram into pieces you can rearrange to form other shapes? What other shapes can you form?

How could you dissect a parallelogram and rearrange its pieces to form a right triangle? Use pictures and words to describe where to cut and how to rearrange the pieces.

Shapes Template

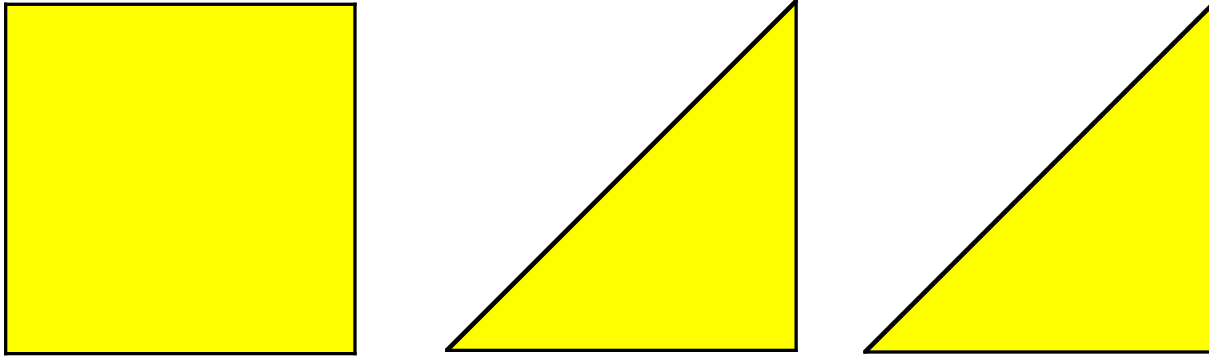
Problem 1





Problem 2

Warm-up for Dissecting Shapes



Here are a square and two right triangles. You will cut out and **rearrange** these three shapes to create new **geometric figures**.

1. Cut out the square and the two right triangles. Use all three to form a **right triangle**.
2. Draw a picture that shows how you **transformed** the square and two right triangles into a right triangle.
3. What are the **properties** of a right triangle?



4. Use the square and the two right triangles to form a **rectangle**. Draw a picture that shows how you used the three **pieces** to form a rectangle:

5. What are the properties of a rectangle?

Potential Sentence Starters and Frames

Some ideas for sentence frames/starters that could be incorporated into your lesson are listed below. If you think a sentence frame/starter will be helpful, consider how will it support students' mathematical learning and/or development of academic language, and decide which sentence frame/starter (from the list below or that you create) would best support students' learning. You may find that the starters and frames vary in level of difficulty, and plan to provide them to students accordingly.

Starters

To decide where to make a cut, I thought about _____

I know my new line segment is perpendicular to the original line segment because

The cut that I made allowed me to make a rectangle because _____

Frames

I learned that the _____ from the beginning of the problem has the same _____ as the _____ that I created.

The cut that I made allowed me to make a _____ because _____

Academic Language

Students should have opportunities to see, hear, and write key mathematical ideas during this activity. There are some specific terms that students need to understand in order to engage in this task, and there are some additional terms and phrases that may surface as the students engage with the task. You may think of additional words or phrases that are key to this activity. As the task is introduced, solved by the students, and discussed, ensure that students have opportunities to experience (i.e., through discussion, pictures, and the use of gestures) and to build understanding for key words and phrases. Examples of words and phrases that may be involved in work on this problem include:

- perpendicular to the side of the parallelogram
- the angles changed
- opposite sides are still parallel
- opposite sides are still the same length
- midpoint of the side
- these two angles together make a straight line
- parallelogram; rearrange; rectangle; pieces; properties; transformed; stayed the same
- final shape; convincing; any; right triangle; geometric figures; dissect
- cut



Word Chart for Dissecting Shapes

Spanish, French, Portuguese

* = Cognate

Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Parallelogram	A two-dimensional four-sided figure whose opposite sides are parallel and the same length	-----	Parallelograms	Parallel Quadrilateral	*Paralelogramo *Parallélogramme *Paralelogramo	
Rectangle	A parallelogram with four right angles	-----	Rectangular Rectangles	Parallelogram Quadrilateral Quadrangle	*Rectángulo *Rectangle *Retângulo	
Represent	To express or describe with words, symbols, graphs, equations, diagrams	To stand for, symbolize; to describe or present in words, set forth; to serve as an example of; to state, depict, portray	Represented Representing Represents Representative Representation	Symbolize Depict	*Representar *Représenter *Representar	



Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Property	An essential attribute of a geometric figure.	quality or attribute; a figure or object's characteristics, features	Properties	Feature Aspect Characteristic Facet Trait	*Propiedades *Propriétés *Propriedades	
Convincing	Persuading or assuring by argument or evidence	Causing one to believe the truth of something; plausible	Convince Convinced Convincingly Convincer Convincible	Persuasive Believable Credible Plausible	*Convincente *Convaincant(e) *Convincente	
Method	An orderly procedure, technique, or way of working to a solution.	A manner or way of carrying out a task.	Methods Methodical Methodology	Approach Manner Technique Way	*Método *Méthode *Método	
Transform	Able to change the position, size or shape of a line or two-dimensional figure.	To change the appearance of.	Transforms Transformed Transforming Transformer	Change Alter Modify Remodel	*Transformar *Transformer *Transformar	



Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Right Triangle	A triangle in which one interior angle is a right angle, that is, 90 degrees. The other two angles are complementary, which means that they add up to 90 degrees.	A triangle having a right angle.	Right Triangles Right Triangular	---	Triángulo Rectángulo Triangle Rectangle Triângulo Retângulo	
Dissect	To partition a geometrical figure by straight lines.	To cut open and examine the inside of; to cut apart or separate.	Dissects Dissected Dissecting Dissection	Break up Partition Divide Slice	*Disseccionar *Disséquer *Dissecar	
Cut	To separate a geometric figure into pieces	To make an opening, incision.	Cuts Cutting	Chop Slice Separate Sever	Cortar Couper Cortar	
Pieces	Either of two equal parts of a whole. Either of two equal parts, which together compose a value twice as large as either one of the halves.	One of two equal parts; 50%;	Halves Halved	Split in two Split down the middle Bisected Divide equally in two	Pedazos Morceaux/ *Pièces Pedaços	



Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Rearrange	A 4-sided regular polygon with all sides equal and all internal angles 90 degrees; two-dimensional	A rectangle with all four sides equal	Squares Squarely	Equal sides Congruent sides	Reorganizar *Réarranger *Rearranjar	



I. Morceaux & Pièces (French)

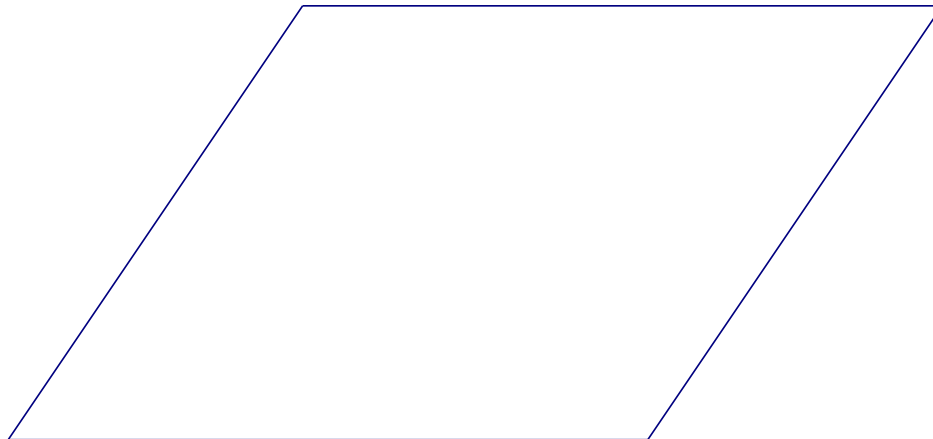
The French translation(s) listed for “pieces” in the word generation chart is “morceaux” and the cognate “pièces.” Note that “morceaux” is the better translation for “pieces” in English despite its orthographic dissimilarity. “Pièces” in French is more frequently used to describe “items in a set” (e.g., my dinner set has 46 pieces), “works of art” (e.g., these pieces are from the impressionist era) and coins. (i.e., money).

II. Properties

Before prompting students to contemplate and describe the “properties” of different two-dimensional shapes, it may be helpful to clarify the definition of properties. It is conceivable that students might confuse this meaning of properties with that related to one or a collective’s possessions. Instead, make clear to students that, in the context of the math task, properties refer to the features or characteristics of shapes.

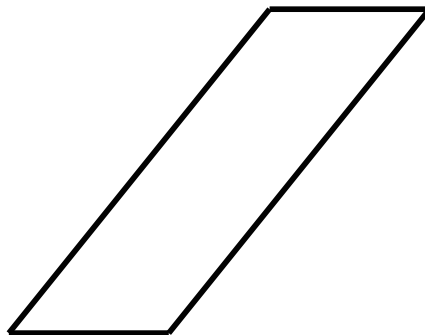
Disecionando Formas

- 1) Busca cómo cortar este paralelogramo a trozos con los cuales puedas volver a formar un rectángulo (al final de este problema podrás encontrar una copia para cortar). Asegúrate de usar todas las piezas para crear el rectángulo.



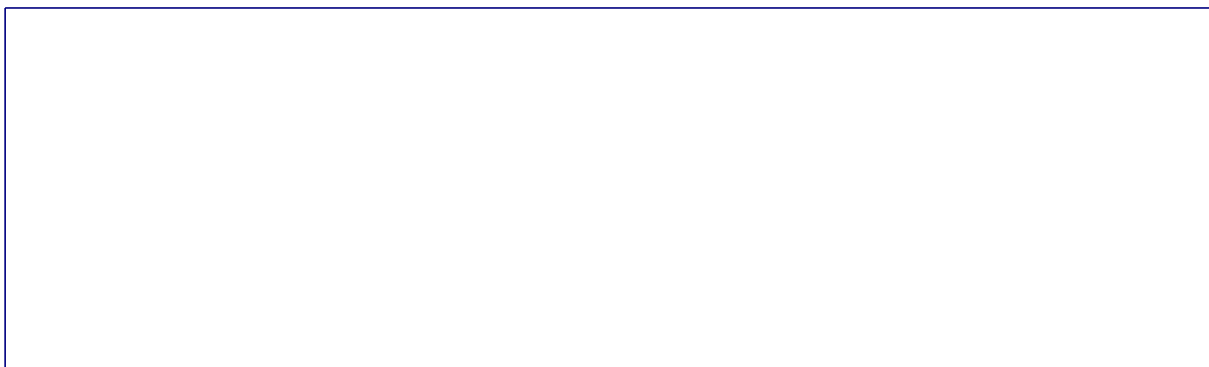
- a) Dibuja y describe dónde decidistes cortar (un corte se puede representar con una línea de puntos) y cómo decidistes poner las piezas en forma de rectángulo.
- b) Haz una lista de las propiedades que cambiaron y de las que siguen igual cuando tu cambiastes el paralelogramo en rectángulo.
- c) Estás seguro/a de que la forma final tiene las propiedades de un rectángulo? Haz una explicación matemática.

- d) Tu método será efectivo para lograr un paralelogramo igual que el de la figura de abajo? Si no es así, qué cambios necesitas hacer en la descripción de tu método? (adjunto encontrarás una copia más grande de esta forma).



- e) Tu método te dejará transformar cualquier paralelogramo en un rectángulo? Describe cómo.

- 2) Encuentra la manera de cortar el rectángulo de abajo a piezas que las puedas arreglar para formar un triángulo con un ángulo de 90° (adjunto encontrarás una copia de este rectángulo para cortar). Asegúrate de que usas todas las piezas cuando hagas el triángulo.



- a) Dibuja y describe dónde decidistes cortar y cómo arreglastes todas las piezas.
- b) Haz una lista de las propiedades que cambiaron y de las que siguen igual cuando cambiastes el rectángulo a un triángulo recto.
- c) Estás seguro/a de que la forma final tiene las propiedades de un triángulo recto? Haz una explicación matemática.
- d) Tu método te dejará transformar cualquier rectángulo en un triángulo recto? Describe cómo.

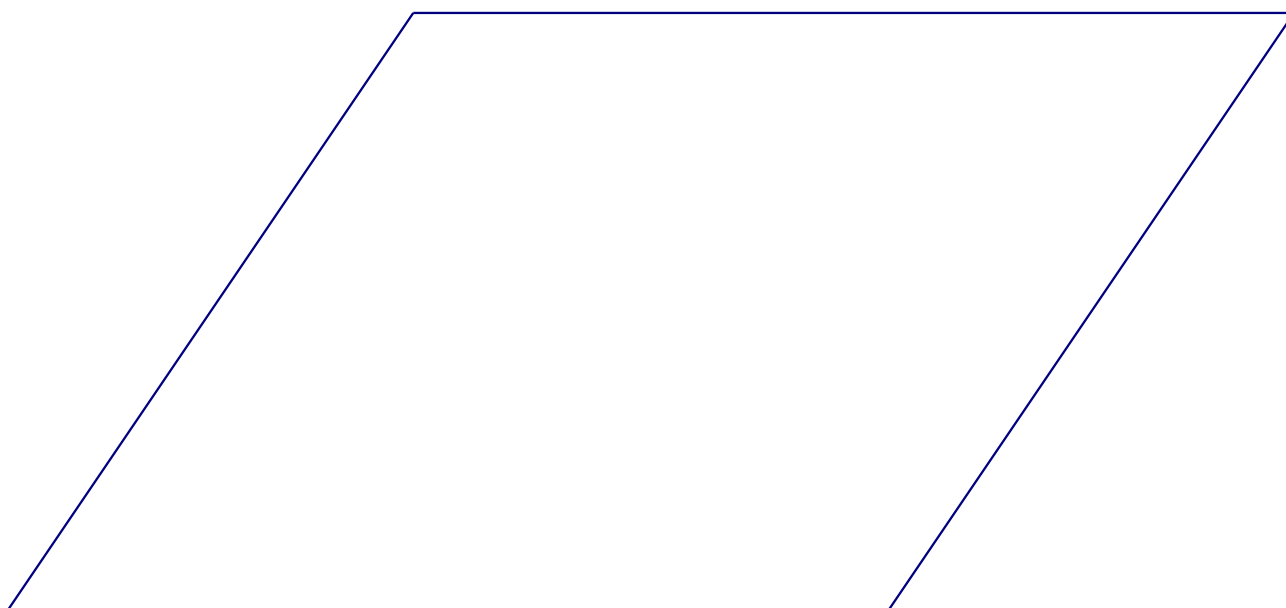
Extension

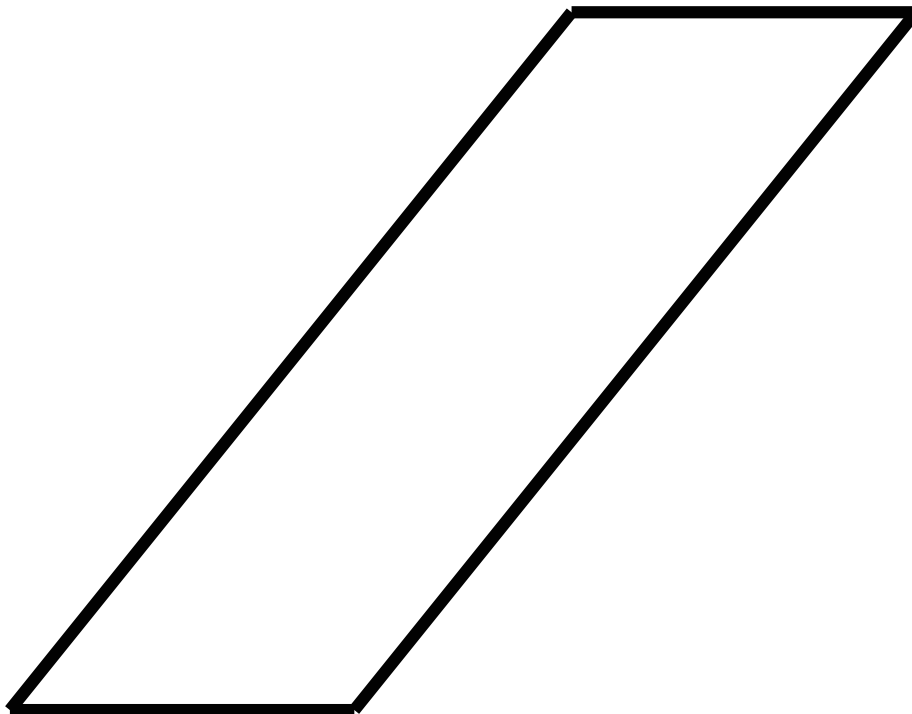
Tu ya has cortado un paralelogramo a piezas y las has colocado en forma de rectángulo. Puedes cortar un paralelogramo a piezas y colocarlas formando otras figuras? Que figuras puedes formar?

Podrás diseccionar un paralelogramo y colocar las piezas en forma de triángulo recto? Dibuja y describe dónde cortastes y cómo colocastes las piezas.

Shapes Template

Problem 1





Problem 2