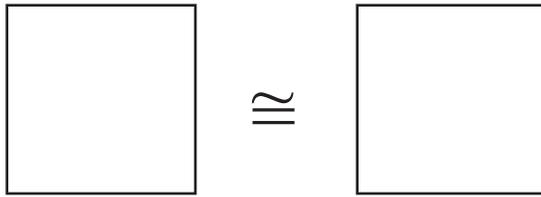REVIEW OF GEOMETRY CONCEPTS

Congruence, Similarity, Equivalence

Congruence - A relationship in which figures are equal in every way; point to point, side to side, surface to surface. These figures match exactly; and can be exactly superimposed on each other.

Congruence is also a demonstration of the reflexive property or a = a.

Symbol: ≅

Illustration:

$$\square \cong \square$$

Similarity - A relationship between figures in which shape and angles are the same, and the sides are in the same proportion to each other, i.e. rectangles, 2 X 4, 4 X 8, 5 X 10 are all similar.

Also, all regular polygons, from the equilateral triangle to the decagon etc. are similar to other regular polygons of the same type but different sizes.

Symbol: ∼

Illustration:

$$\square \sim \square$$
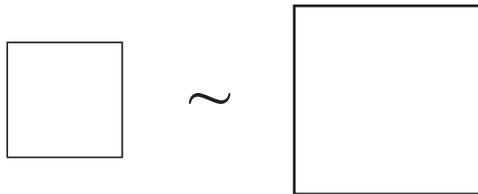
Equivalence - a relationship between figures which have different shapes, but which cover the same space (or have equal value).

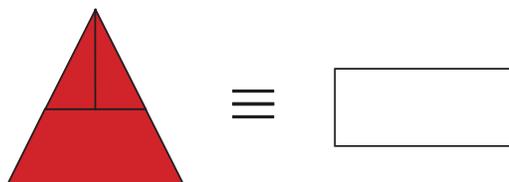Equivalence may be a demonstration of the commutative property
Or if a = b, then b = a
Or the transitive property,
Of if a = b and b = c, then a = c

Symbol: ≡
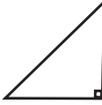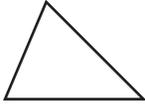
Illustration:

$$\triangle \equiv \square$$

Plane Figures
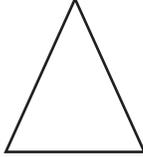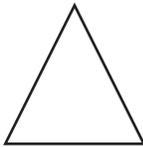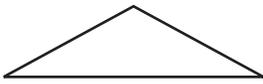
Triangles: (according to sides) scalene, isosceles, equilateral
                 (according to angles) right, acute, obtuse

"Seven Triangles of reality" - according to sides and angles

	Classified by sides:		
	Scalene	Isosceles	Equilateral
Right Angled			Can't create one.
Acute Angled			
Obtuse Angled			Can't create one.

Classified by angles:

Quadrilaterals: (according to specific characteristics)
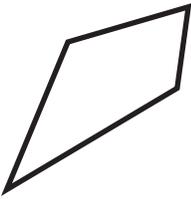   common quadrilateral
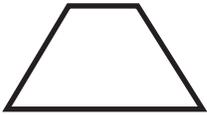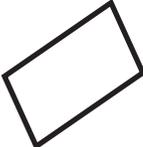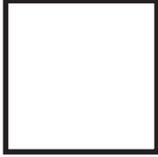   trapezoid (1 pair of parallel sides)
          parallelogram (2 pair of parallel sides)
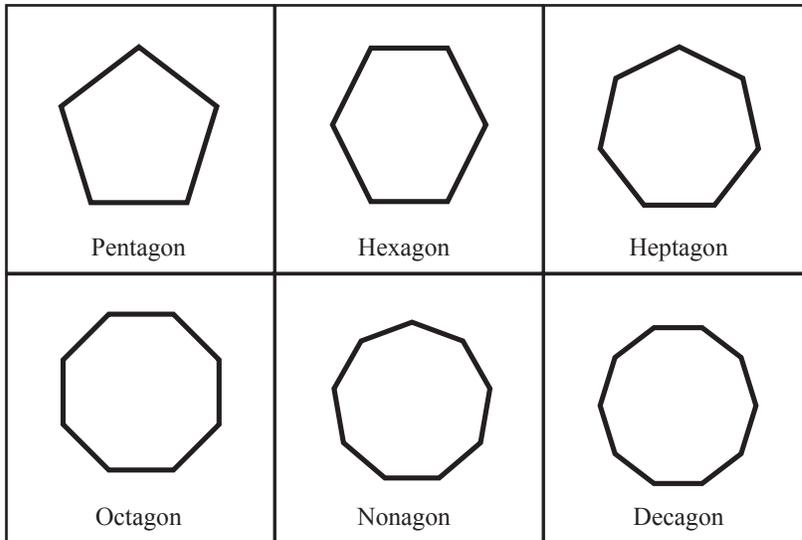   rhombus (2 pair of parallel sides + 4 equal sides)
              rectangle (2 pair of parallel sides + 4 right angles)
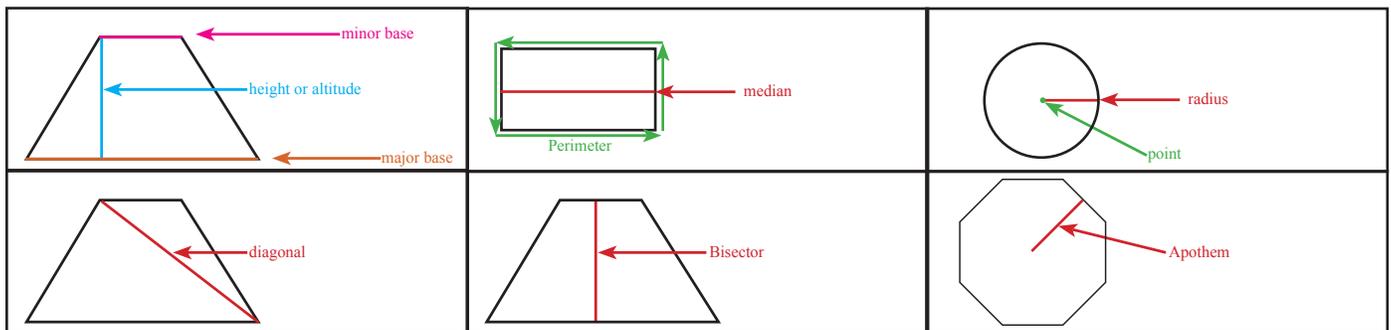   square (2 pair of parallel sides + 4 equal sides + 4 right angles)

common quadrilateral	Trapezoid	Parallelogram
Rhombus	Rectangle	Square

Regular Polygons: pentagon, hexagon, heptagon, octagon, nonagon, decagon

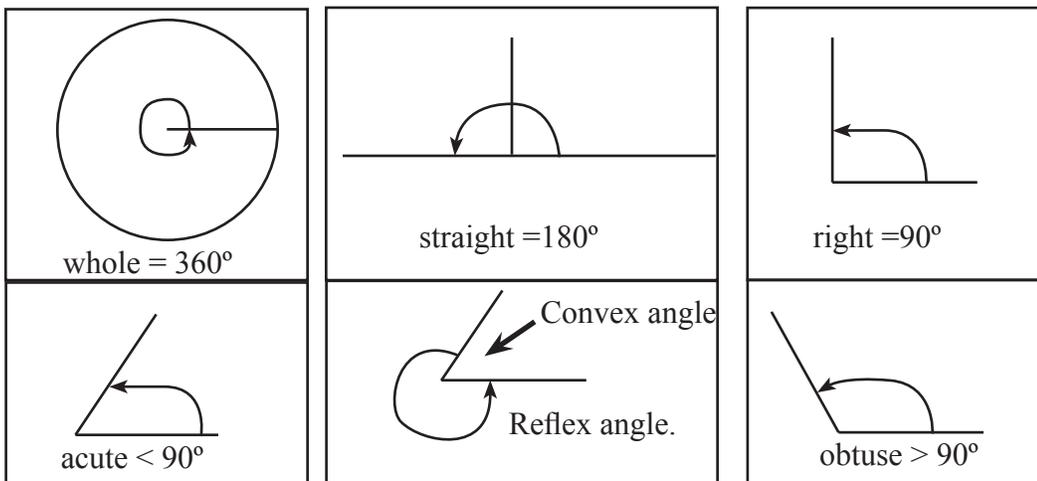|		
Pentagon	Hexagon	Heptagon
Octagon	Nonagon	Decagon

Lines

base (major base, minor base)
height or altitude
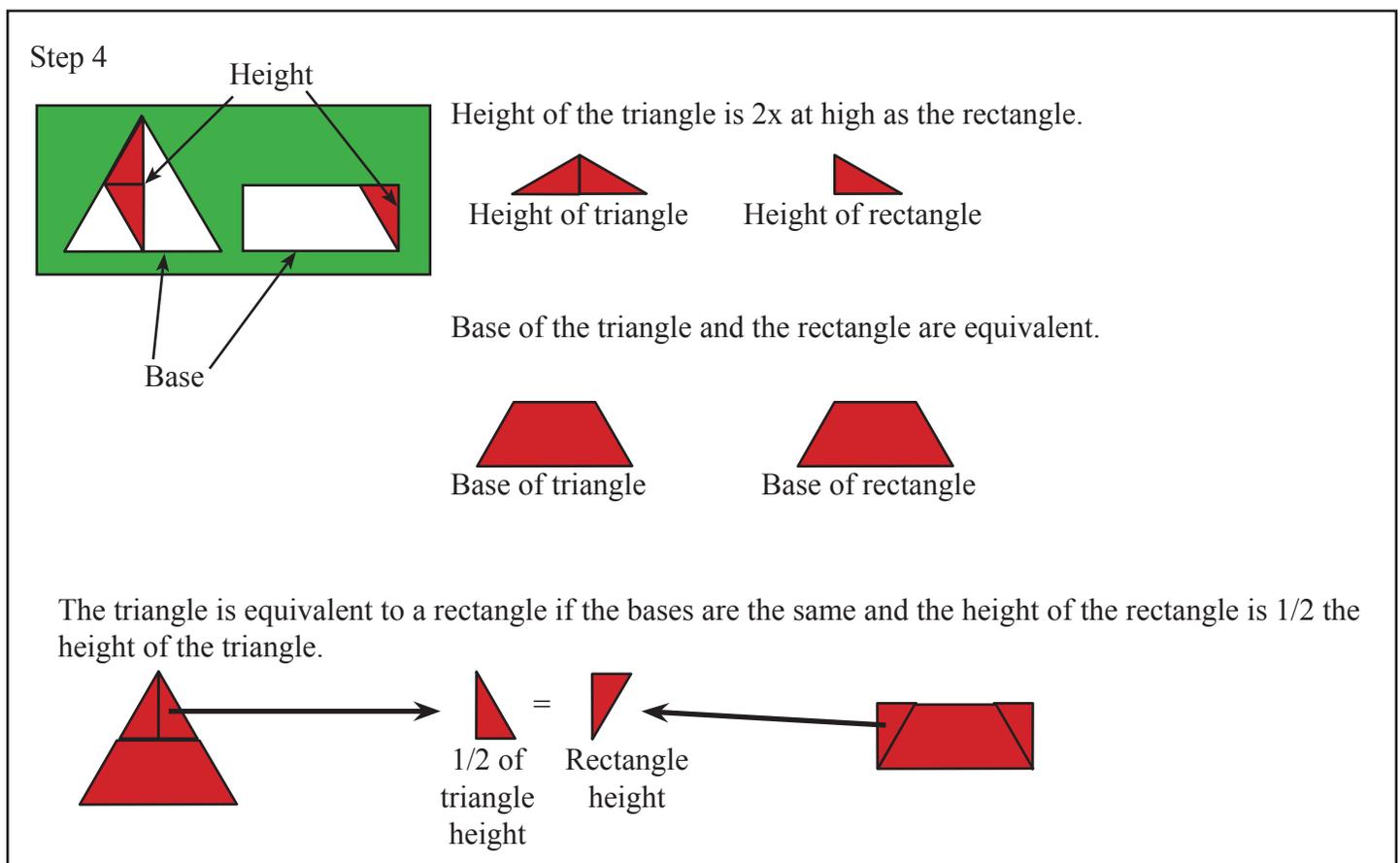diagonal, bisector, median, radius, apothem, perimeter
point (center of a figure)

minor base
height or altitude
major base
median
Perimeter
radius
point
diagonal
Bisector
Apothem
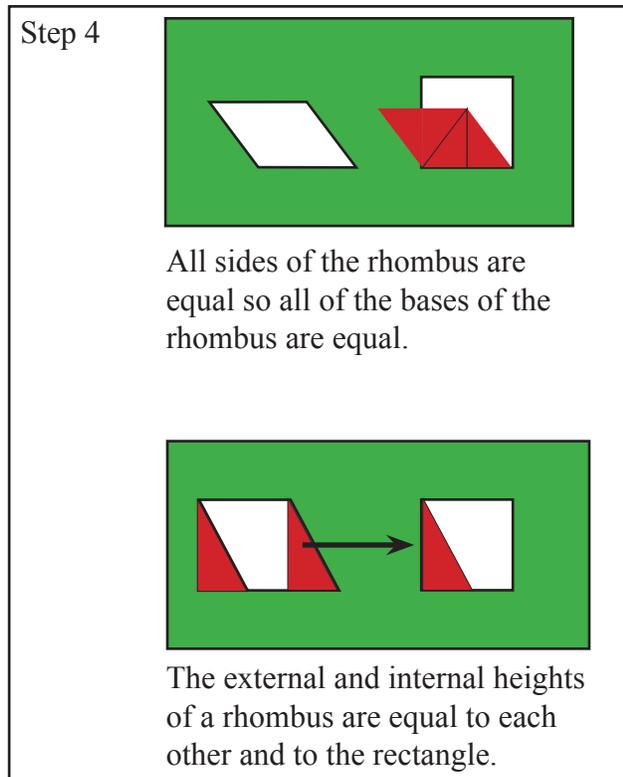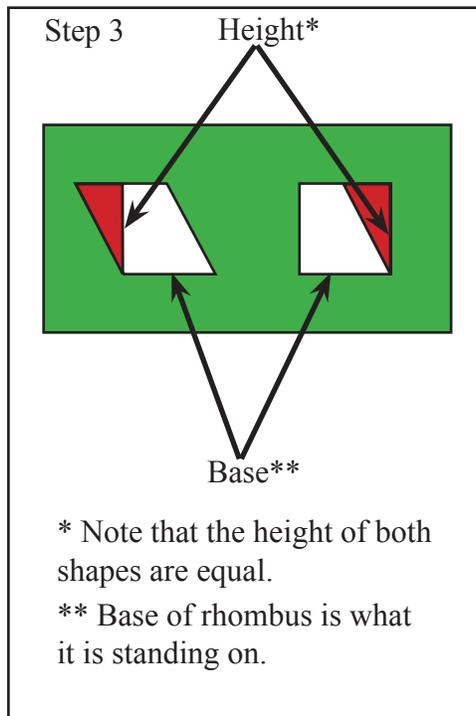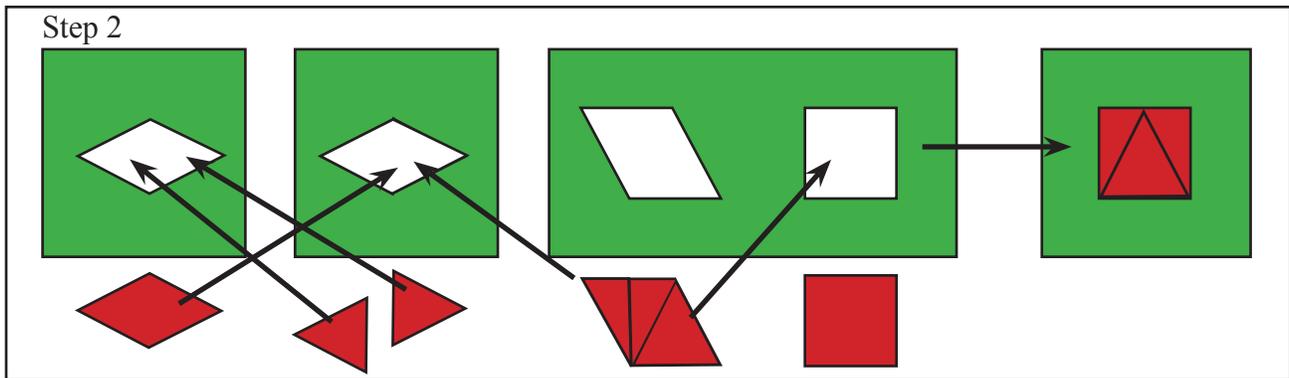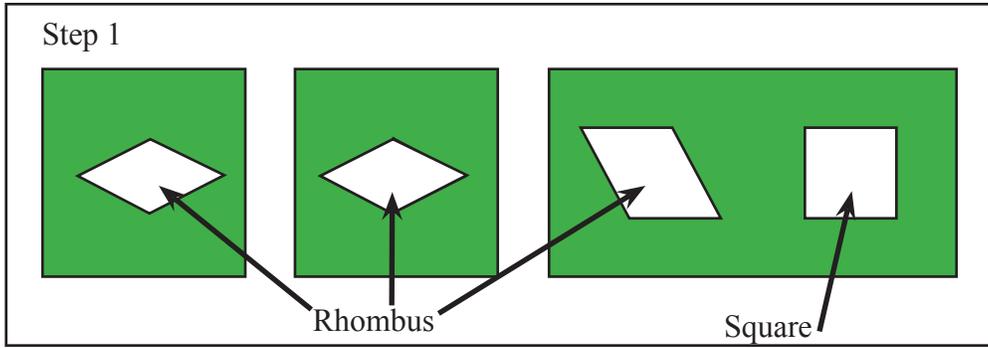
Angles
whole = 360º, straight =180º, right =90º, obtuse > 90º, acute < 90º, reflex/convex angles

whole = 360º

straight =180º

right =90º

acute < 90º

Convex angle
Reflex angle.

obtuse > 90º

From Triangle to Rectangle

Step 1

Triangle   Rectangle

Step 2

Step 3

Height*

Base

* Note that the height of the rectangle is 1/2 of the triangle.

Step 4

Height

Base

Height of the triangle is 2x at high as the rectangle.

Height of triangle   Height of rectangle

Base of the triangle and the rectangle are equivalent.

Base of triangle   Base of rectangle

The triangle is equivalent to a rectangle if the bases are the same and the height of the rectangle is 1/2 the height of the triangle.

1/2 of   Rectangle
triangle   height
height

From Rhombus to Rectangle

Step 1

Rhombus

Square

Step 2

Step 3

Height*

Base**

* Note that the height of both shapes are equal.

** Base of rhombus is what it is standing on.

Step 4

All sides of the rhombus are equal so all of the bases of the rhombus are equal.

The external and internal heights of a rhombus are equal to each other and to the rectangle.

From Rhombus to Rectangle Part 2.

Step 1

Rhombus

Square

Step 2

Step 3   Short diagonal

Base

Long diagonal

Height

Step 4

The short diagonal of the
rhombus is equal to the base of
the rectangle.

Half of the long diagonal is
equal to the height of the
rectangle.
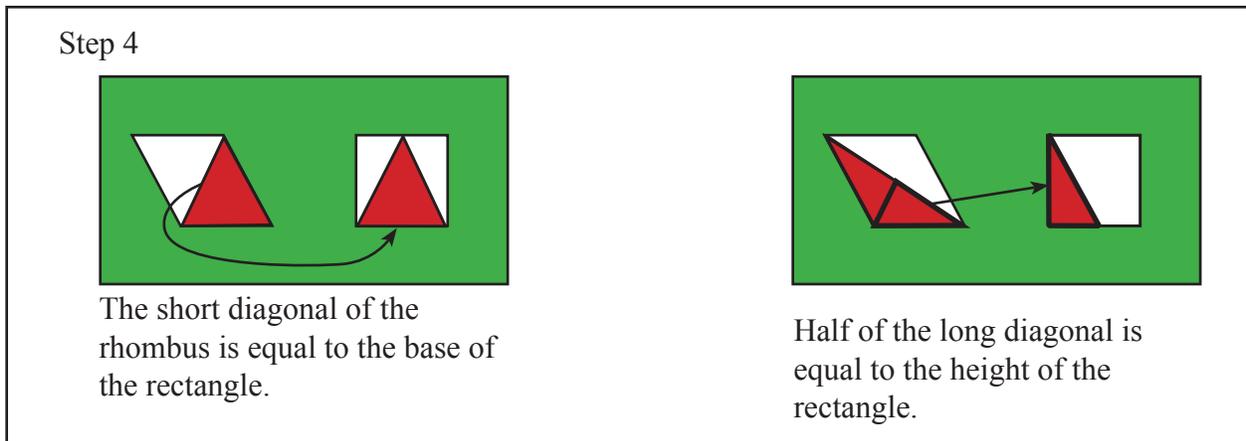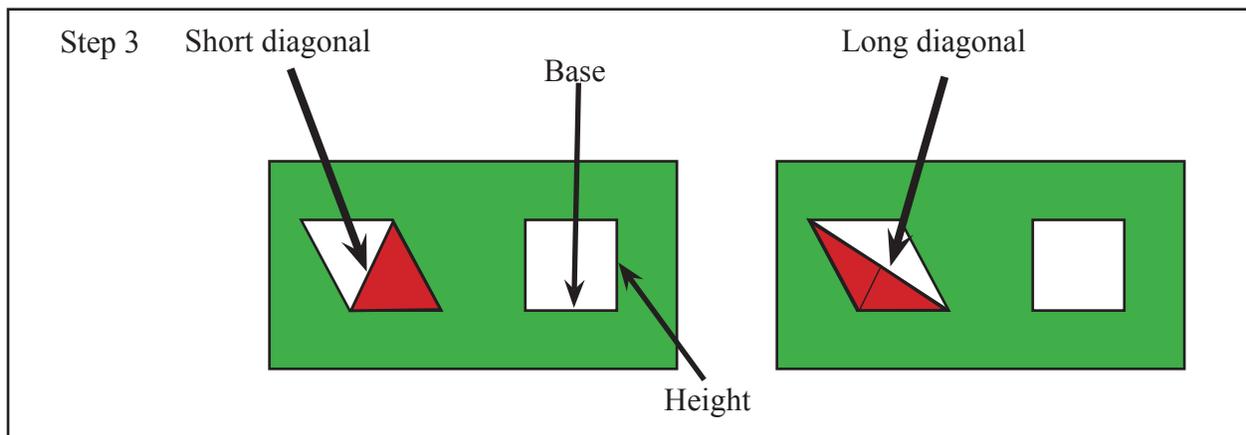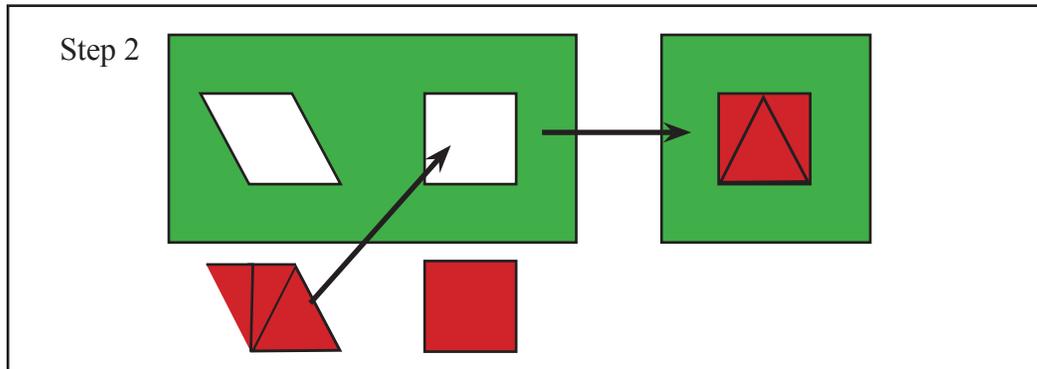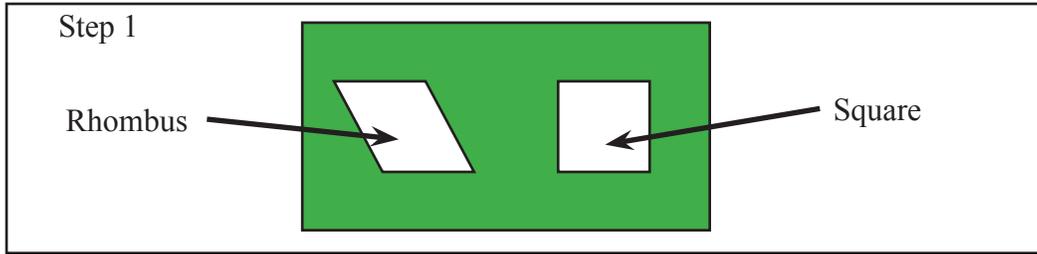
From Basic Parallelogram to Rectangle.

Step 1

Parallelogram

Square / rectangle

Step 2

Step 3

Height

Base

Step 4

Since we use the same triangle, we know that the base of both the parallelogram and rectangle are the same.

Since we use the same triangle, we know that the height of both the parallelogram and rectangle are the same.
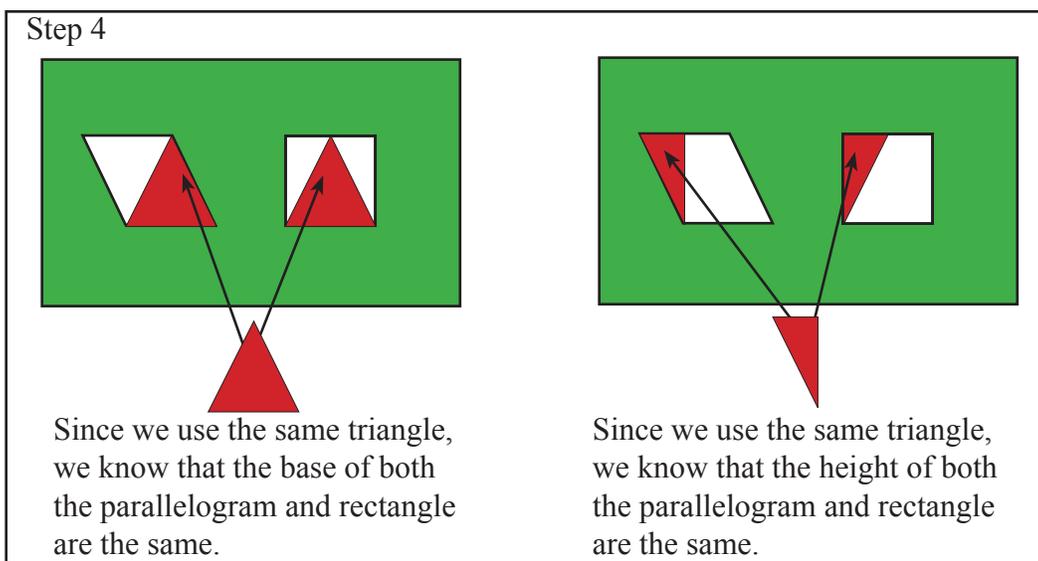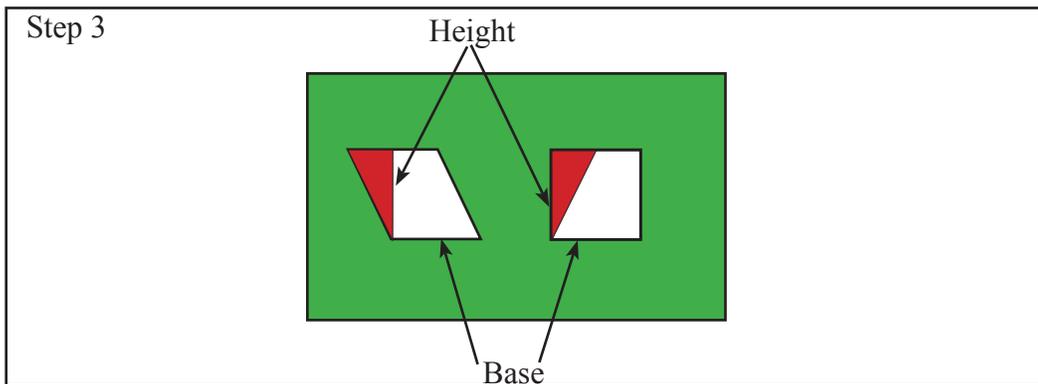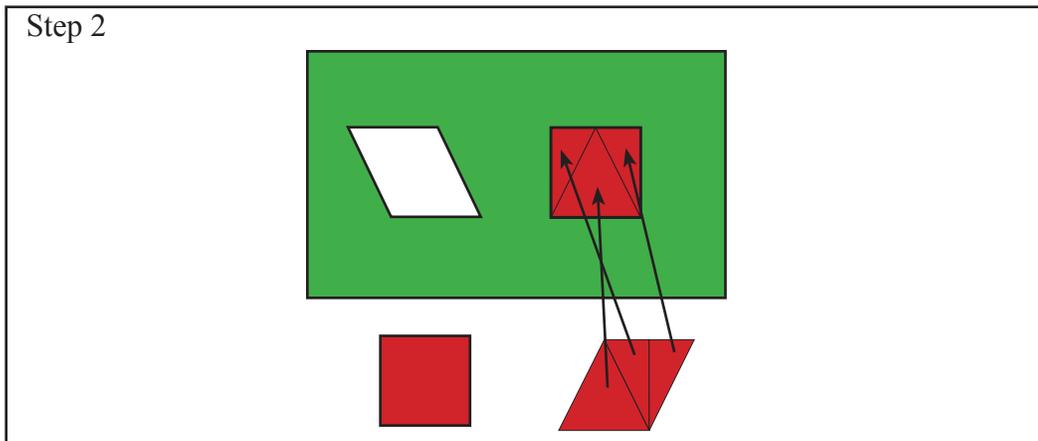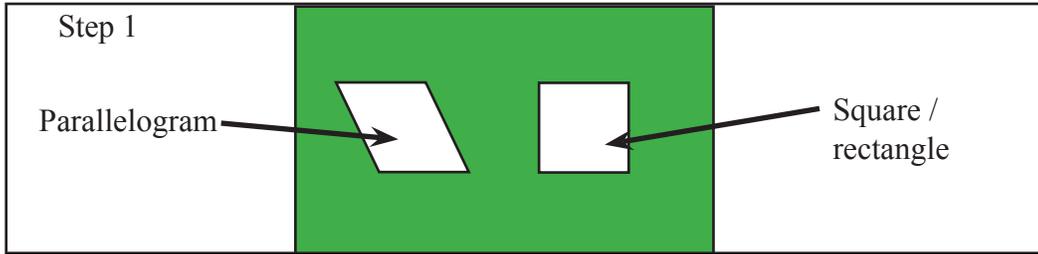
From Trapezoid to Rectangle, Part 1.

Step1

Trapezoid   R e c t a n g l e

Step 2

Step 3

minor base

height

major base

base   base

Step 4 (7 and 8)

the rectangle has a base of 1/2
the major base and the 1/2 minor
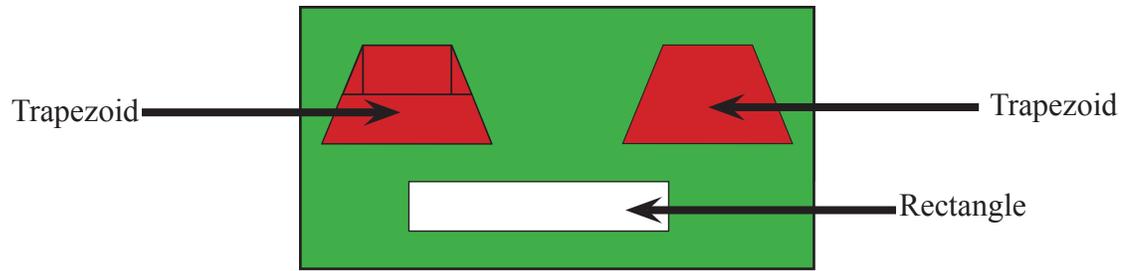base of the trapezoid.

The height of the trapezoid is
equal to the height of the rect-
angle.

Step 4 (7 and 9)

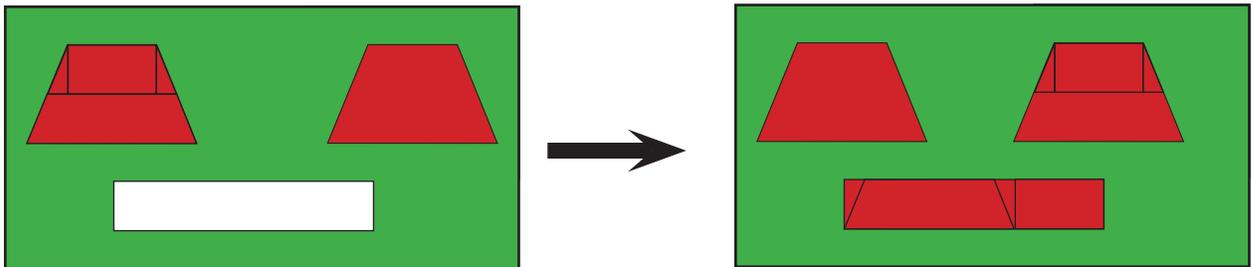

The base of the rectangle is the sum of all the
bases of the trapezoid.

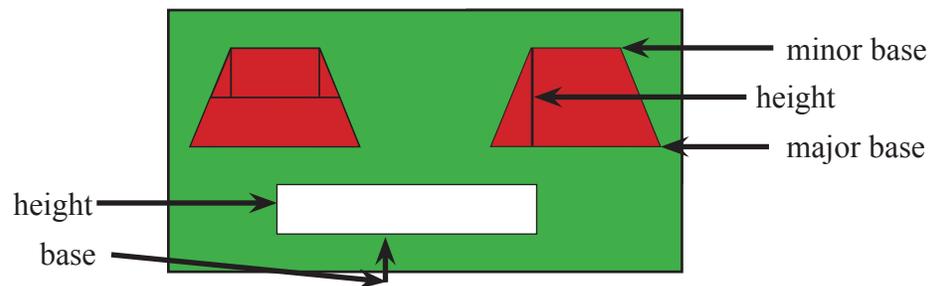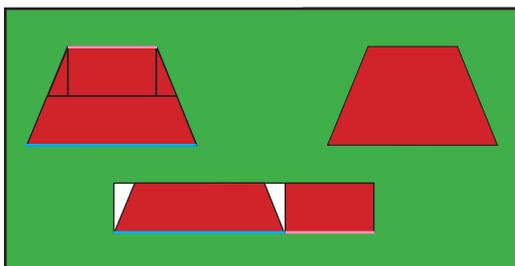The height of the rectangle is half the height of
the trapezoid.

From Trapezoid to Rectangle, Part 2.

Step 1

Trapezoid   Trapezoid

Rectangle
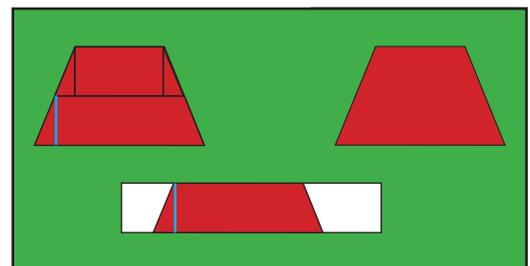
Step 2

Step 3

minor base
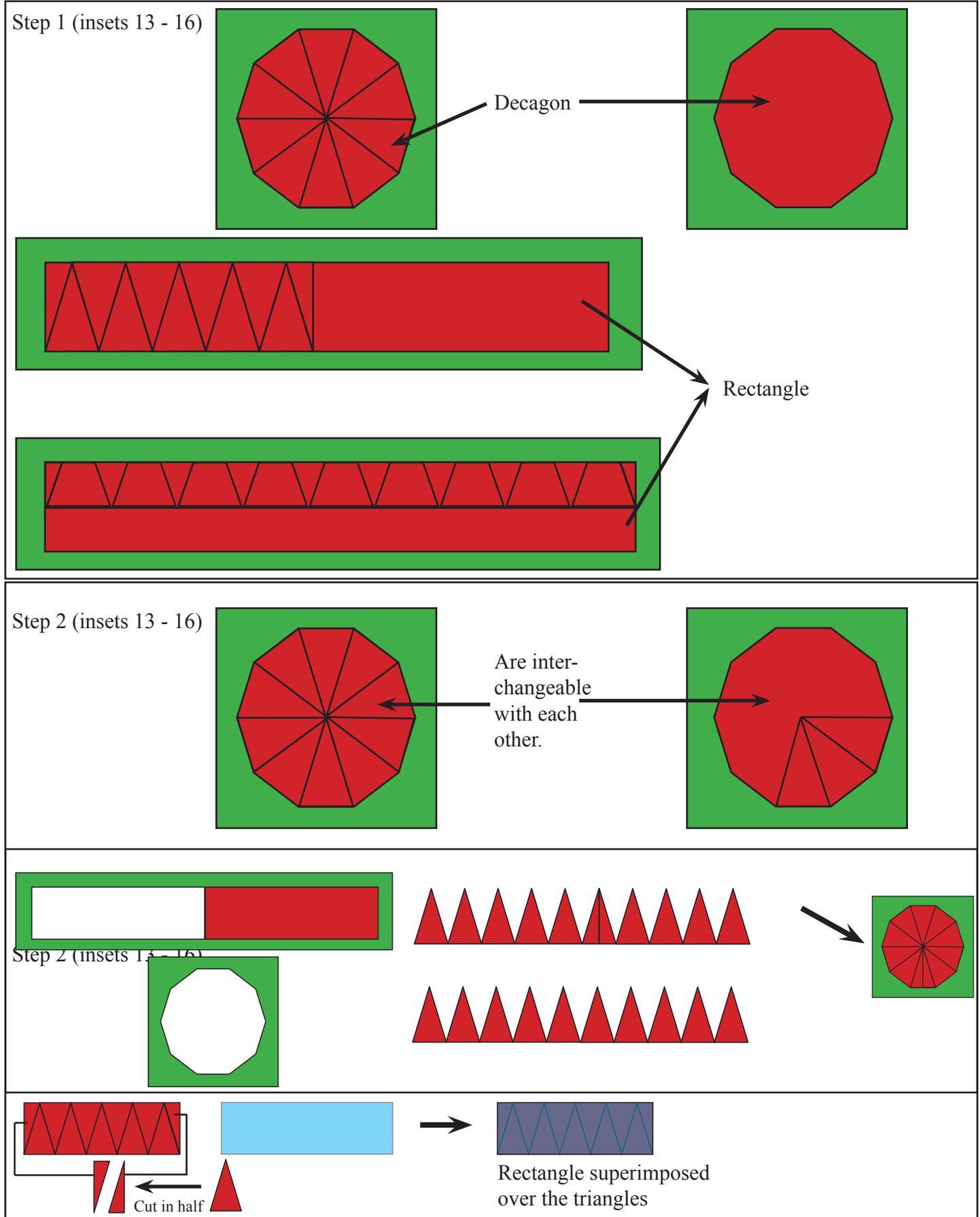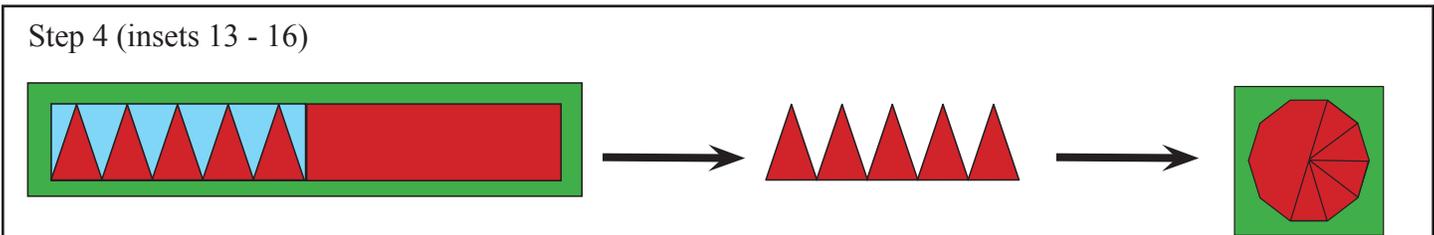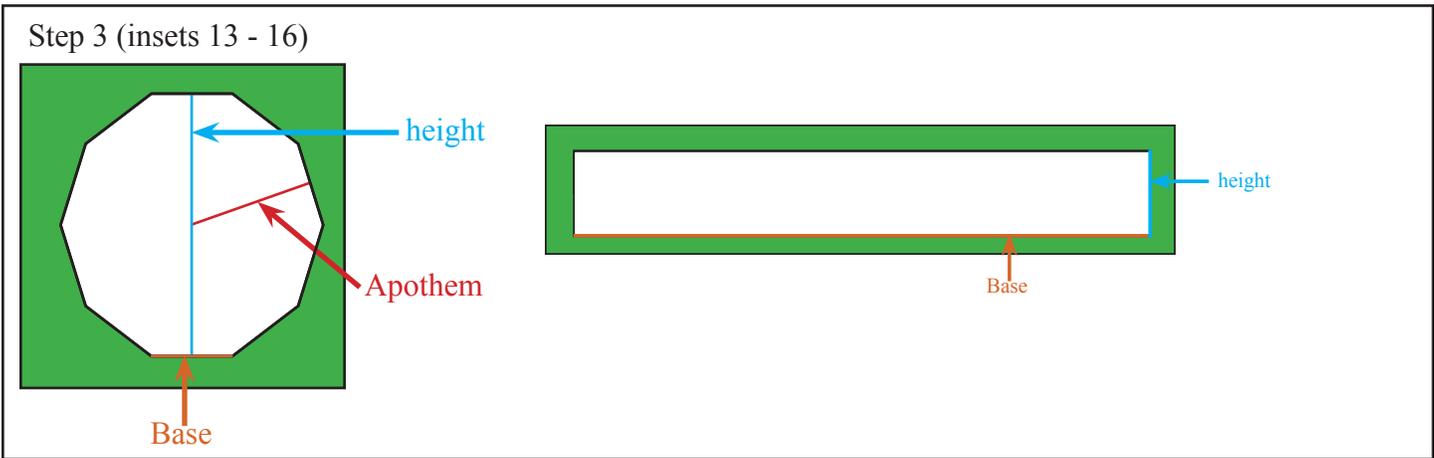
height

major base

height

base

Step 4

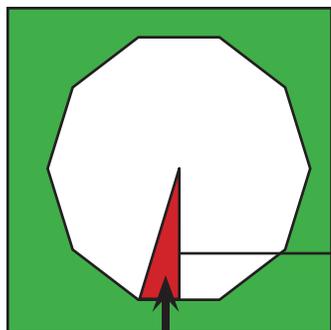If you add the major base and the minor base of the trapezoid together you will get the base of the rectangle.

If we superimpose the bottom half of the trapezoid to the rectangle, we see that the height is equal to 1/2 of the trapezoid's height. (can be done with top half of trapezoid too).

From Regular Polygon to Rectangle.

Step 1 (insets 13 - 16)

Decagon

Rectangle

Step 2 (insets 13 - 16)

Are inter-
changeable
with each
other.

Step 2 (insets 13 - 16)

Cut in half

Rectangle superimposed
over the triangles

Step 3 (insets 13 - 16)

height

Apothem

Base

height

Base

Step 4 (insets 13 - 16)

The base of the solid small rectangle is equal to half the perimeter of the regular polygon.

This line is the height of the triangle, but it also represents the apothem of a regular polygon (decagon).
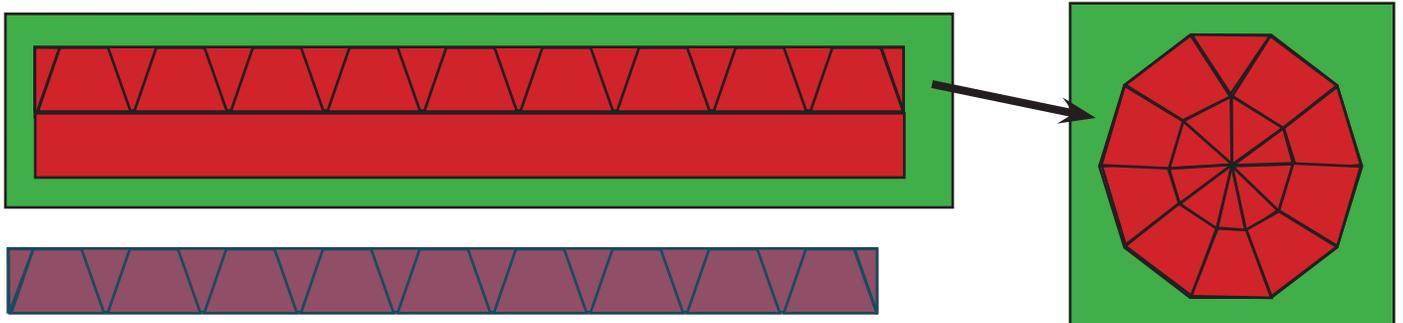
The triangle in the polygon and the triangle in the rectangle are equal. Because of that we know that the apothem of a regular polygon is equal to the height of the rectangle.

Step 1 (#16)
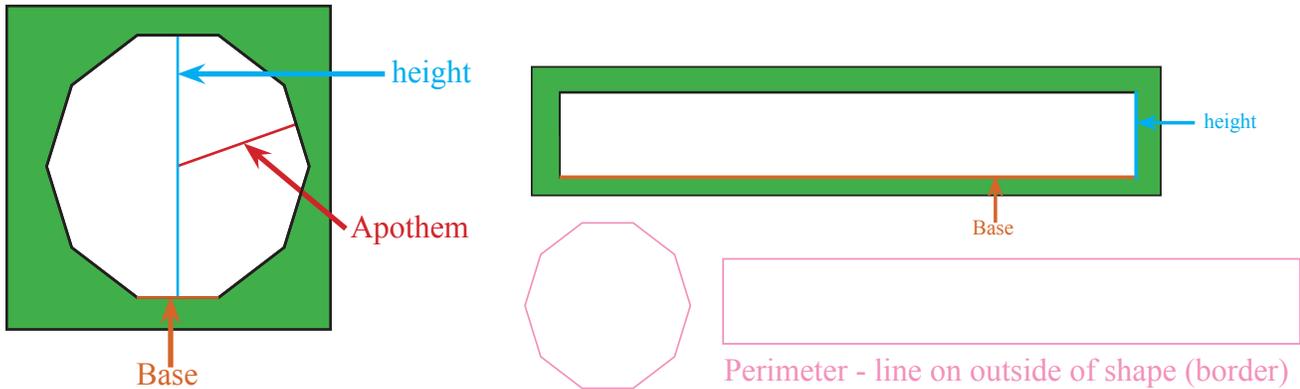
Isosceles Triangles.   Trapezoids.
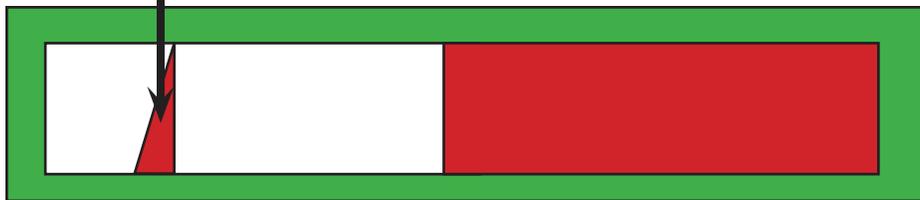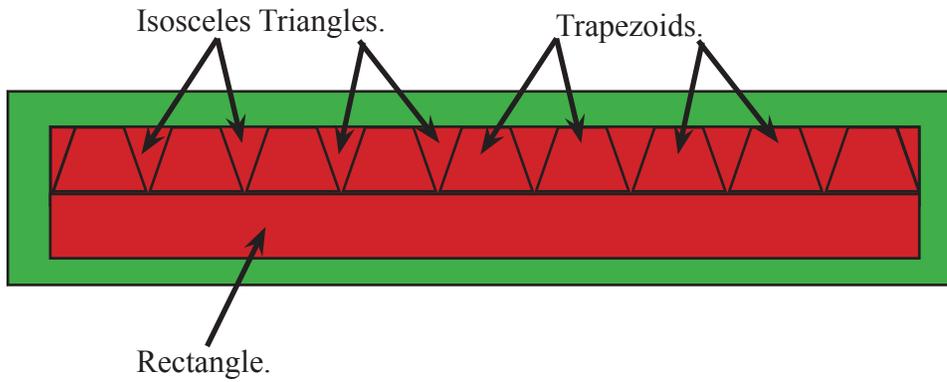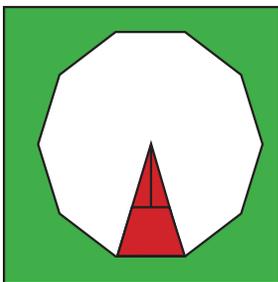
Rectangle.

Step 2 (#16)

Long red rectangle superimposed to show equality between the two
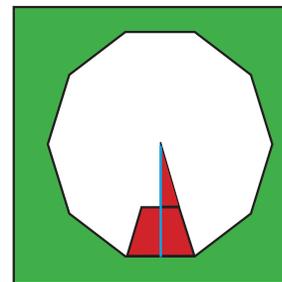sections. This shows the long red rectangle is equal to the polygon.

Step 3 (16)

height

Apothem

Base

height

Base

Perimeter - line on outside of shape (border)

Step 4 (16)

A trapezoid and the two half - triangles
represent a tenth of a decagon.

An apothem line can run through a half
triangle and out to the base of the trapezoid.