Theorem 24: The sum of the angles of a quadrilateral is 360°.
Def: A rectangle is a quadrilateral each of whose angles is a right angle.
Corollary to Theorem 24: A quadrilateral is equiangular iff it is a rectangle.
Def: A parallelogram is a quadrilateral whose opposite sides are parallel.
Theorem 25: The opposite sides and angles of a parallelogram are equal.
Theorem 26: The diagonals of a parallelogram bisect each other.
Theorem 27: A quadrilateral is a parallelogram if its opposite sides are equal.
Theorem 28: A quadrilateral is a parallelogram if its opposite angles are equal.
Theorem 29: A quadrilateral is a parallelogram if two opposite sides are both parallel and equal.
Theorem 30: A quadrilateral is a parallelogram if its diagonals bisect each other.
Def: A square is a quadrilateral all of whose sides and angles are equal. Every square is a rhombus.
Def: A rhombus is a quadrilateral all of whose sides are equal.
Theorem 31: All rectangles are parallelograms.
Theorem 32: All rhombuses are parallelograms.
Theorem 33: The diagonals of a rectangle are equal.
Theorem 34: The diagonals of a rhombus are perpendicular.
Def: A regular polygon is one that is equilateral and equiangular.

Def: A trapezoid is a quadrilateral that has exactly one pair of parallel sides. The parallel sides are called the bases of the trapezoid, and the non-parallel sides are called its legs. The pairs of angles that include each base are called base angles.
Def: An isosceles trapezoid is a trapezoid whose legs are equal.
Theorem 35: The base angles of an isosceles trapezoid are equal.
Theorem 36: The diagonals of an isosceles trapezoid are equal.
If a quadrilateral is a trapezoid, then its diagonals cannot bisect each other.

Def: A midsegment of a triangle is a line segment that connects the midpoints of two of its sides.
Theorem 37: The Midsegment Theorem –
A midsegment of a triangle is parallel to the third side and half as long.

Def: A transformation is a one-to-one correspondence between two sets of points.

A translation slides an object a certain distance without turning it.
A reflection flips an object over a mirror line.
A rotation turns an object a certain number of degrees about a fixed point.
A dilation enlarges or reduces the size of an object.

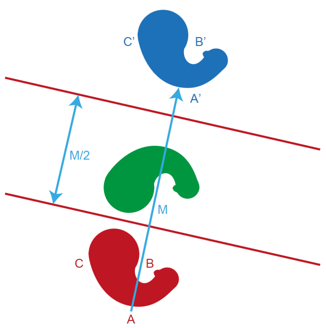
Def: an isometry is a transformation that preserves distance and angle measure.
Translations, reflections, and rotations are all examples of isometries, but dilations are not.

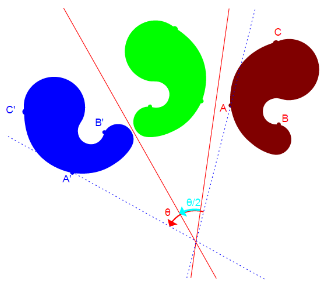
Def: The reflection of point P through line l is P itself if P lines on l. Otherwise, it is the point P' such that l is the perpendicular bisector of PP'.

Construction 8: To reflect a point through a line.

Def: A translation is the composite of two successive reflections through parallel lines.

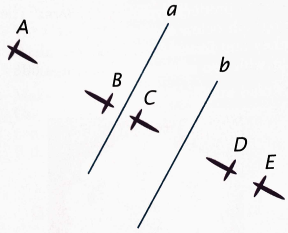
The distance between a point of the original figure and its translation image is called the *magnitude* of the translation.





Def: A rotation is the composite of two successive reflections through intersecting lines.
The point in which the lines intersect is the *center* of rotation, and the measure of the angle through which a point of the original figure turns to coincide with its rotation image is called the *magnitude* of the rotation.

In the figure below, $a \parallel b$ and birds A, B, D, and E are reflection images of bird C through either or both of the lines.



Which bird is the reflection image of

31. bird C through *a*?

32. bird B through *b*?

33. bird C through *b*?

34. bird D through *a*?

Which bird is the image of bird C as a result of successive reflections through

35. *a* and *b*?

36. *b* and *a*?

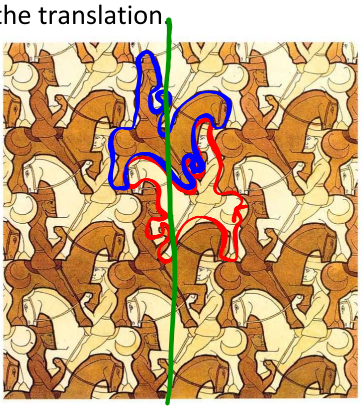
37. What transformation do exercises 35 and 36 illustrate?

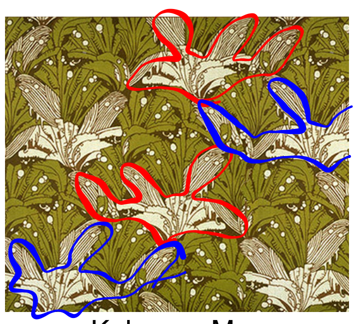
31. B
32. E
33. D
34. A
35. E
36. A
} 37 translations

8.3 - Isometries and Congruence

Def: Two figures are congruent if there is an isometry such that one figure is the image of the other.

Def: A glide reflection is the composite of a translation and a reflection in a line parallel to the direction of the translation.





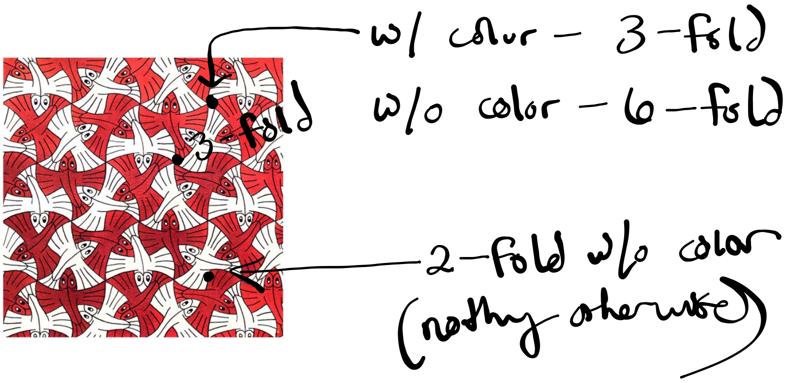
Koloman Moser

M.C. Escher

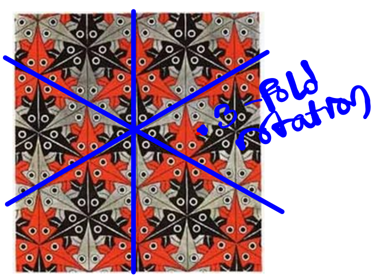
8.4 - Transformations and Symmetry

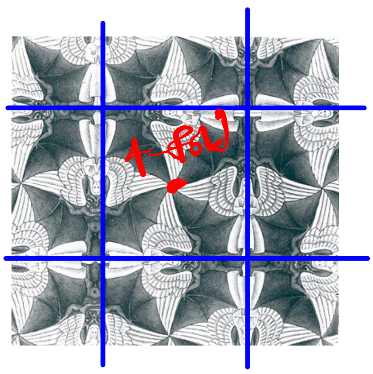
Def: A figure has rotation symmetry with respect to a point iff it coincides with its rotation image through less that 360° about the point.

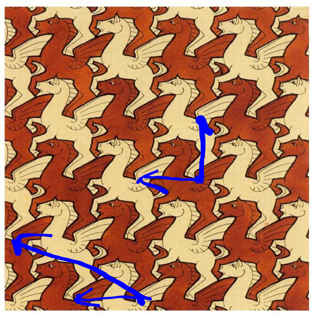
A figure is said to have n-fold rotation symmetry iff the smallest angle through which it can be turned to look exactly the same is 360°/n.



Def: A figure has reflection (line) symmetry with respect to a line iff it coincides with its reflection image through the line. The line is sometimes called the axis of symmetry.







Def: A pattern has translation symmetry iff it coincides with a translation image.

HW #1 (submitted Friday, 11/7) - Ch 1 Review Problems pp. 36-38
HW #2 (submitted Friday, 11/14) - Ch 2 Review Problems pp. 71-74, Ch 3 Review Problems pp. 124-128
HW #3 (submitted Friday, 11/21) - Ch 4 Review Problems pp.176-180
HW #4 (submitted Friday, 12/5) - Ch 5 Review Problems pp. 206-209
HW #5 (submitted Monday, 12/15) - Ch 6 Review Problems pp. 250-254

HW #6 (due Friday, 01/09)

- Ch 7 Review Problems pp. 292-295
- Khan Academy exercises: **anything that has been recommended by me!**

("Introduction to Euclidean geometry," "Angles and intersecting lines," "Congruence," etc.)

- Start working on Ch 8 Review Problems (pp. 325-329)

Test #3 - Friday, 01/16?