Lesson 14

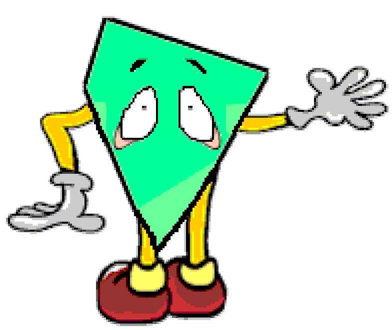
Glencoe Geometry Chapter 6.1 & 10.1

Parallelograms & Tessellations

By the end of this lesson, you should be able to

1. Recognize and apply properties of parallelograms.
2. Recognize beautiful tessellations.

No more triangles today!! However, triangles belong to a larger family of closed, 2-dimensional geometric shapes consisting of a collection of line segments joined at their ends called __polygons____.



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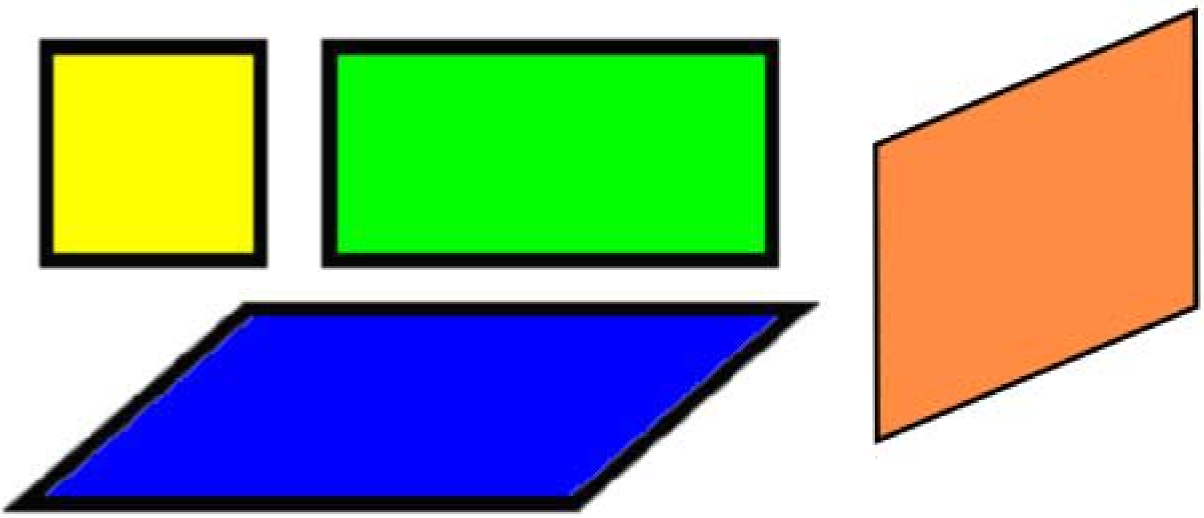
Today we are kicking it up a notch as we begin our study of four-sided polygons called ____quadrilaterals____.

There are many types of four-sided shapes, but today we are looking at a very special type.

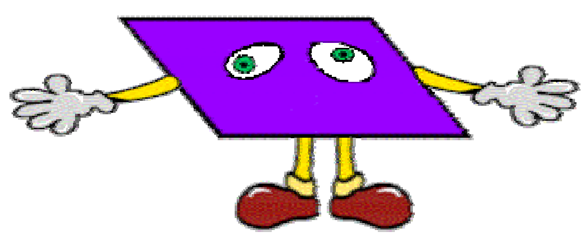
Parallelogram—a quadrilateral with *both* pairs of opposite sides parallel to each other.

Examples:



Parallelograms have some important properties:

1. Opposite sides are congruent
2. Opposite angles are congruent
3. Consecutive angles are supplementary
4. The diagonals divide it into two congruent triangles
5. The diagonals bisect each other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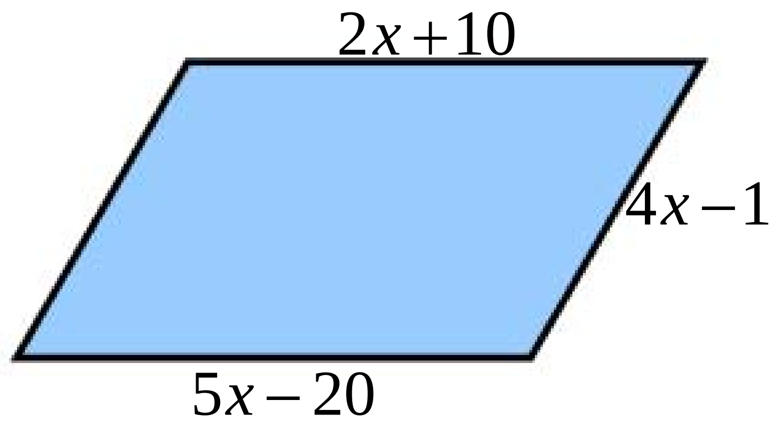
Let's work with some of these parallelograms!

Example:

The opposite sides of a parallelogram are represented by 2x+10 and 5x-20. Find the length of unlabeled side.

$$2x+10=5x-20$$
$$30=3x$$
$$x=10$$
$$so$$
$$4x-1 \rightarrow 4(10)-1=39$$



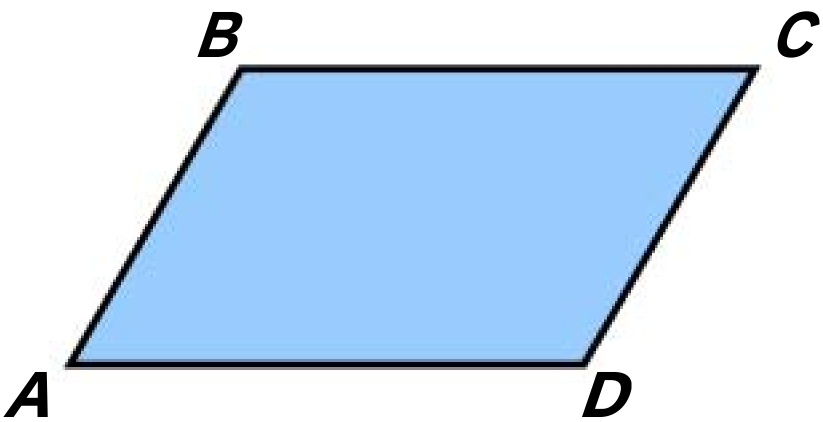
Example:

If one angle of a parallelogram is 60 degrees, find the number of degrees in the remaining 3 angles.

Opposite angles are equal, so there is another angle of 60. Since consecutive angles are supplementary (add to 180), the other two angles are the supplements of 60 (180 – 60 = 120). So the four angles are:
60, 60, 120, 120

Example:

The measures of angles A and B of parallelogram ABCD are in the ratio of 2:7. Find the measures of angle A and angle B.



Angles A and B are consecutive and supplementary. We can express the ratios using x.

$2x+7x=180$

$9x=180$

$x=20$

Angle A was the smaller angle:

$m\angle A=2x$

$m\angle A=2(20)=40$

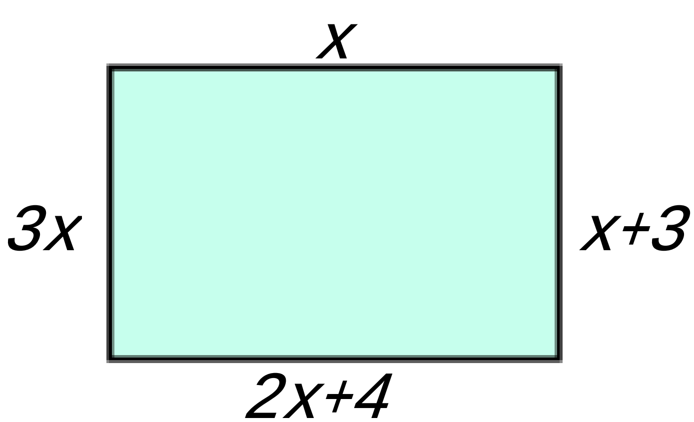
Angle B was the larger angle:

$m\angle B=7x$

$m\angle B=7(20)140$

Example:

In quadrilateral PRST, the perimeter is 49. PR=x, RS=x+3, ST=2x+4, and TP=3x. Find the length of the shortest side of the quadrilateral.



Perimeter is the distance all the way around.

$(x)+(x+3)+(2x+4)+(3x)=49$

$7x+7=49$

$7x=42$

$x=6$

The shortest side is labeled x so it is 6 units long.

Example:

If *ABCD* is a parallelogram and the slope of $\overline{AB}$ is $\frac{1}{3}$, then the slope of $\overline{CD}$ is ______.

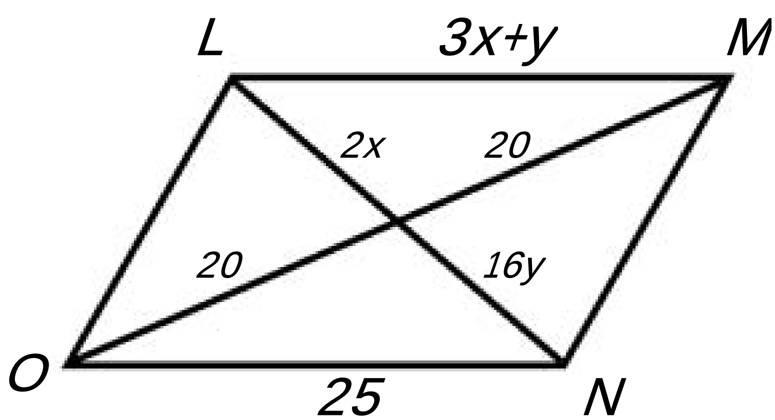
Parallel lines have the same slope!

A. 3 B. $\frac{1}{3}$ C. $-\frac{1}{3}$ D. -3

Example:

In parallelogram *LMNO*, find the values of *x* and *y*.

$3x + y = 25$ and $2x = 16y$
solving the second equation for x:
$x = 8y$. Plugging this into the first equation:
$3(8y) + y = 25$
$24y + y = 25$
$25y = 25$
$y = 1$
So $x = 8y = 8(1) = 8$

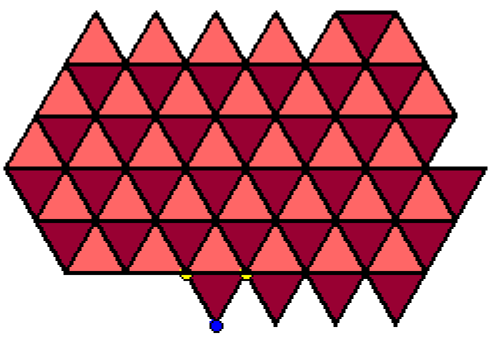


The word 'tessera' in latin means a small stone cube. They were used to make up 'tessellata' - the mosaic pictures forming floors and tilings in Roman buildings

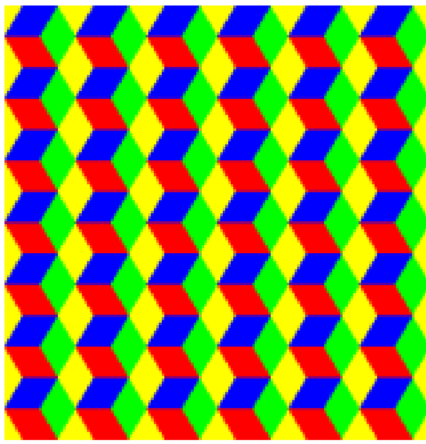
Say What??!!

A tessellation, or tiling, is created when a shape is repeated over and over again covering a plane without any gaps or overlaps.

These can be fun to create and are often used in art and design.



http://mathforum.org/pubs/boxer/tess.html



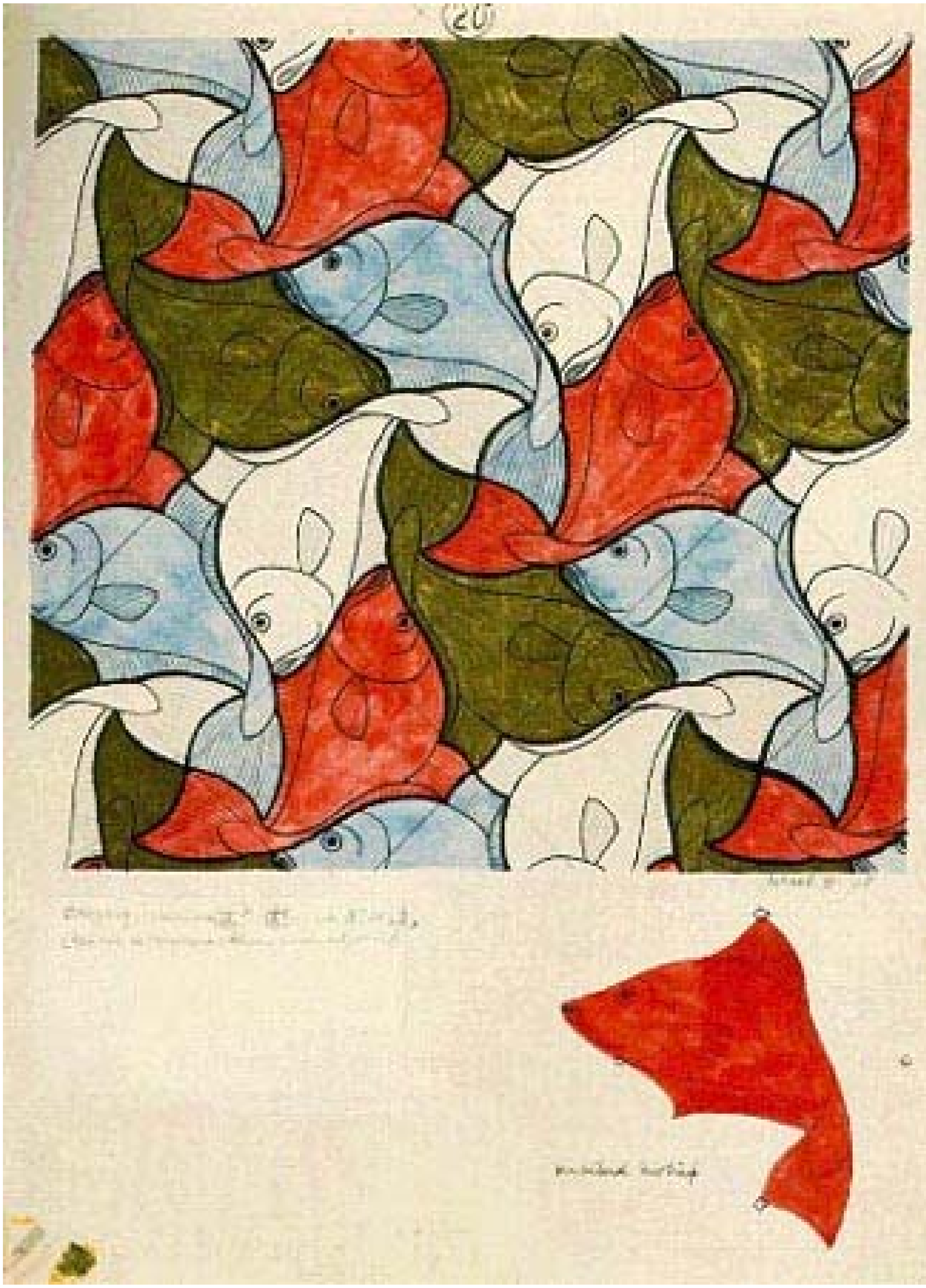
http://gwydir.demon.co.uk/jo/tess/triex.htm

http://www.concretenetwork.com/concrete/concrete_patio/stamped_concrete_is_first_class.htm

M.C. Escher(1898-1972) is one of the world's most famous graphic artists who's art incorporated complex geometric patterns and many tessellations in his symmetry drawings.

Check out the official website at:

http://www.mcescher.com/



Escher's SYMMETRY NO.20

http://www.mcescher.com/

Escher's Metamorphosis II 1940

http://www.mcescher.com/

Escher's Reptiles 1943

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