

3.2 - Angles Associated with Parallel Lines

October 11, 2019 2:55 PM

VOCABULARY

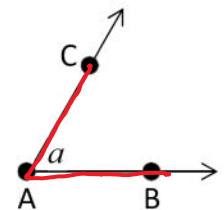
A **line** is a straight figure having no thickness and extending forever in opposite directions. Lines are named using two points on the line with a small line above them, \overline{AB} .



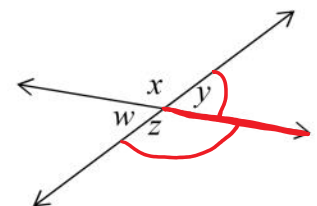
A **line segment** is a portion of a line that starts at a point and stops at another. Line segments are named using the two endpoints with a small line segment above them, \overline{AB} .



An **angle** is formed by two line segments with a common endpoint, the **vertex**. Angles are named with an angle symbol, \angle , followed by the name of the vertex or by a point from each side with the vertex between them, $\angle A$ or $\angle CAB$ or $\angle BAC$. Angles are measured with degrees, variables can be used to represent the angle measures.



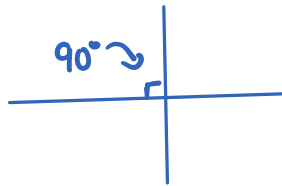
Adjacent angles are a pair of angles that share a side; w and x , x and y , y and z , w and z are pairs of adjacent angles.



Vertically opposite angles are a pair of angles that aren't next to each other and are formed where two lines intersect; w and y are vertically opposite angle and so are x and z .

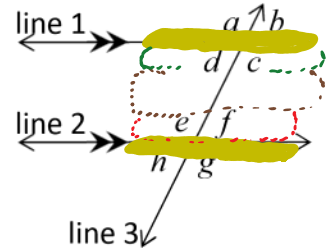
Vertically opposite angles will always be equal, or "congruent".

Perpendicular lines intersect to form right angles. The symbol for perpendicular is \perp .



PARALLEL LINES

Parallel lines are lines on the same plane that do not intersect; lines 1 and 2 are parallel. The symbol for parallel is \parallel , so line 1 \parallel line 2.



A **transversal** is a line that intersects two or more other lines; line 3 is a transversal to lines 1 and 2.

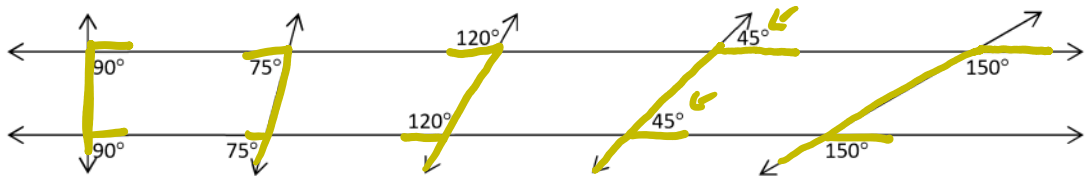
When there are two parallel lines and a transversal:

- **interior angles** are inside the parallel lines; $c, d, e,$ and f are interior angles.
- **exterior angles** are outside the parallel lines; $a, b, g,$ and h are exterior angles.
- ✶ **corresponding angles** are pairs of angles, an interior angle and the non-adjacent exterior on the same side of the transversal; their positions at the intersection points correspond to each other. a and e, b and f, c and g, d and h are pairs of corresponding angles.

✶ corresponding angles are equal.

“F – Angles”

Inductive reasoning is used to make a conjecture about corresponding angles.



“If the two lines are parallel, then the corresponding angles are congruent.” ←

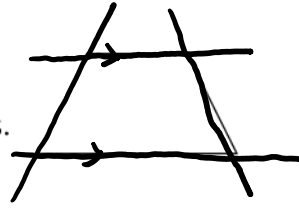
Also,

“If corresponding angles are congruent, then the two lines are parallel.” ←

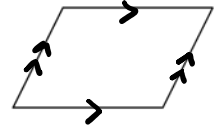
QUADRILATERAL PROPERTIES

- Angles in a quadrilateral add up to 360° .

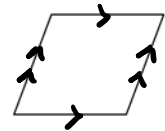
A **trapezoid** has only one pair of parallel sides.



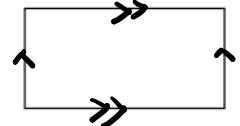
A **parallelogram** has two pairs of parallel sides; a parallelogram is not a special type of trapezoid.



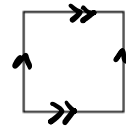
A **rhombus** has two pairs of parallel sides and all four sides are the same length; a rhombus is a type of parallelogram



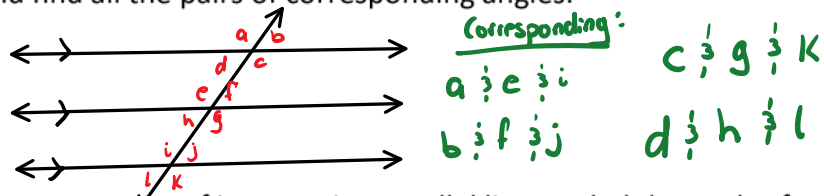
A **rectangle** has four right angles; a rectangle is a type of parallelogram.



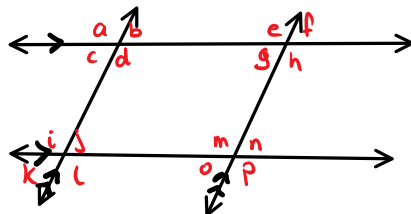
A **square** has four right angles and four sides the same length; a square is a type of rectangle, a type of rhombus, and a type of parallelogram.



exercise: Draw a transversal with three parallel lines. Label the angles formed and find all the pairs of corresponding angles.

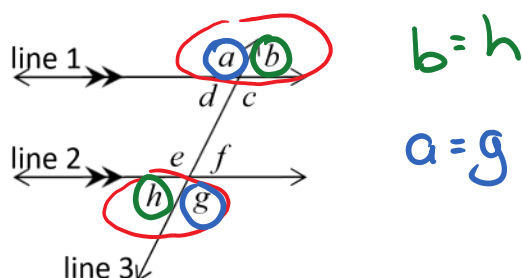


exercise: Draw two pairs of intersecting parallel lines. Label the angles formed and find all the pairs of corresponding angles.



We can add to our list of angles when given two parallel lines and a transversal.

- **alternate exterior angles** are a pair of exterior angles on alternate sides of the transversal; alternate refers to the transversal and exterior refers to the parallel lines. a and g , b and h are pairs of alternate exterior angles.

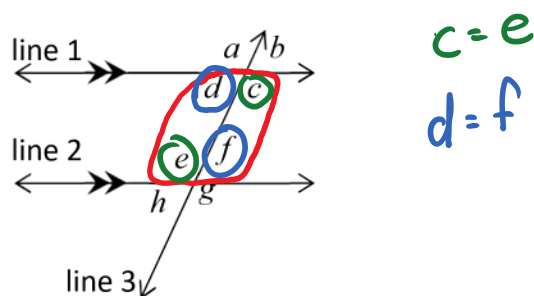


Also,

If alternate exterior angles are congruent, then the two lines are parallel.

“Z – Angles”

- **alternate interior angles** are a pair of interior angles on alternate sides of the transversal; alternate refers to the transversal and interior refers to the parallel lines. c and e , d and f are pairs of alternate interior angles. Another angle property from parallel lines and its converse will be true.



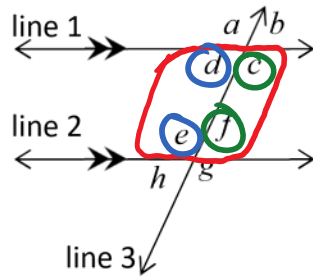
If two lines are parallel, then the alternate interior angles are congruent.

Also,

If alternate interior angles are congruent, then the two lines are parallel.

“C – Angles”

- **interior angles on the same side of the transversal (co-interior) c and f , d and e .** Another angle property from parallel lines and its converse will be true.



$$c + f = 180^\circ$$

$$d + e = 180^\circ$$

If two lines are parallel, then the interior angles on the same side of the transversal are supplementary.

If interior angles on the same side of the transversal are supplementary, then the two lines are parallel.