IM 9–12 MATH v.1

Unit 2
Congruence

GEOMETRY

Lesson 7

Angle-Side-Angle Triangle Congruence

Illustrative Mathematics®

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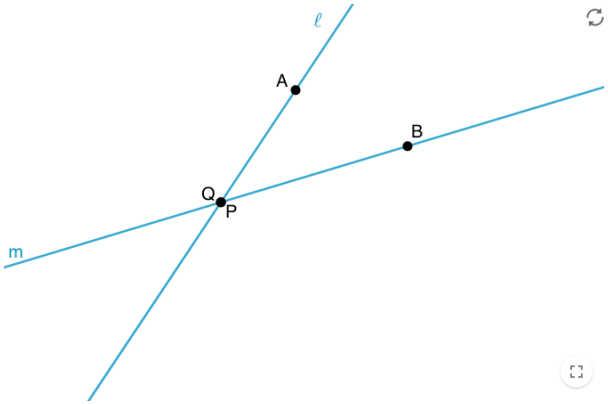
Learning Goal

Let's see if we can prove other sets of measurements that guarantee triangles are congruent, and apply those theorems.

Geometry

Assertion

Warm-up: Notice and Wonder



What do you notice? What do you wonder?

Assertion: Through two distinct points passes a unique line. Two lines are said to be distinct if there is at least one point that belongs to one but not the other. Otherwise, we say the lines are the same. Lines that have no point in common are said to be parallel.

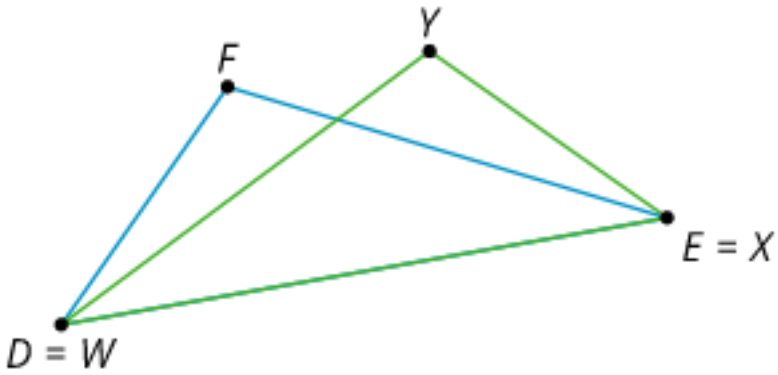
Therefore, we can conclude: given two distinct lines, either they are parallel, or they have exactly one point in common.

Proving the Angle-Side-Angle Triangle Congruence Theorem

1. Two triangles have 2 pairs of corresponding angles congruent, and the corresponding sides between those angles are congruent. Sketch 2 triangles that fit this description.
2. Label the triangles *WXY* and *DEF*, so that angle *W* is congruent to angle *D*, angle *X* is congruent to angle *E*, and side *WX* is congruent to side *DE*.
3. Use a sequence of rigid motions to take triangle *WXY* onto triangle *DEF*. For each step, explain how you know that one or more vertices will line up.

Proving the Angle-Side-Angle Triangle Congruence Theorem

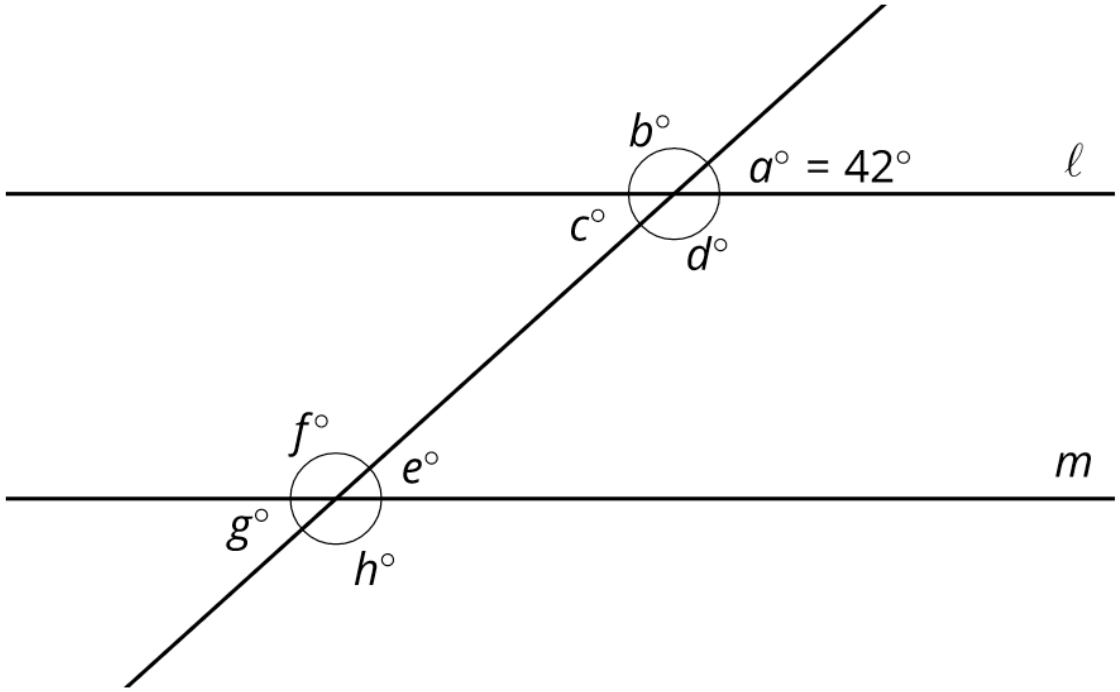
Could the situation look like this after we reflect across ? How do you know?



Find the Missing Angle Measures

Lines ℓ and m are parallel. $A = 42$. Find b, c, d, e, f, g, and h.

$\ell \parallel m$



What Do We Know For Sure About Parallelograms?

Quadrilateral *ABCD* is a **parallelogram**. By definition, that means that segment *AB* is parallel to segment *CD*, and segment *BC* is parallel to segment *AD*.

1. Sketch parallelogram *ABCD* and then draw an auxiliary line to show how *ABCD* can be decomposed into 2 triangles.
2. Prove that the 2 triangles you created are congruent, and explain why that shows one pair of opposite sides of a parallelogram must be congruent.

Angle-Side-Angle Triangle Congruence

Lesson Synthesis

Work with your partner to brainstorm a list of hints or steps that will help other students write proofs that use triangle congruence theorems.

- I can explain why the Angle-Side-Angle Triangle Congruence Theorem works.
- I can use the Angle-Side-Angle Triangle Congruence Theorem in a proof.

Learning Targets

Geometry

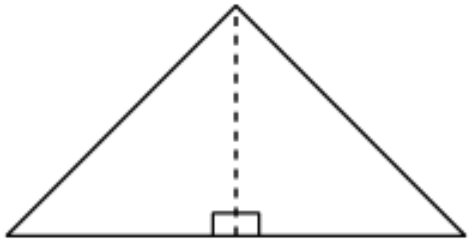
Both (Pairs of) Sides Now

Cool-down

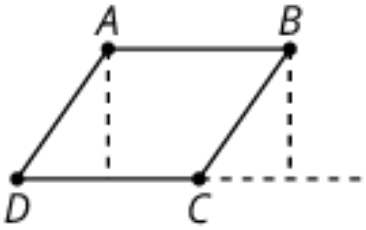
So far, you proved that one pair of parallel sides in a parallelogram must be congruent. Add to your proof to prove that both pairs of parallel sides in a parallelogram must be congruent.

auxiliary line

An extra line drawn in a figure to reveal hidden structure.

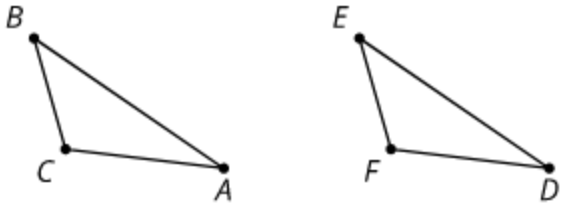


For example, the line shown in the isosceles triangle is a line of symmetry, and the lines shown in the parallelogram suggest a way of rearranging it into a rectangle.



corresponding

For a rigid transformation that takes one figure onto another, a part of the first figure and its image in the second figure are called corresponding parts. We also talk about corresponding parts when we are trying to prove two figures are congruent and set up a correspondence between the parts to see if the parts are congruent.



In the figure, segment *AB* corresponds to segment *DE*, and angle *BCA* corresponds to angle *EFD*.

parallelogram

A quadrilateral in which pairs of opposite sides are parallel.