Lesson 2.1.3 **Name**________________________

More Angles Formed by Transversals

- In Lesson 2.1.2, you looked at corresponding angles formed when a transversal intersects two parallel lines. Today you will investigate other special angle relationships formed in this situation.

- **2-24.** Whenever one geometric figure can be translated, rotated, or reflected (or a combination of these) so that it lies on top of another, the figures must have the same shape and size. When this is possible, the figures are said to be **congruent** and the symbol ≅ is used to represent the relationship.

a. Review the angle relationships you have studied so far. Which types of angles must be congruent?

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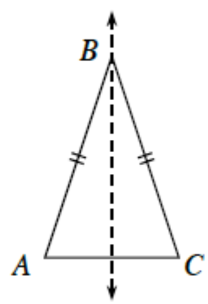
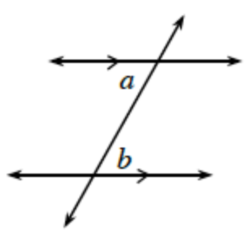
b. Angles are not the only type of figure that can be congruent. For example, sides of a figure can be congruent to another side. Also, a complex shape (such as a trapezoid) can be congruent to another if there is a sequence of rigid transformations that carry it onto the other.

Consider an isosceles triangle, like the one shown below. Because of its reflection symmetry, which parts must be congruent? State each relationship using symbols.



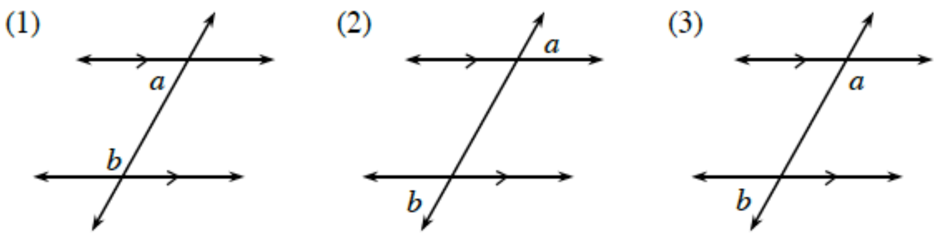
- **2-25.** Suppose ∠*a* in the diagram below measures 48°.

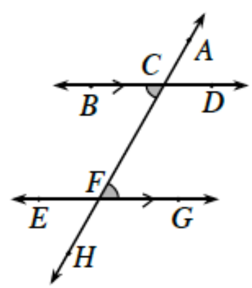


a. Use what you know about vertical, corresponding, and supplementary angle relationships to find the measure of ∠*b.*

b. Julia is still having trouble seeing the angle relationships clearly in this diagram. Her teammate, Althea explains, "*When I translate one of the angles along the transversal, I* *notice its image and the other given angle are a pair of vertical angles. That way, I know that angles a and b must be congruent.*"

Use Althea's method and tracing paper to determine if the following angle pairs are congruent or supplementary. Be sure to state whether the pair of angles created after the translation is a vertical pair or forms a straight angle. Be ready to justify your answer for the class.



- **2-26.** ALTERNATE INTERIOR ANGLE RELATIONSHIP
- In problem 2-25, Althea showed that the shaded angles in the diagram are congruent. However, these angles also have a name for their geometric relationship (their relative positions on the diagram). These angles are called **alternate interior** angles. They are called "alternate" because they are on opposite sides of the transversal, and "interior" because they are both inside (that is, between) the parallel lines.
- 

a. Find another pair of alternate interior angles in this diagram.

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b. Think about the relationship between the measures of alternate interior angles. If the lines are parallel, are they always congruent? Are they always supplementary? Complete the conjecture, "*If lines are parallel, then alternate interior angles are…*"

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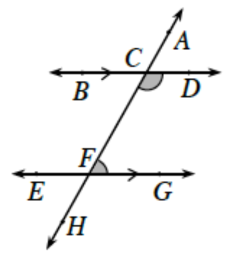
c. Instead of writing conditional statements, Roxie likes to write **arrow diagrams** to express her conjectures. She expresses the conjecture from part (b) as:

Lines are parallel → alternate interior angles are congruent.

This arrow diagram says the same thing as the conditional statement you wrote in part (c). How is it different from your conditional statement? What does the arrow mean?

d. Prove that alternate interior angles are congruent. That is, how can you use rigid transformations to move $\angle CFG$ so that it lands on $\angle BCF$? Explain. Be sure your team agrees.

- **2-27.** The shaded angles in the diagram below have another special angle relationship. They are called **same-side interior** angles.



a. Why do you think they have this name?

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b. What is the relationship between the angle measures of same-side interior angles? Are they always congruent? Supplementary? Talk about this with your team. Then write a conjecture about the relationship of the angle measures. Your conjecture can be in the form of a conditional statement or an arrow diagram. If you write a conditional statement, it should begin, "*If lines are parallel, then same-side interior angles are…*"

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c. Claudio decided to prove this theorem this way. He used letters in his diagram to represent the measures of the angles. Then, he wrote $a + b = 180^\circ$ and $a = c$. Is he correct? Explain why or why not.

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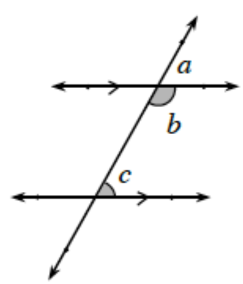

d. Finish Claudio's proof to explain why same-side interior angles are always supplementary whenever lines are parallel.