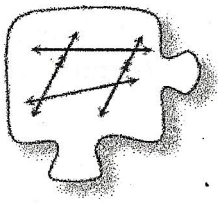
2.1.2 What is the relationship?

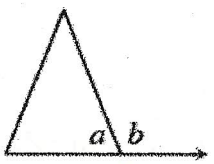


Angles Formed by Transversals

In Lesson 2.1.1, you examined vertical angles and found that vertical angles are always equal. Today you will look at another special relationship that guarantees angles have equal measure.

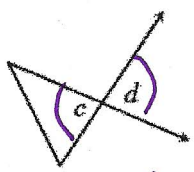
2-13. Examine the diagrams below. For each pair of angles marked on the diagram, quickly decide what relationship their measures have. Your responses should be limited to one of three relationships: same (equal measures), complementary (have a sum of 90°), and supplementary (have a sum of 180°). ≅

a.



Supplementary

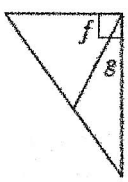
b.



Vertical

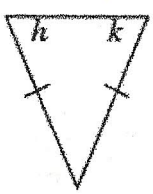
congruent

c.



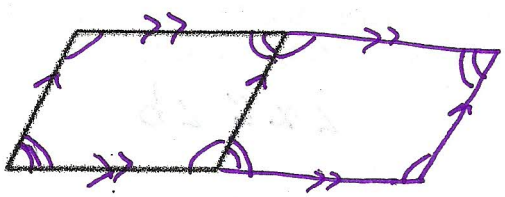
comp.

d. ≅ congruent



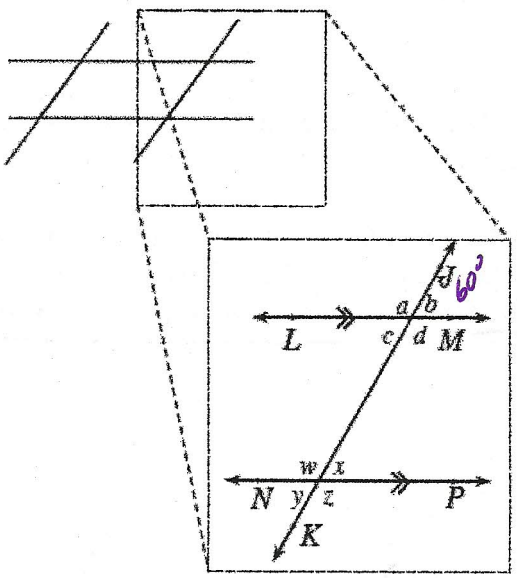
2-14. Consider the angles inside a single parallelogram. Which angles must have equal measure? How can you justify your claim?

Def. of parallelogram



What about the relationship between lines? Can you identify any lines that must be parallel? Mark all of the lines on your diagram with the same number of arrows to show which lines are parallel.

2-15. Julia wants to learn more about the angles in Marcos's diagram and has decided to focus on just a part of his tiling. An enlarged view of that section is shown in the image below, with some points and angles labeled.



a. A line that crosses two or more other lines is called a **transversal**. In Julia's diagram, which line is the transversal? Which lines are parallel?

$\overleftrightarrow{JK}$ is transversal

$\overleftrightarrow{LM} \parallel \overleftrightarrow{NP}$

b. Trace $\angle x$ on tracing paper and shade its interior. Then translate $\angle x$ by sliding the tracing paper along the transversal until it lies on top of another angle and matches it exactly. Which angle in the diagram corresponds with x?

$\angle x \cong \angle b$

c. In this diagram, $\angle x$ and $\angle b$ are called **corresponding angles** because they are in the same position at two different intersections of the transversal. What is the relationship between the measures of angles x and b? Must one be greater than the other, or must they be equal? Explain how you know.

$\cong$

2-16. CORRESPONDING ANGLES FORMED BY PARALLEL LINES

The corresponding angles in Julia's diagram in problem 2-15 have equal measure because they were formed by translating a parallelogram.

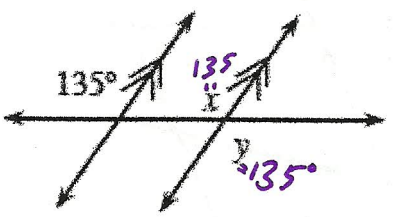
a. Name all the other pairs of corresponding angles you can find in Julia's diagram from problem 2-15. $\angle x \cong \angle b$ $\angle c \cong \angle y$ $\angle d \cong \angle z$ $\angle a \cong \angle w$

b. Suppose $b = 60°$. Use what you know about vertical, supplementary, and corresponding angle relationships to find the measures of all the other angles in Julia's diagram.

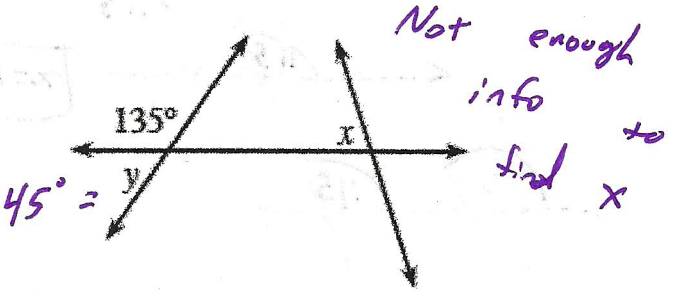
$\angle b = 60°$ $\angle c = 60°$ $\angle x = 60°$ $\angle w = 120°$
$\angle a = 120°$ $\angle d = 120°$ $\angle y = 60°$ $\angle z = 120°$

2-17. Frank wonders whether corresponding angles *always* have equal measure. For parts (a) through (d) below, use tracing paper to decide if corresponding angles have the same measure. Then determine if you have enough information to find the measures of x and y. If you do, find the angle measures and state the relationship.

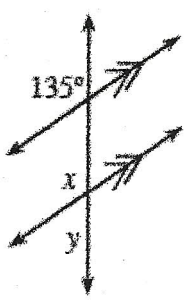
a.



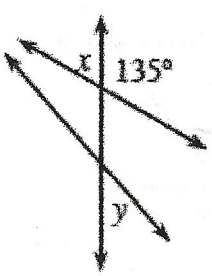
b.



c.



d.



e. Answer Frank's question: Do corresponding angles always have equal measure? If not, when are their measures equal?

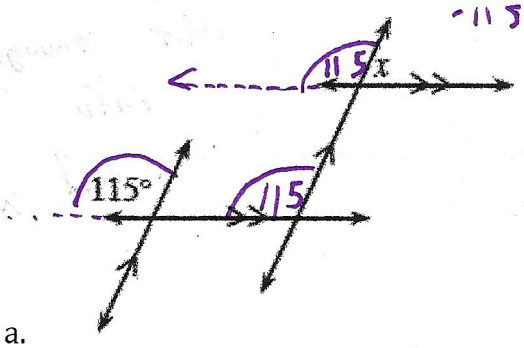
f. Conjectures are often written in the form, *"If..., then..."*. A statement in if-then form is called a **conditional statement**. Make a conjecture about corresponding angles by completing this conditional statement: *"If ..., then corresponding angles have equal measure."*

If // lines are cut by a transversal, then corresponding ∠s are ≅.

g. Prove that your conjecture in part (f) is always true. That is, explain why this conjecture is a theorem.

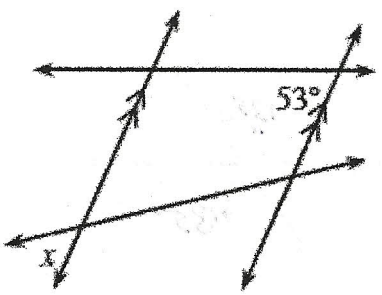
2-18. For each diagram below, find the value of x, *if possible*. If it is not possible, explain how you know. State the relationships you use. Be prepared to justify every measurement you find to other members of your team.

a.



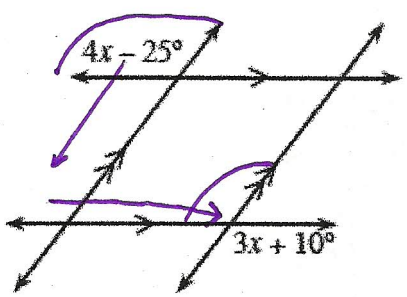
115 + x = 180
−115 −115
x = 65°

c.



not enough info

b.



4x − 25 = 3x + 10

x = 35