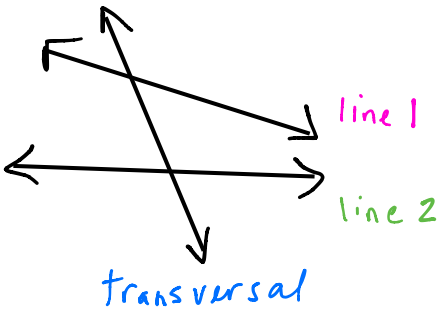
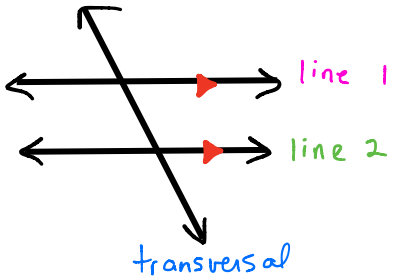
Proving Lines Parallel

Remember from the previous section that when you have two lines cut by a transversal, those two lines may be parallel OR not. See below.

Not Parallel



Parallel



You can use certain angle pairs to decide whether two lines are parallel.

Note: If any of the following statements are true...

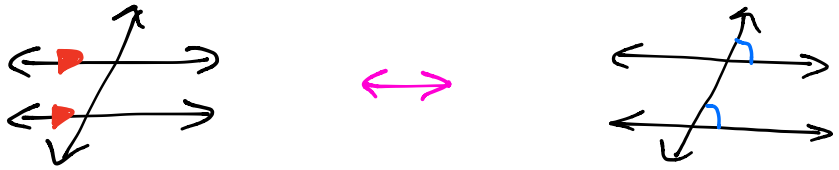
- Corresponding angles are congruent
- Alternate interior angles are congruent
- Alternate exterior angles are congruent
- Same-side interior angles are supplementary

.... Then the two lines that are cut by the transversal are parallel to each other!

So, since these statements are true in both directions, as indicated by the previous section and this section, then all 4 statements can be written as biconditionals because they are also true when they are reversed.

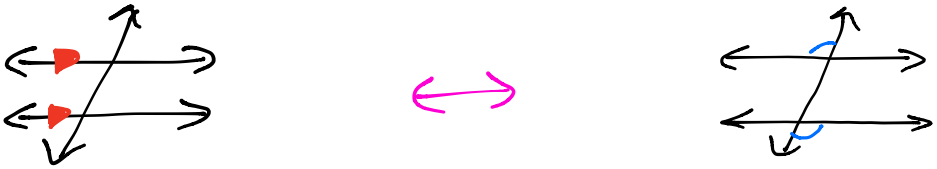
Biconditionals to memorize:

Two parallel lines are cut by a transversal IFF corresponding angles are congruent.

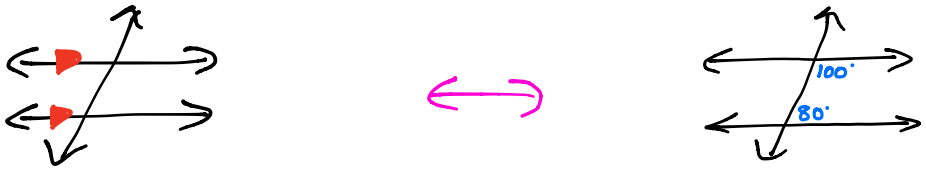


Two parallel lines are cut by a transversal IFF alternate interior angles are congruent.

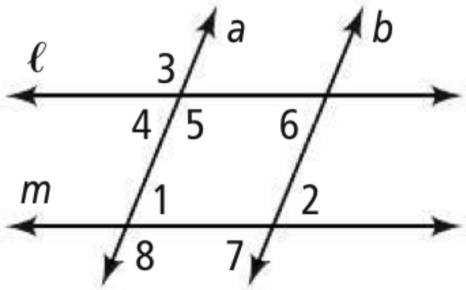
Two parallel lines are cut by a transversal IFF alternate exterior angles are congruent.



Two parallel lines are cut by a transversal IFF same-side interior angles are supplementary.



Ex 1a) Which lines are parallel if $\angle 1 \cong \angle 7$? Justify your answer.

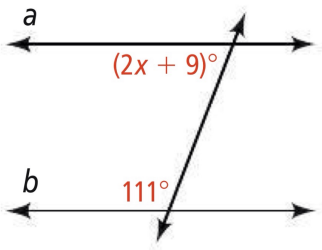


Ex 1b) Which lines are parallel if $\angle 6 \cong \angle 7$? Justify your answer.

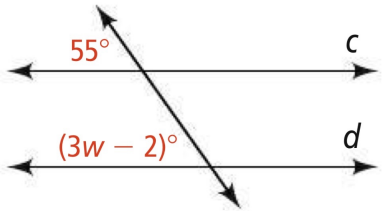
Ex 2a) The fence gate shown is made up of pieces of wood arranged in various directions. Suppose $\angle 1 \cong \angle 2$. Are lines r and s parallel?

Ex 2b) What if instead of being given the information above, you were given the information that $\angle 1$ and $\angle 3$ were supplementary. Are lines r and s parallel in this scenario? Explain.

Ex 3a) What is the value of x for which $a \parallel b$?



Ex 3b) What is the value w for which $c \parallel d$?



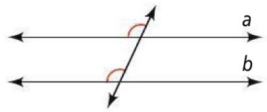
Lesson Check

Lesson Check

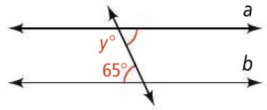
Do you know HOW?

State the theorem or postulate that proves $a \parallel b$.

1.



2.

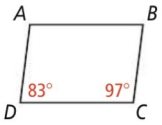


3. What is the value of y for which $a \parallel b$ in Exercise 2?

Do you UNDERSTAND?

MATHEMATICAL PRACTICES

4. **Error Analysis** A classmate says that $\overleftrightarrow{AB} \parallel \overleftrightarrow{DC}$ based on the diagram at the right. Explain your classmate's error.



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Homework:

Textbook p. 160-162

#7-10, 12-16, 18-26 even, 31, 39, 42

(17 problems total)