Proving Parallel Lines
2.3

State Theorems 2.1.2 through 2.1.4 and Postulate 11 **:**
All of the above theorems start with start with the hypothesis "If two parallel lines are cut by a transversal"

Postulate11:

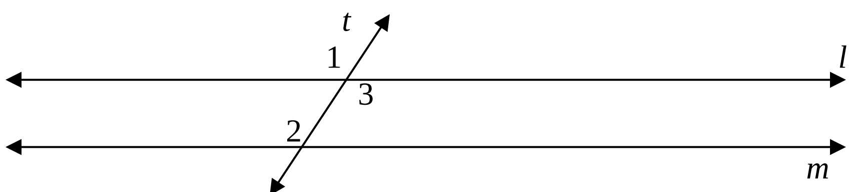
Theorem 2.1.2

Theorem 2.1.3

Theorem 2.1.4

Theorem 2.1.5

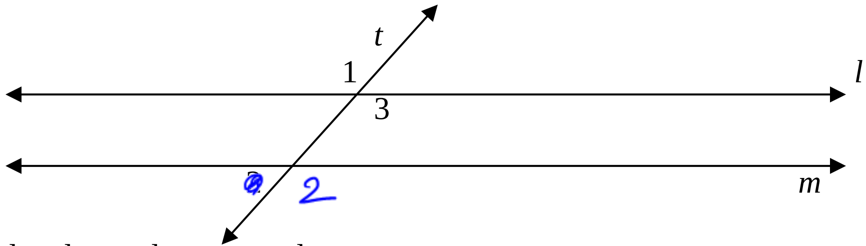
Theorem 2.3.2: If two lines are cut by a transversal so that interior angles are congruent, then these lines are parallel.



Given: lines l and m and transversal t
$\angle 2 \cong \angle 3$
Prove: l || m

Statements	Reasons
1. lines l and m and transversal t $\angle 2 \cong \angle 3$	1. Given
2. $\angle 1 \cong \angle 3$ then vertical angles	2. If two lines intersect then vertical angles are $\cong$
3. $\angle 1 \cong \angle 2$	3. Transitive property
4. l || m	4. If two lines are cut by a transversal so that corres. angles are $\cong$ so lines are parallel

<u>Theorem 2.3.3:</u> If two lines are cut by a transversal so that alternate exterior angles are congruent



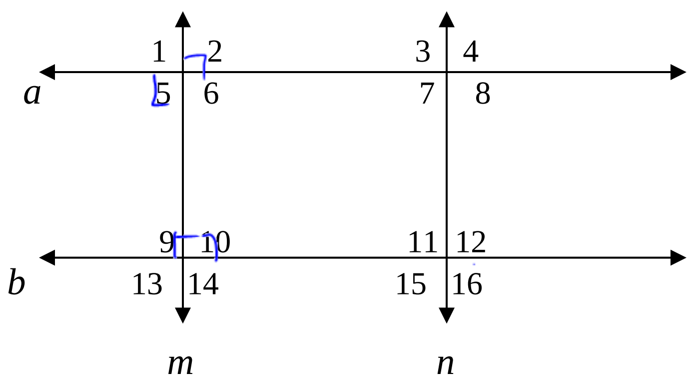
Given: lines l and m and transversal t

$\angle 1 \cong \angle 2$

Prove: l || m

Statements	Reasons
1. lines l and m and transversal t $\angle 1 \cong \angle 2$	1. Given
2. $\angle 1 \cong \angle 3$	2. vertical angles are $\cong$
3. $\angle 2 \cong \angle 3$	3. Transitive
4. l || m	4. Corresponding angles are $\cong$ then l||m

Example 1: Name the lines (if any) that must be parallel under the given conditions.



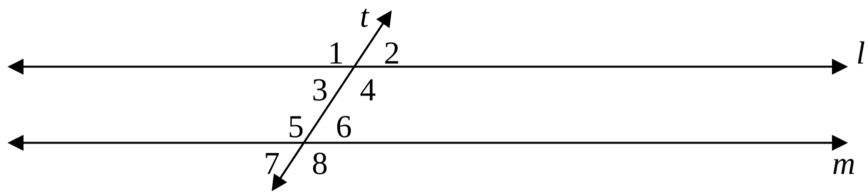
a. $\angle 1 \cong \angle 3$ m||n , corresponding ∠s

b. $\angle 4 \cong \angle 15$ a||b , Alternat exterior

c, $\angle 10 \cong \angle 13$ vertical ∠s , but we can say anything about || lines

d. $a \perp m$ and $b \perp m$ a||b , Thm 2.3.7 Line that are ⊥ to the same line are ||

Example 2: Determine the values of x or the angle so that the line *l* will be parallel to *m*.



a. If $m\angle 1 = 107°$, find $m\angle 5$ = 107 Corresponding ∠s

b. If $m\angle 4 = 106°$, find $m\angle 6$

$m\angle 4 + m\angle 6 = 180$

$m\angle 6 = 180 - 106 = 74°$

c. If $m\angle 2 = 72°$, find $m\angle 7 = 4x + 20$ Alt Ext $m\angle 2 = m\angle 7$

find x?

$72 = 4x + 20 \Rightarrow 52 = 4x \Rightarrow 13 = x$

d. If $m\angle 3 = 2x + 26$, $m\angle 5 = 6(x-1)$

$m\angle 3 + m\angle 5 = 180$

$2x + 26 + 6(x-1) = 180$

$2x + 26 + 6x - 6 = 180$

$8x + 20 = 180$

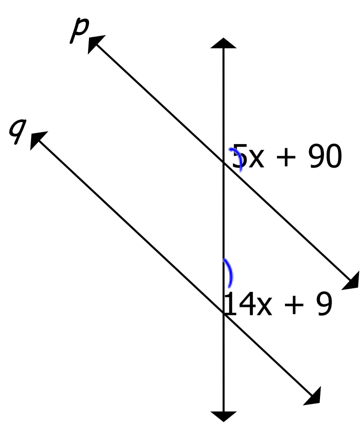
$8x = 160$

$x = 20$

$m\angle 3 = 2(20) + 26 = 66°$

$m\angle 5 = 6(20-1) = 6(19) = 114°$

Example 3: Find the value of x and the measure of each angle that will make $p \parallel q$



For p ∥ q we need

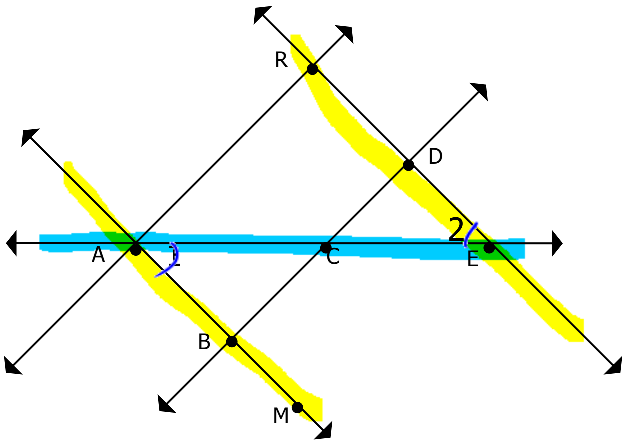
$5x + 90 = 14x + 9$

$90 - 9 = 14x - 5x$

$81 = 9x$

$9 = x$

Example 4: a. If $\angle 1 \cong \angle 2$ which lines must be parallel?

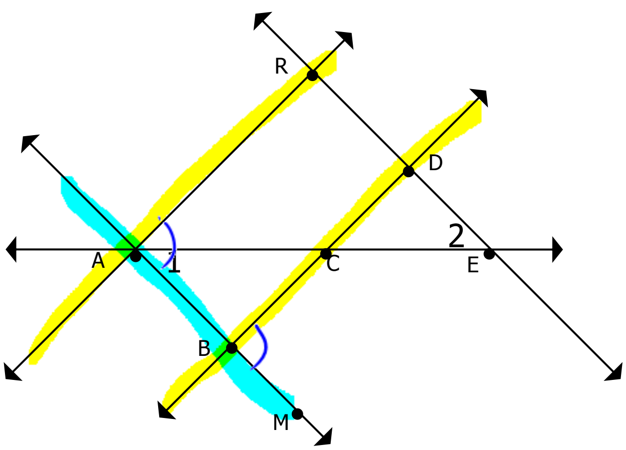


$\overleftrightarrow{AE}$ → transversal

$\angle 1 \cong \angle 2$ alt interior $\angle$s

$\therefore$ $\overleftrightarrow{AM} \parallel \overleftrightarrow{RE}$

b. If $\angle RAB \cong \angle CBM$, which lines must be parallel?



$\overleftrightarrow{AM}$ → transversal

$\angle RAB \cong \angle CBM$ corresponding $\angle$

$\therefore$ $\overleftrightarrow{AR} \parallel \overleftrightarrow{BD}$

OK, TRY: p. 87 #s 19 and 21