3-3 Proving Lines Parallel

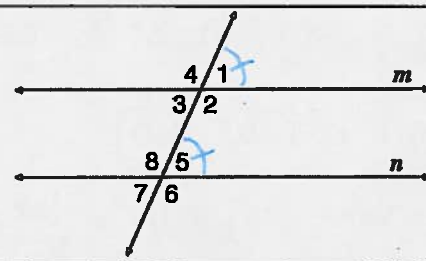
Recall: What is the *converse* of a conditional statement?

statement formed by switching hypothesis + conclusion

Corresponding Angles Converse Postulate

If $\angle 1 \cong \angle 5$, then $m \parallel n$.

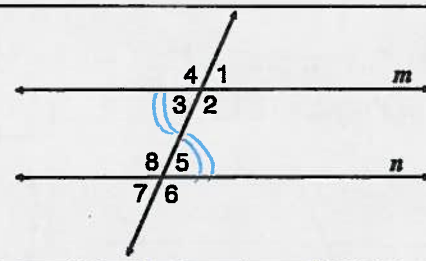
* you can exchange $\angle 1 \cong \angle 5$ with $\angle 2 \cong \angle 6$, $\angle 4 \cong \angle 8$, or $\angle 3 \cong \angle 7$



Alternate Interior Angles Converse Theorem

If $\angle 3 \cong \angle 5$, then $m \parallel n$

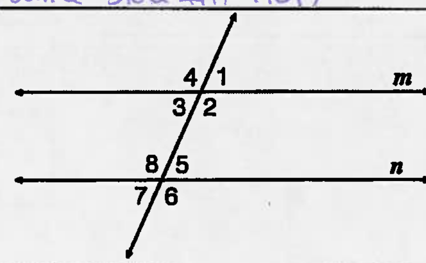
* you can exchange $\angle 3 \cong \angle 5$ with $\angle 2 \cong \angle 8$



Consecutive Interior Angles Converse Theorem (aka Same-Side Interior)

If $m\angle 2 + m\angle 5 = 180°$, then $m \parallel n$

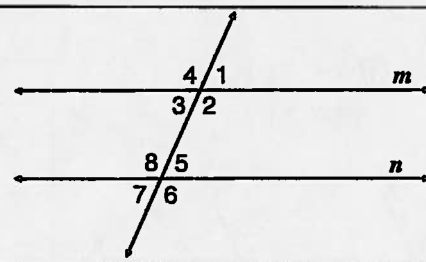
* you can also use $m\angle 3 + m\angle 8 = 180°$



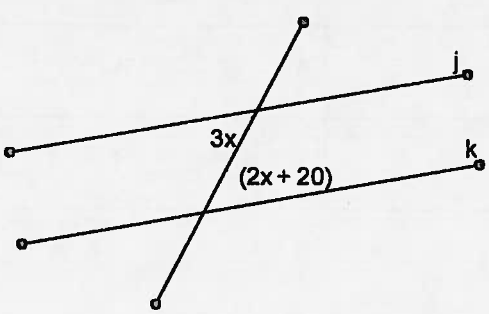
Alternate Exterior Angles Converse Theorem

If $\angle 1 \cong \angle 7$, then $m \parallel n$

* you can also use $\angle 4 \cong \angle 6$



EX 1) Find the value of x that makes $j \parallel k$.



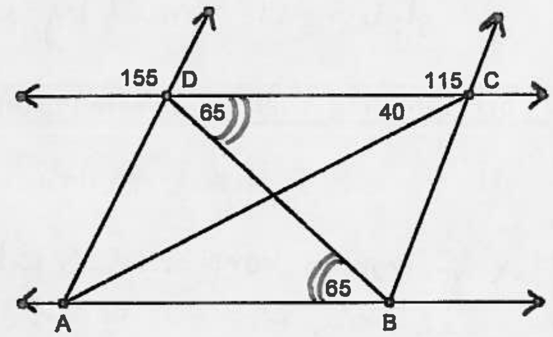
If $3x = 2x + 20$, then $j \parallel k$.

So $\boxed{x = 20}$

EX 2) Use the figure to the right to answer the following questions. Justify your answer.

a) Is $\overleftrightarrow{AB} \parallel \overleftrightarrow{DC}$? $\boxed{\text{Yes}}$

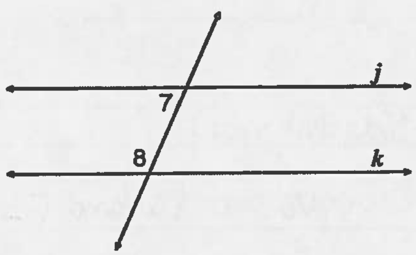
Since $\angle ABD \cong \angle BDC$, $\overleftrightarrow{AB} \parallel \overleftrightarrow{DC}$ by Alt. Int. ∠s Converse



b) Is $\overleftrightarrow{BC} \parallel \overleftrightarrow{AD}$? $\boxed{\text{NO}}$

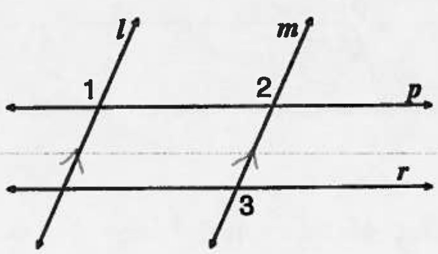
Since $155° \neq 115°$, the ∠s are not corresponding. So $\overleftrightarrow{BC}$ is not ∥ to $\overleftrightarrow{AD}$

EX 3) Given: $m\angle 7 = 125°$, $m\angle 8 = 55°$
Prove: $j \parallel k$



Statement	Reason
1. $m\angle 7 = 125°, m\angle 8 = 55°$	1. Given
2. $m\angle 7 + m\angle 8 = 180°$	2. ∠ Addition
3. ∠7 and ∠8 are supp.	3. Def. supp. ∠s
4. $j \parallel k$	4. Same-Side Int. ∠s Converse

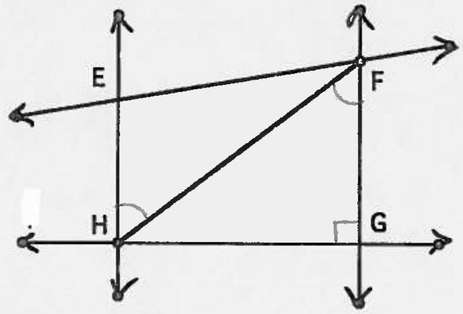
EX 4) Given: $l \parallel m$, $\angle 1 \cong \angle 3$
Prove: $r \parallel p$



Statement	Reason
1. $l \parallel m$	1. Given
2. $\angle 1 \cong \angle 2$	2. Corres. ∠s Post.
3. $\angle 1 \cong \angle 3$	3. Given
4. $\angle 2 \cong \angle 3$	4. Transitive
5. $r \parallel p$	5. Alt. Ext. ∠s Converse

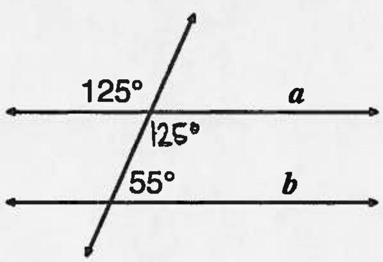
EX 5) Given: $\angle EHF \cong \angle HFG$, $\overleftrightarrow{FG} \perp \overleftrightarrow{GH}$

Prove: $\overleftrightarrow{EH} \perp \overleftrightarrow{GH}$



Statement	Reason
1. $\angle EHF \cong \angle HFG$	1. Given
2. $\overleftrightarrow{EH} \parallel \overleftrightarrow{FG}$	2. Alt. Int. ∠s Converse
3. $\overleftrightarrow{FG} \perp \overleftrightarrow{GH}$	3. Given
4. $\overleftrightarrow{HG}$ is transversal	4. Def. transversal
5. $\overleftrightarrow{EH} \perp \overleftrightarrow{GH}$	5. ⊥ Transversal Thm.

EX 6) Does the information given in the diagram allow you to conclude that $a \parallel b$? ***Explain***.



$\boxed{\text{YES}}$ By the Vertical ∠s Theorem the ∠ across from 125° is also 125°. The sum of 125° and 55° is 180°, so the ∠s are supplementary. since the ∠s are supplementary, a∥b by the Same-Side Interior ∠s Converse.