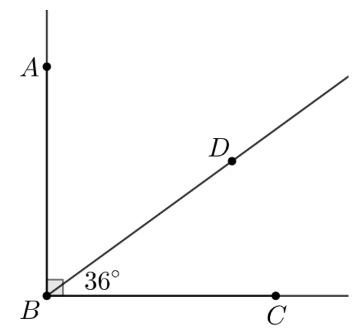
Name: ______________________________

# Lesson 1.13
# Angle Theorems

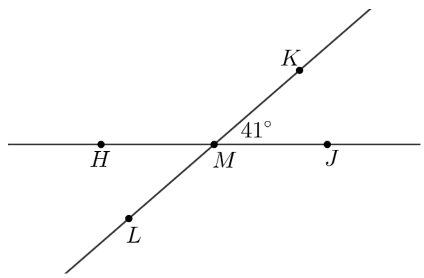
Geometry GT

## Recall

In the figure to the right, find $m\angle ABD$.

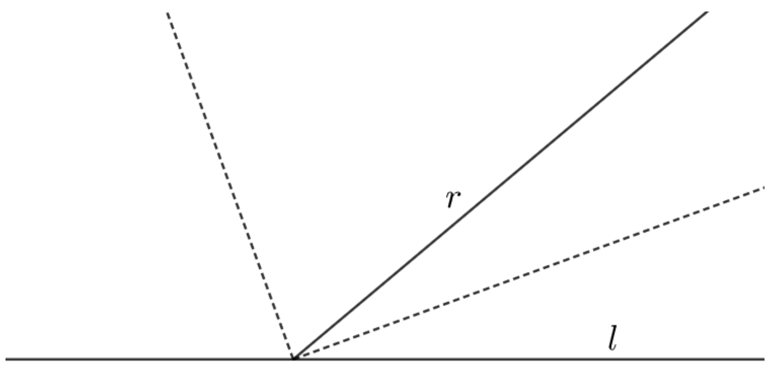



In the figure to the right, find $m\angle HML$ and $m\angle HMK$.




## Explore

In the figure below, ray $r$ meets line $l$, and the dashed lines are angle bisectors.

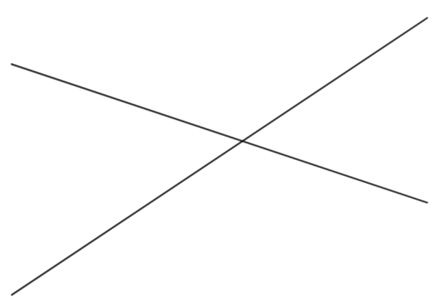


Noel made the conjecture: "The angle formed between the angle bisectors is always a right angle, no matter what the angle between $r$ and $l$ is." It is difficult to tell specifically which angles Noel is talking about in his conjecture. Label the diagram and rephrase Noel's conjecture more precisely using your labels.

Is the conjecture true? Explain your reasoning.

## Discuss

Here are two intersecting lines that create two pairs of vertical angles.



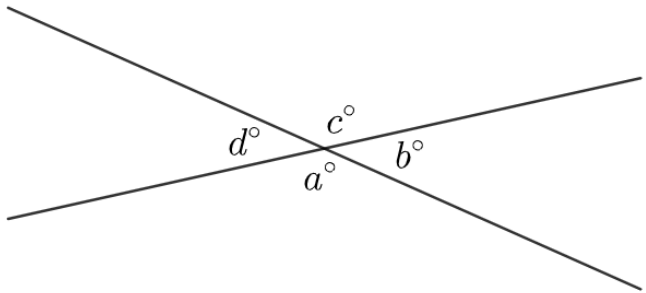
What is the relationship between vertical angles? Write down a conjecture. Label the diagram to make it easier to write your conjecture precisely.

How do you know your conjecture is true for all possible pairs of vertical angles? Explain your reasoning.

**Theorem**

Vertical angles are congruent.

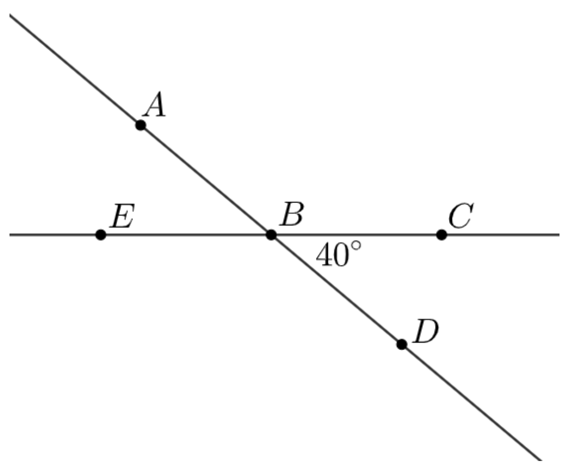
## Demonstrate



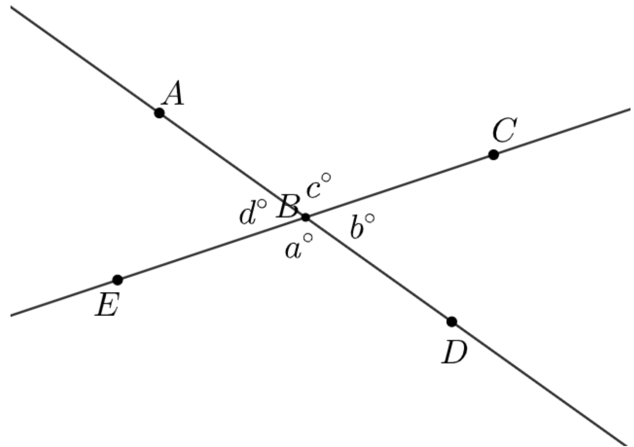

Use algebra to convincingly explain why $a = c$.

## Practice

**1.** What is $m\angle ABE$?



**2.** Select **all** true statements about the figure.




**A.** $c + b = d + c$

**B.** $d + b = 180$

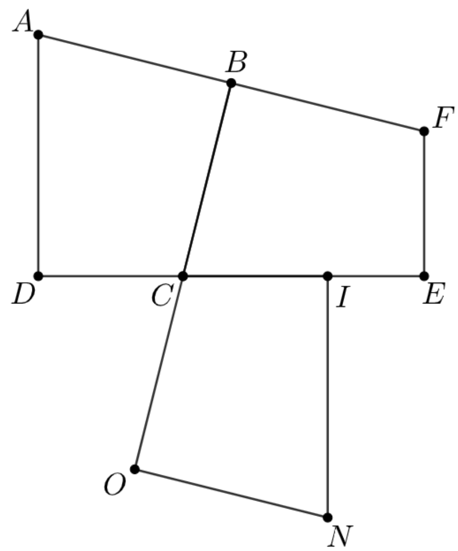
**C.** Rotate clockwise by $\angle ABC$ using center $B$, then $\angle CBD$ is the image of $\angle ABE$

**D.** Rotate 180° clockwise using center $B$, then $\angle CBD$ is the image of $\angle EBA$

**E.** Reflect across the angle bisector of $\angle ABC$, then $\angle CBD$ is the image of $\angle ABE$

**F.** Reflect across line $\overleftrightarrow{CE}$, then $\angle CBD$ is the image of $\angle EBA$

**3.** Draw the result of this sequence of transformations.




**A.** Rotate $ABCD$ clockwise by $\angle ADC$ using point $D$ as the center.

**B.** Translate the image by the directed line segment $\overline{DE}$.

**4.** Quadrilateral $ABCD$ is congruent to quadrilateral $A'B'C'D'$. Describe a sequence of rigid motions that take $A$ to $A'$, $B$ to $B'$, $C$ to $C'$, and $D$ to $D'$.