

A close-up photograph of a person wearing a white shirt, focused on working on a circuit board. The person is using a soldering iron, and their hands are visible as they manipulate components on the board. The background is dark with some blurred lights, suggesting a workshop or laboratory setting.

## 3.4 Parallel and Perpendicular Lines

*Learning Targets for today*

- ① To be able to recognize the relationship between three parallel lines.
- ① To be able to recognize the relationship between two lines that are perpendicular to the same line.

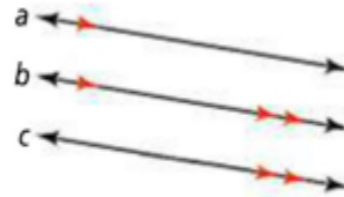
### Transitive Property of Parallel Lines

#### Theorem

If two lines are parallel to the same line, then they are parallel to each other.

If ...

$$a \parallel b \text{ and } b \parallel c$$



Then ...

$$a \parallel c$$

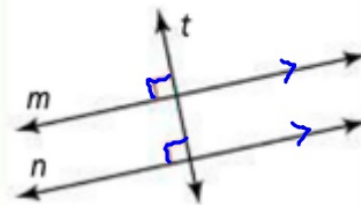
### Theorem 3-9

#### Theorem

In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

If ...

$$m \perp t \text{ and } n \perp t$$



Then ...

$$m \parallel n$$

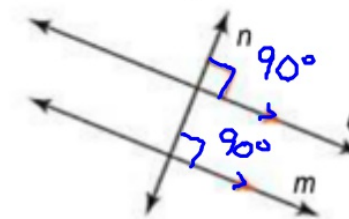
### Perpendicular Transversal Theorem

#### Theorem

In a plane, if a line is perpendicular to one of two parallel lines, then it is also perpendicular to the other.

If ...

$$n \perp \ell \text{ and } \ell \parallel m$$



Then ...

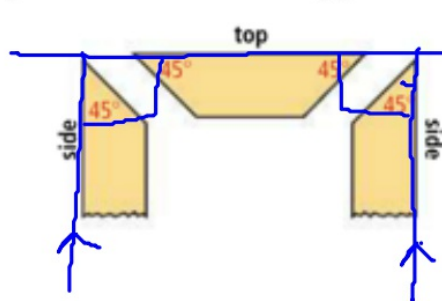
$$n \perp m$$



*Problem Solving with Parallel Lines*

**Example for you...**

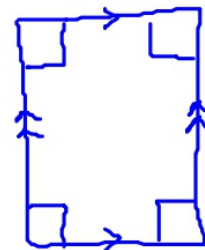
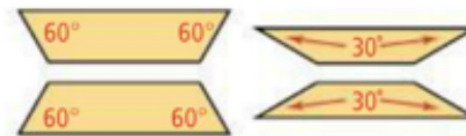
1. Can you assemble the pieces below to form a picture frame with opposite sides parallel? Explain?



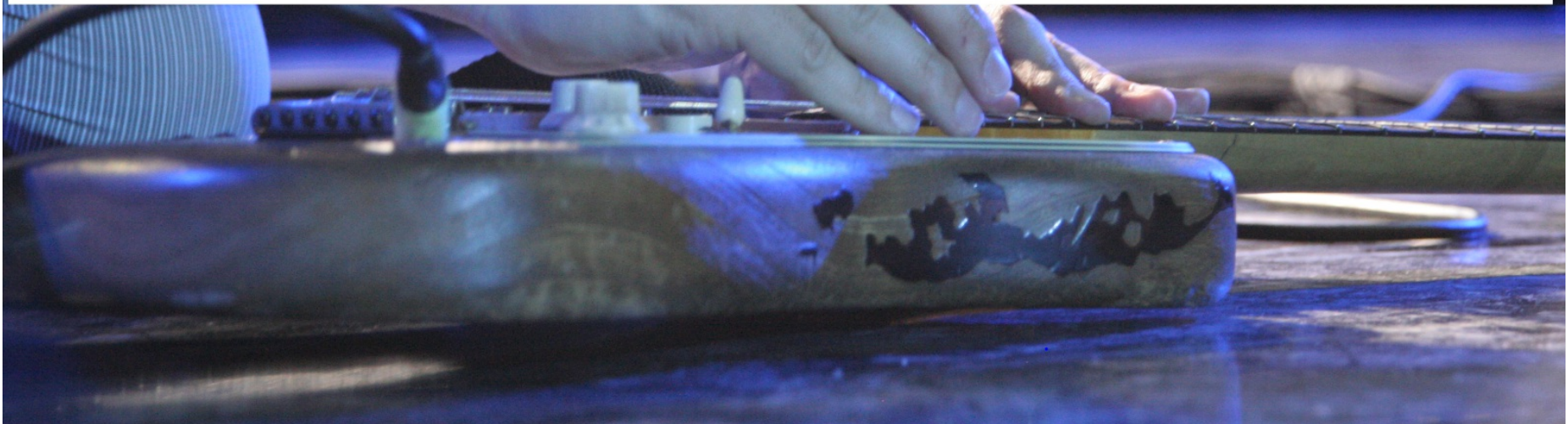
Thm 3-9  
Yes! Both  
"SIDES" are  
⊥ to TOP.

**Your turn to try...**

1. Can you assemble the pieces below to form a picture frame with opposite sides parallel? Explain?



\* all opposites  
are going to  
be parallel

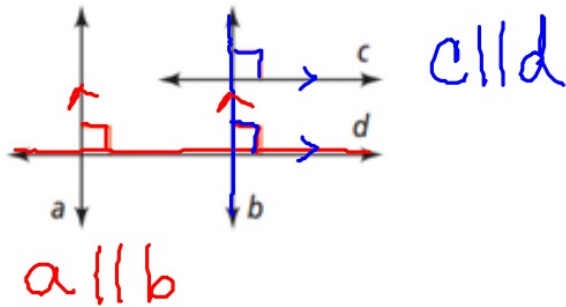




*Proving Relationships between Lines*

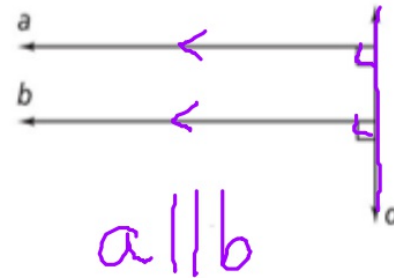
**Example for you...**

1. Use the diagram below to explain what lines are parallel.



**Your turn to try...**

1. Use the diagram below to explain what lines are parallel.





## Proving Relationships between Lines

### Example for you...

1. A developer is planning a new housing complex. The map of the complex is below. Assume that all streets lie in a plane.

a. If Washington and Lincoln Streets are to be parallel, what must be true of  $\angle 1$  and  $\angle 2$ ?

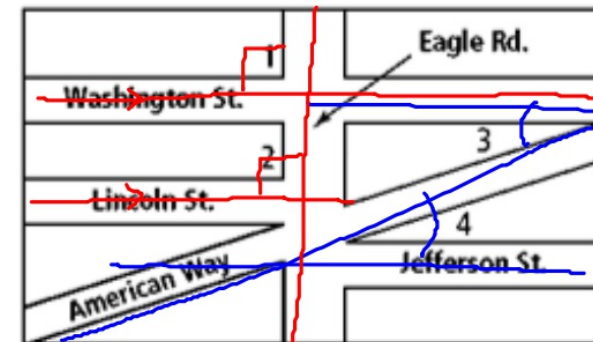
*Congruent angles*

b. Which streets must be parallel if  $\angle 3 \cong \angle 4$ ? Justify your answer.

*Jefferson St. + Washington St.*

c. If  $m\angle 1 = 90$  and your answers to parts (a) and (b) are true, to what roads is Eagle Road perpendicular?

*Washington St. + Lincoln St.*





*Proving Relationships between Lines*

**Your turn to try...**

1. If Adam Ct. is perpendicular to Bertha Dr. and Charles St., what must be true?  
 (A) Adam Ct.  $\perp$  Edward Rd.     (C) Adam Ct.  $\parallel$  Dana La.  
 (B) Bertha Dr.  $\parallel$  Charles St.     (D) Dana La.  $\perp$  Charles St.
2. Adam Ct. is perpendicular to Charles St. and Charles St. is parallel to Edward Rd. What must be true?  
 (E) Adam Ct.  $\perp$  Edward Rd.     (H) Bertha Dr.  $\parallel$  Charles St.  
 (G) Adam Ct.  $\parallel$  Dana La.     (I) Dana La.  $\perp$  Charles St.

