

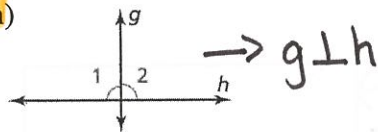
All about Perpendicular Lines (Day 2)

Lesson Objective

INBAT use + prove theorems about $\perp$ lines.

Perpendicular Line Theorems (** to abbreviate "transversal," we will use transv). (***)

Linear Pair Perpendicular Theorem: If two lines intersect to form a linear pair of $\cong$ angles, then the lines are perpendicular. (Lin. Pair $\perp$ Thm)



$$m\angle 1 + m\angle 2 = 180$$

PROOF: Given: $\angle 1 \cong \angle 2$

Prove: $g \perp h$

$$\angle 1 \cong \angle 2$$

given

$$m\angle 1 = m\angle 2$$

if $\angle$'s $\cong \rightarrow \angle$'s $=$

$$m\angle 1 + m\angle 1 = 180$$

subst. prop.

$$2m\angle 1 = 180$$

simplify

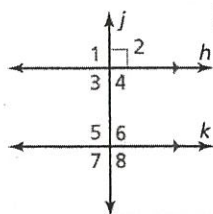
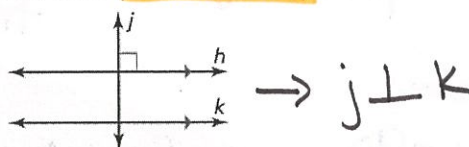
$$m\angle 1 = 90$$

Div. prop.

$$g \perp h$$

if intersect @ $90^\circ \rightarrow \perp$

Perpendicular Transversal Theorem: In a plane, if a transversal is $\perp$ to one of the two parallel lines, then it is $\perp$ to the other line. ($\perp$ Transv. Thm)



PROOF: Given: $h \parallel k, j \perp h$

Prove: $j \perp k$

use this diagram

$$h \parallel k$$

given

$$\angle 2 \cong \angle 6$$

if $\parallel \rightarrow$ corresp $\angle$'s $\cong$

$$m\angle 2 = m\angle 6$$

if $\angle$'s $\cong \rightarrow \angle$'s $=$

$$j \perp h$$

given

$$m\angle 2 = 90^\circ$$

if $\perp \rightarrow$ intersect @ 90°

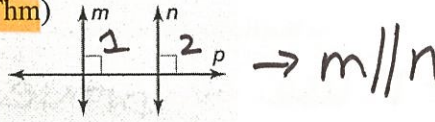
$$m\angle 6 = 90^\circ$$

trans. prop. =

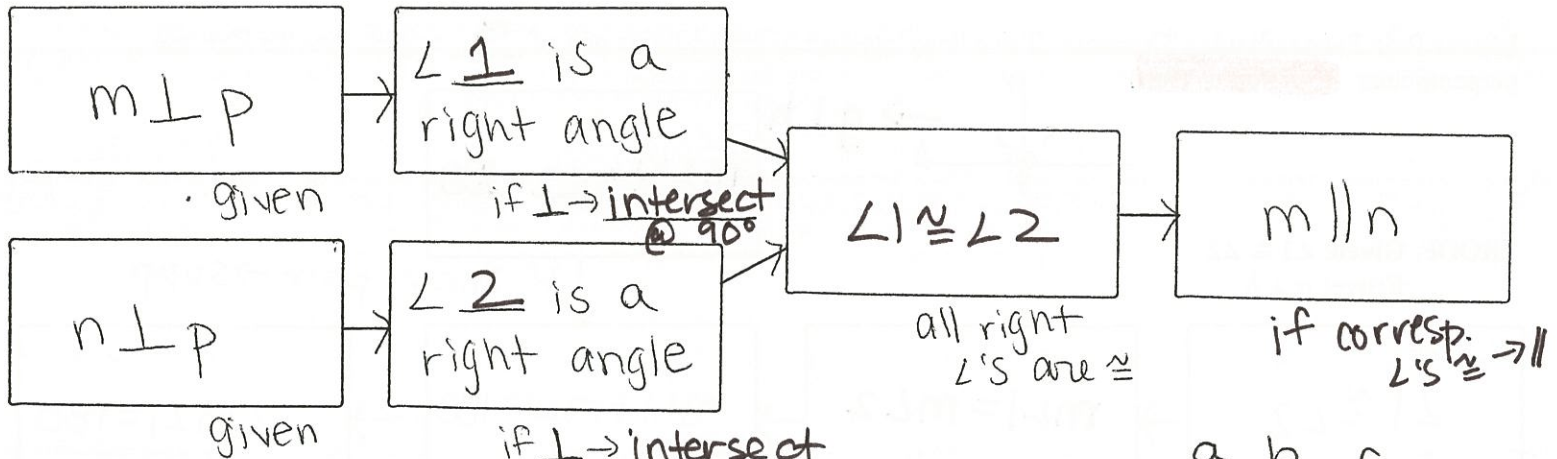
$$j \perp k$$

if intersect @ $90^\circ \rightarrow \perp$

Lines Perpendicular to a Transversal Theorem: In a plane, if two lines are $\perp$ to the same line, then the two lines are $\parallel$ to each other. (Line $\perp$ to Transv. Thm)



PROOF: Given: $m \perp p, n \perp p$
Prove: $m \parallel n$



Examples:

1. Determine if there is enough information given in the diagram to prove each statement.

a. $\angle 1 \cong \angle 2$

yes, ~~vert.~~ vert. $\angle$'s $\cong$

b. $\angle 1 \cong \angle 3$

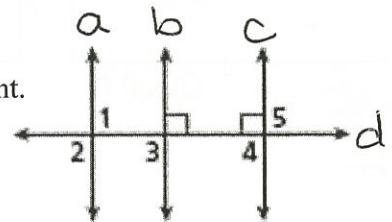
No!

c. $a \perp d$

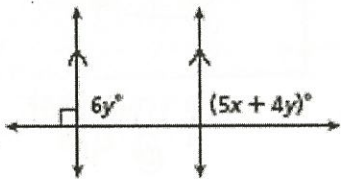
No!

d. $b \parallel c$

yes! by line $\perp$ to transv. thm.



2. Solve to find x and y in the diagram.

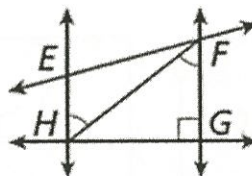


$$\begin{aligned} 6y &= 90 \\ y &= 15 \end{aligned}$$

$$\begin{aligned} 5x + 4y &= 90 \\ 5x + 4(15) &= 90 \end{aligned}$$

$$\begin{aligned} 5x &= 30 \\ x &= 6 \end{aligned}$$

3. Given: $\angle EHF \cong \angle HFG, \overline{FG} \perp \overline{GH}$
Prove: $\overline{EH} \perp \overline{GH}$



Write the flow chart with your group!
HINT: Use the $\perp$ Transv. Thm