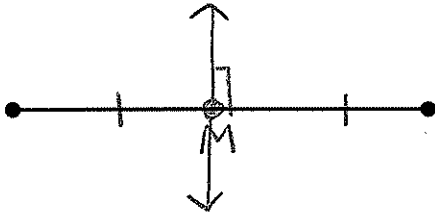


Objective: Prove and apply theorems about perpendicular lines.

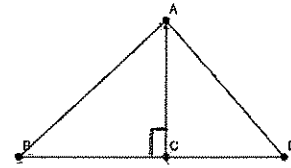
1) **Perpendicular Bisector:** a line which is \perp to a segment at its midpoint.

- Example.

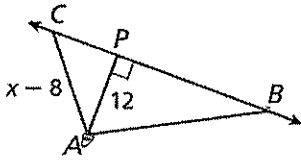


2) **Distance to a Line:** the "distance" from a point to a line is always a \perp segment line intersecting at 90° .

- Which is the distance from point A to line BD? AC



EX 1: Which segment is the shortest distance from A to BC? AP



Write and solve an *inequality* for x. ($<$ or $>$)

$$\begin{array}{r} x-8 > 12 \\ +8 \quad +8 \\ \hline x > 20 \quad \boxed{D} \end{array}$$

$$\begin{array}{r} AC > AP \quad \boxed{A} \\ \hline AP \perp AC \end{array}$$

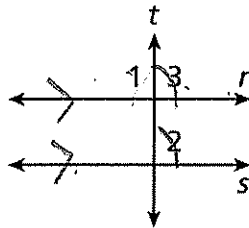
$$12 < x-8 \quad x > 20$$

3) **Theorems about Perpendicular Lines:**

| Theorem | If... (hypothesis) | Picture | then... (conclusion) |
|--|---|---------|--|
| Linear Pair of Congruent Angles Theorem | 2 lines form a linear pair with <u>Congruent</u> angles, ... | | the lines are <u>perpendicular</u> \perp <u>l m</u> |
| Perpendicular Transversal Theorem | a transversal is perpendicular to 1 of 2 <u>parallel</u> lines, ... | | it is <u>perpendicular</u> to the other line. <u>q</u> \perp <u>p</u> |
| Perpendicular to Same Line Theorem | 2 lines are perpendicular to the <u>same</u> line, ... | | the 2 lines are <u>parallel</u> . <u>r</u> \parallel <u>s</u> |

EX 2: Given: $r \parallel s, \angle 1 \cong \angle 2$

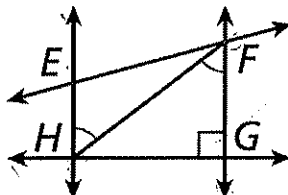
Prove: $r \perp t$



| Statements | Reasons |
|---|--------------------------------|
| 1. $r \parallel s, \angle 1 \cong \angle 2$ | 1. Given |
| 2. $\angle 2 \cong \angle 3$ | 2. Corresp. \angle 's Post. |
| 3. $\angle 1 \cong \angle 3$ | 3. Transitive Prop. of \cong |
| 4. $r \perp t$ | 4. Linear Pair of CAT |

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

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



| Statements | Reasons |
|--|---------------------------------------|
| 1. $\angle EHF \cong \angle HFG$ | 1. Given |
| 2. $\overline{EH} \parallel \overline{FG}$ | 2. Converse of Alt. Int. \angle Th. |
| 3. $\overline{FG} \perp \overline{GH}$ | 3. Given |
| 4. $\overline{EH} \perp \overline{GH}$ | 4. Perp. Trans. Th. |