Name: ___________________________

Date: ___________________________

Period: _________________________

Geometry Lesson 5

Objective: TSW use postulates and theorems to understand and manipulate points, lines, and planes.

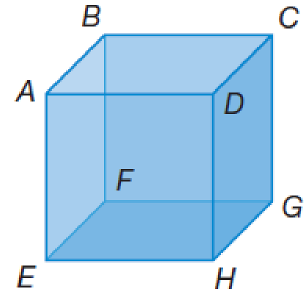
Lines and planes are classified by whether or not they intersect and how they intersect. _________________________

Lines – When lines intersect to form a right angle. The symbol to show that two lines are perpendicular is $\perp$.

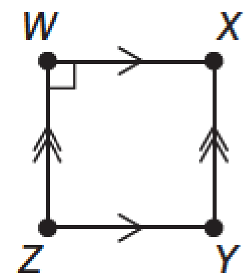
In the diagram, $\overline{AE}$ and $\overline{EH}$ are perpendicular, or simply _______________________.

Parallel Lines – Coplanar lines that do not intersect. The symbol to show that two lines are parallel is $\parallel$. In the diagram __________________.

Parallel Planes – Planes that do not intersect. In the diagram plane ABC is parallel to plane EFG.



To indicate that lines are perpendicular on a diagram, it is only necessary to indicate that two segments intersect at a right angle, as $\overline{WX}$ and $\overline{WZ}$do in the diagram of the square $WXYZ$. To indicate that lines are parallel in a diagram, ___________________________ are drawn on them. In the diagram the corresponding arrowheads indicate that $\overline{WX} \parallel \overline{ZY}$ and $\overline{WZ} \parallel \overline{XY}$.



Math Language

Planes, segments, and rays can also be perpendicular to one another if they intersect at 90° angles.

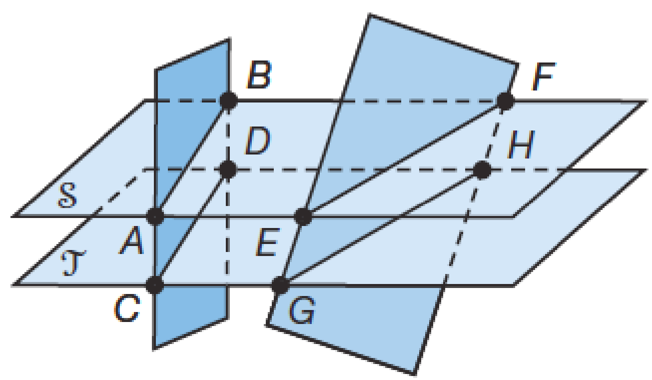
____________ Lines – Lines that are not in the same plane and do not intersect. $\overline{DH}$ and $\overline{EF}$ on the cube above are skew.

Theorem 5-1: If two parallel planes are cut by a third plane, then the lines of the intersection are parallel.

Example 1. Identifying Parallel Lines.

In the figure, plane S and T are parallel. Identify two pairs of parallel lines.

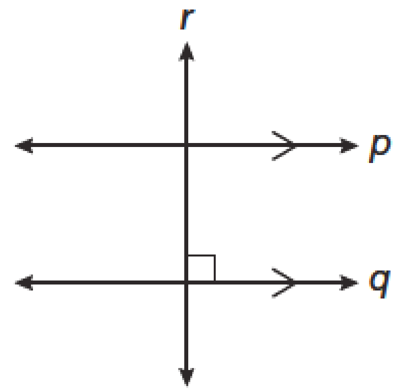
Solution



Theorem 5-2: If two lines in a plane are perpendicular to the same line, then they are parallel to each other.

Theorem 5-3: In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other one.

In the diagram if $p \parallel q$ and $r \perp q$, then r is also perpendicular to p by Theorem _____________.



Perpendicular lines actually create four right angles.

Math Reasoning

Formulate Recall that a circle is 360°. How could you use this information to show that four congruent adjacent angles must all be right angles?

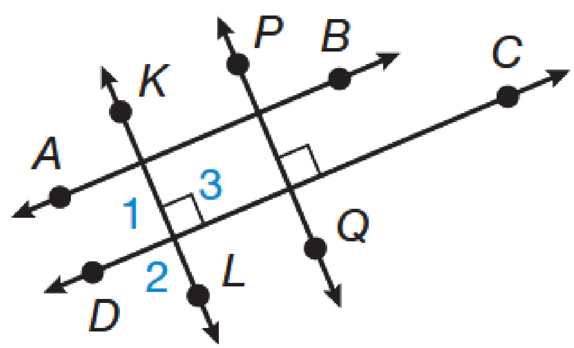
Theorem 5-4: If two lines are perpendicular, then they form congruent adjacent angles.

Theorem 5-5: If two lines form congruent adjacent angles, then they are perpendicular.

Theorem 5-6: All right angles are congruent.

Example 2. Classifying Pairs of Lines.

In the figure, $\overleftrightarrow{AB} \parallel \overleftrightarrow{DC}$, $\overleftrightarrow{KL} \perp \overleftrightarrow{DC}$, and $\overleftrightarrow{PQ} \perp \overleftrightarrow{DC}$



a. What is the relationship between $\overleftrightarrow{KL}$ and $\overleftrightarrow{AB}$?
Solution

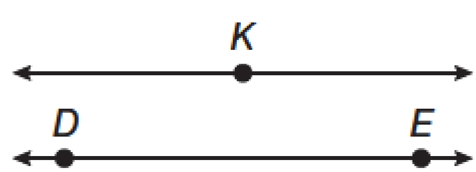
b. What is the relationship between $\overleftrightarrow{KL}$ and $\overleftrightarrow{PQ}$?
Solution

c. What is the measure of $\angle 1$? What is the measure of $\angle 2$?
Solution

Postulate 10: The Parallel Postulate – Through a point not on a line, there exists exactly one line through the point that is parallel to the line.

Example 3. Using the Parallel Postulate

Draw as many lines as possible that are parallel to $\overleftrightarrow{DE}$, through a point K that is not on $\overleftrightarrow{DE}$.



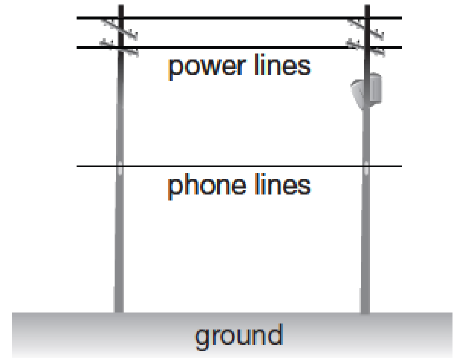
Solution

Hint

The distance between two parallel lines is the same at every point.

Theorem 5-7: Transitive Property of Parallel Lines – If two lines are parallel to the same line, then they are parallel to one another.

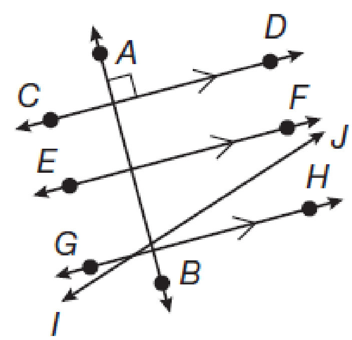
Example 4. Application: Power Lines
Felix is repairing power lines and he needs to ensure that the power lines are parallel. After taking some measurements, he determined that the upper power line and the phone line are parallel and the lower power line and the phone line are parallel. Does Felix have enough information to conclude that the upper and lower power lines are parallel?
Solution



> **Math Reasoning**
>
> **Model** What measurements should Felix take to be sure that the phone line and the power line are approximately parallel?

You Try!!!!

b. In this figure, $\overleftrightarrow{CD} \parallel \overleftrightarrow{GH}$, and $\overleftrightarrow{CD} \perp \overleftrightarrow{AB}$. What is the relationship between $\overleftrightarrow{AB}$ and $\overleftrightarrow{GH}$?



c. If $\overleftrightarrow{RS} \perp \overleftrightarrow{XY}$ and $\overleftrightarrow{VW} \perp \overleftrightarrow{XY}$, what is the relationship between $\overleftrightarrow{RS}$ and $\overleftrightarrow{VW}$?