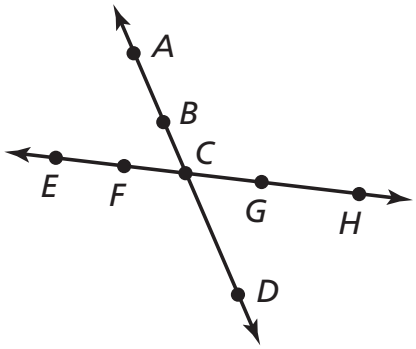
3.1 Start Thinking

Sketch two perpendicular lines that intersect at point A. Plot one point on each line that is not A. Call these points B and C. Connect B and C to make $\overline{BC}$. What type of figure do points A, B, and C make? Could you ever plot points B and C to make a perpendicular segment to either original line? A parallel segment? Explain your reasoning.

3.1 Warm Up

Use the diagram.



1. What is another name for $\overleftrightarrow{BD}$?
2. What is another name for $\overline{EG}$?
3. What is another name for $\overrightarrow{CH}$?
4. Name all segments with endpoint B.
5. Name one pair of opposite rays.
6. Name a point on $\overleftrightarrow{AC}$.

3.1 Cumulative Review Warm Up

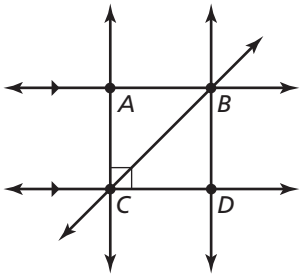
The midpoint *M* and one endpoint of $\overline{JK}$ are given. Find the coordinates of the other endpoint.

1. $M(5, 2)$ and $J(6, -7)$
2. $M(-14, -5)$ and $K(-1, 8)$
3. $M(9, -1)$ and $J(-3, 0)$

Name_____ Date _____

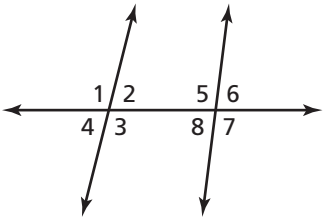
3.1 Practice A

In Exercises 1–4, use the diagram.

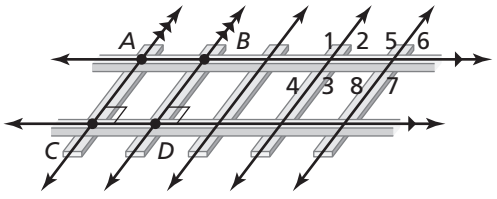


1. Name a pair of parallel lines.
2. Name a pair of perpendicular lines.
3. Is $\overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$? Explain.
4. Is $\overleftrightarrow{BD} \perp \overleftrightarrow{CD}$? Explain.

In Exercises 5–8, identify all pairs of angles of the given type.



5. alternate interior
6. alternate exterior
7. corresponding
8. consecutive interior
9. Is it possible to draw three lines in two planes such that all three lines are skew? Explain your reasoning.
10. How many pairs of consecutive interior angles do you have when two horizontal lines are intersected by a transversal? How many pairs of consecutive interior angles do you have when three horizontal lines are intersected by a transversal? How many pairs of consecutive interior angles do you have when n horizontal lines are intersected by a transversal?
11. The given markings show how the railroad ties on a railroad track are related to each other.



   a. Name two pairs of parallel lines.

   b. Name two pairs of perpendicular lines.

   c. Name all pairs of consecutive interior angles.

   d. Name all pairs of corresponding angles.

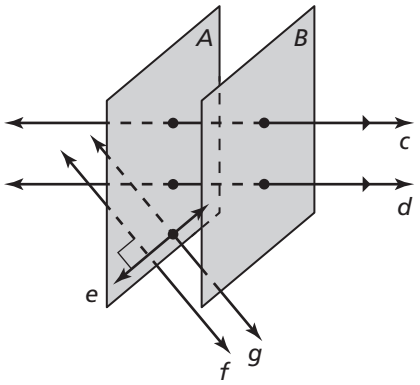
   e. Name all pairs of alternate interior angles.

   f. Name all pairs of alternate exterior angles.

Name _____ Date _____

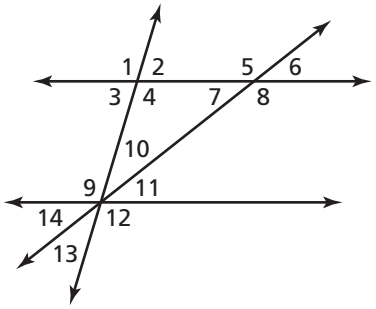
3.1 Practice B

In Exercises 1–6, use the diagram.

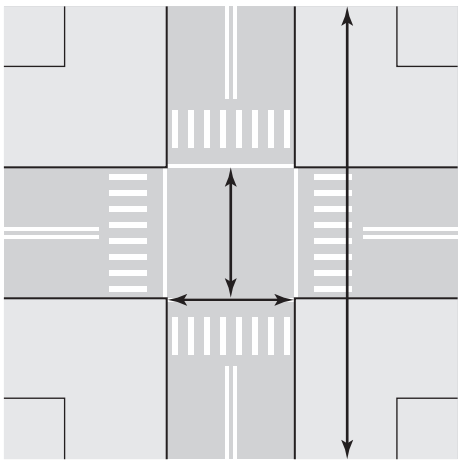


1. Name a pair of parallel lines.
2. Name a pair of perpendicular lines.
3. Name a pair of skew lines.
4. Name a pair of parallel planes.
5. Is line f parallel to line g? Explain.
6. Is line e perpendicular to line g? Explain.

In Exercises 7–11, classify the angle pair as *corresponding, alternate interior*, *alternate exterior,* or *consecutive interior* angles.



7. $\angle 4$ and $\angle 9$
8. $\angle 1$ and $\angle 9$
9. $\angle 1$ and $\angle 12$
10. $\angle 6$ and $\angle 11$
11. $\angle 4$ and $\angle 7$
12. Two planes are parallel and each plane contains a line. Are the two lines skew? Explain your reasoning.
13. Use the figure to decide whether the statement is true or false. Explain your reasoning.



   a. The line containing the sidewalk and the line containing the center of the road are parallel to each other.

   b. The line containing the center of the road is skew to the line containing the crosswalk.

   c. The plane containing a stop sign is perpendicular to the plane containing the ground.

Name_____ Date _____

3.1 Enrichment and Extension

Pairs of Lines and Angles

1. If two parallel planes are cut by a third plane, are the lines of intersection parallel? Explain your reasoning and include a drawing.

2. Draw line a parallel to line b. Draw line c parallel to line b. What relationship appears to exist between lines a and c? Make a conjecture about two lines that are parallel to the same line.

3. Draw line ℓ perpendicular to a line m. Draw a line n perpendicular to line m. What relationship appears to exist between line ℓ and line n? Make a conjecture about two lines that are perpendicular to the same line.

In Exercises 4 and 5, draw the figure described.

4. Lines ℓ and m are skew, lines ℓ and n are skew, and lines m and n are parallel.

5. Line ℓ is parallel to plane A, plane A is parallel to plane B, and line ℓ is not parallel to plane B.

6. List all possible answers for each.

   a. $\angle 1$ and _____ are corresponding angles.

   b. $\angle 13$ and _____ are corresponding angles.

   c. $\angle 14$ and _____ are consective interior angles.

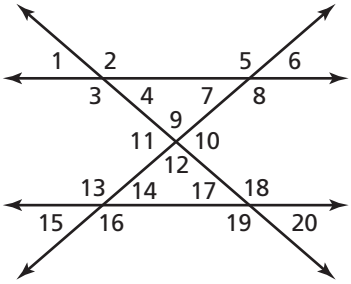
   d. $\angle 4$ and _____ are consective interior angles.

   e. $\angle 7$ and _____ are alternate interior angles.

   f. $\angle 17$ and _____ are alternate interior angles.

   g. $\angle 6$ and _____ are alterior exterior angles.

   h. $\angle 18$ and _____ are alternate exterior angles.



Name _____ Date _____

3.1 Puzzle Time

What Has A Foot On Each End And One In The Middle?

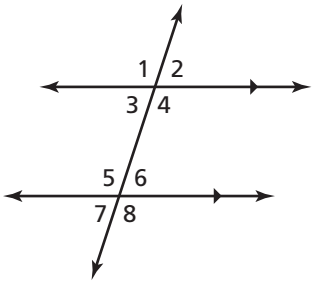
Write the letter of each answer in the box containing the exercise number.

Fill in the blank.

1. Two lines are _____ if and only if they are both vertical lines or they both have the same slope.
2. Two lines are _____ if and only if one is vertical and the other is horizontal or the slopes of the lines are negative reciprocals of each other.
3. Two lines are _____ if and only if their equations are equivalent.
4. Two lines are _____ lines when they do not intersect and are not coplanar.
5. A(n) _____ is a line that intersects two or more coplanar lines at different points.

Identify the type of the pairs of angles.

6. $\angle 3$ and $\angle 5$
7. $\angle 1$ and $\angle 8$
8. $\angle 2$ and $\angle 6$
9. $\angle 1$ and $\angle 4$
10. $\angle 4$ and $\angle 5$



Answers

G. unskew
K. coincident
H. conditional
C. alternate exterior angles
I. transversal
T. angular
U. straight
S. skew
L. horizontal
R. perpendicular
N. lined angles
T. vertical angles
P. inverse angles
A. parallel
D. consecutive interior angles
B. revolving angles
L. converse angles
Y. alternate interior angles
M. intersecting angles
A. corresponding angles

1		10	8	2	6	4	9	5	7	3