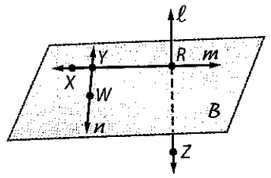
Check Your Understanding

= Step-by-Step Solutions begin on page R14.

Example 1 **Use the figure to name each of the following.**



1. a line containing point X
2. a line containing point Z
3. a plane containing points W and R

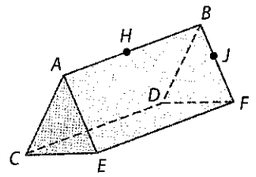
Example 2 **Name the geometric term modeled by each object.**

4. a beam from a laser
5. a floor

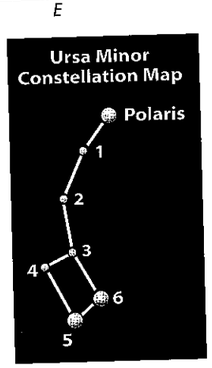
Example 3 **Draw and label a figure for each relationship.**

6. A line in a coordinate plane contains $A(0, -5)$ and $B(3, 1)$ and a point C that is not collinear with $\overleftrightarrow{AB}$.
7. Plane Z contains lines x, y, and w. Lines x and y intersect at point V and lines x and w intersect at point P.

Example 4 **Refer to the figure.**



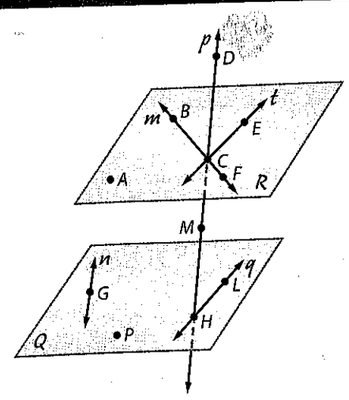
8. How many planes are shown in the figure?
9. Name three points that are collinear.
10. Are points A, H, J, and D coplanar? Explain.
11. Are points B, D, and F coplanar? Explain.
12. **ASTRONOMY** Ursa Minor, or the Little Dipper, is a constellation made up of seven stars in the northern sky including the star Polaris.
    a. What geometric figures are modeled by the stars?
    b. Are Star 1, Star 2, and Star 3 collinear on the constellation map? Explain.
    c. Are Polaris, Star 2, and Star 6 coplanar on the map?



Practice and Problem Solving

Extra Practice is on page R1.

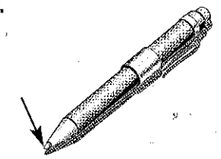
Example 1 **Refer to the figure.**



13. Name the lines that are only in plane Q.
14. How many planes are labeled in the figure?
15. Name the plane containing the lines m and t.
16. Name the intersection of lines m and t.
17. Name a point that is not coplanar with points A, B, and C.
18. Are points F, M, G, and P coplanar? Explain.
19. Name the points not contained in a line shown.
20. What is another name for line t?
21. Does line n intersect line q? Explain.

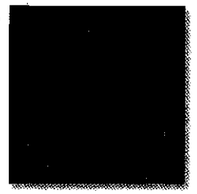
Example 2 **Name the geometric term(s) modeled by each object.**

22.

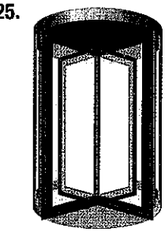


23.

24.



25.

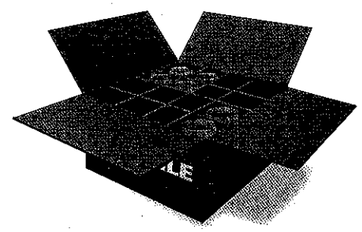


26. a blanket
27. a knot in a rope
28. a telephone pole
29. the edge of a desk
30. two connected walls
31. a partially opened folder

Example 3 **Draw and label a figure for each relationship.**

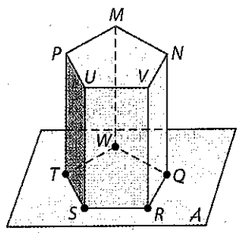
32. Line m intersects plane R at a single point.
33. Two planes do not intersect.
34. Points X and Y lie on $\overleftrightarrow{CD}$.
35. Three lines intersect at point J but do not all lie in the same plane.
36. Points $A(2, 3)$, $B(2, -3)$, C and D are collinear, but A, B, C, D, and F are not.
37. Lines $\overleftrightarrow{LM}$ and $\overleftrightarrow{NP}$ are coplanar but do not intersect.
38. $\overleftrightarrow{FG}$ and $\overleftrightarrow{JK}$ intersect at $P(4, 3)$, where point F is at $(-2, 5)$ and point J is at $(7, 9)$.
39. Lines s and t intersect, and line v does not intersect either one.

Example 4 **MODELING When packing breakable objects such as glasses, movers frequently use boxes with inserted dividers like the one shown.**



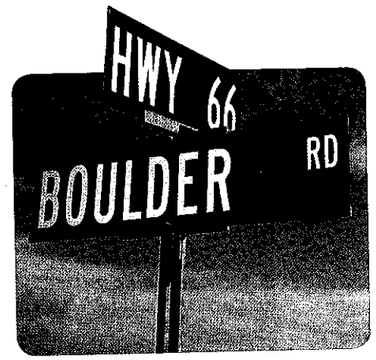
40. How many planes are modeled in the picture?
41. What parts of the box model lines?
42. What parts of the box model points?

Refer to the figure at the right.



43. Name two collinear points.
44. How many planes appear in the figure?
45. Do plane A and plane MNP intersect? Explain.
46. In what line do planes A and QRV intersect?
47. Are points T, S, R, Q, and V coplanar? Explain.
48. Are points T, S, R, Q, and W coplanar? Explain.

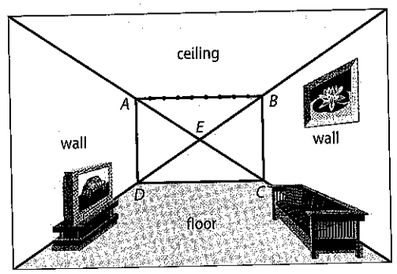
49. FINITE PLANES A *finite plane* is a plane that has boundaries, or does not extend indefinitely. The street signs shown are finite planes.



a. If the pole models a line, name the geometric term that describes the intersection between the signs and the pole.

b. What geometric term(s) describes the intersection between the two finite planes? Explain your answer with a diagram if necessary.

50. ONE-POINT PERSPECTIVE One-point perspective drawings use lines to convey depth. Lines representing horizontal lines in the real object can be extended to meet at a single point called the *vanishing point*. Suppose you want to draw a tiled ceiling in the room below with nine tiles across.

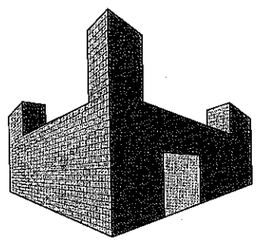


a. What point represents the vanishing point in the drawing?

b. Trace the figure. Then draw lines from the vanishing point through each of the eight points between *A* and *B*. Extend these lines to the top edge of the drawing.

c. How could you change the drawing to make the back wall of the room appear farther away?

51. TWO-POINT PERSPECTIVE Two-point perspective drawings use two vanishing points to convey depth.



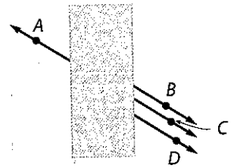
a. Trace the drawing of the castle shown. Draw five of the vertical lines used to create the drawing.

b. Draw and extend the horizontal lines to locate the vanishing points and label them.

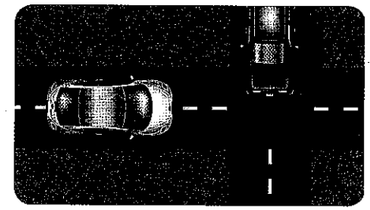
c. What do you notice about the vertical lines as they get closer to the vanishing point?

d. Draw a two-point perspective of a home or a room in a home.

52. CCSS ARGUMENTS Name two points on the same line in the figure. How can you support your assertion?



53. TRANSPORTATION When two cars enter an intersection at the same time on opposing paths, one of the cars must adjust its speed or direction to avoid a collision. Two airplanes, however, can cross paths while traveling in different directions without colliding. Explain how this is possible.



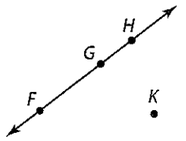
54. MULTIPLE REPRESENTATIONS Another way to describe a group of points is called a locus. A locus is a set of points that satisfy a particular condition. In this problem, you will explore the locus of points that satisfy an equation.

a. Tabular Represent the locus of points satisfying the equation $2 + x = y$ using a table of at least five values.

b. Graphical Represent this same locus of points using a graph.

c. Verbal Describe the geometric figure that the points suggest.

55. PROBABILITY Three of the labeled points are chosen at random.



a. What is the probability that the points chosen are collinear?

b. What is the probability that the points chosen are coplanar?

56. MULTIPLE REPRESENTATIONS In this problem, you will explore the locus of points that satisfy an inequality.

a. Tabular Represent the locus of points satisfying the inequality $y < -3x - 1$ using a table of at least ten values.

b. Graphical Represent this same locus of points using a graph.

c. Verbal Describe the geometric figure that the points suggest.

H.O.T. Problems Use Higher-Order Thinking Skills

57. OPEN ENDED Sketch three planes that intersect in a line.

58. ERROR ANALYSIS Camille and Hiroshi are trying to determine the most number of lines that can be drawn using any two of four random points. Is either correct? Explain.

Camille	*Hiroshi*
Since there are four points, 4 · 3 or 12 lines can be drawn between the points.	*You can draw 3 · 2 · 1 or 6 lines between the points.*

59. CCSS ARGUMENTS What is the greatest number of planes determined using any three of the points *A*, *B*, C, and *D* if no three points are collinear?

60. REASONING Is it possible for two points on the surface of a prism to be neither collinear nor coplanar? Justify your answer.

61. WRITING IN MATH Refer to Exercise 49. Give a real-life example of a finite plane. Is it possible to have a real-life object that is an infinite plane? Explain your reasoning.