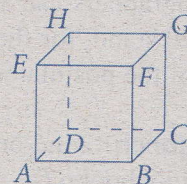




Euclid is known for compiling all the geometry of his time into postulates and theorems. His masterwork *The Elements* (about 300 B.C.) is the basis for geometry books today.

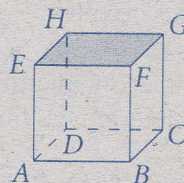
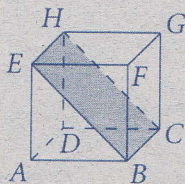
### Example

Are points  $E, H, B,$  and  $C$  coplanar?  
Are points  $E, H, F,$  and  $B$  coplanar?



Yes, the plane that contains the three noncollinear points  $E, H,$  and  $B$  also contains  $C$ .

No, points  $E, H,$  and  $F$  lie in exactly one plane, which doesn't contain  $B$ .



## Exercises ON YOUR OWN

Are the points collinear?

1.  $A, D, E$       2.  $B, C, D$       3.  $B, C, F$       4.  $A, E, C$       5.  $F, B, D$

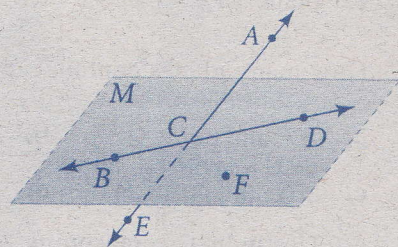
Are the points coplanar?

6.  $B, C, D, F$       7.  $A, C, D, F$       8.  $B, D, E, F$       9.  $A, C, E, F$

10. Name plane  $M$  in another way.

11. What is the intersection of  $M$  and  $\overleftrightarrow{AE}$ ?

12. What is the intersection of  $\overleftrightarrow{AE}$  and  $\overleftrightarrow{BD}$ ?



Exs. 1–12

Are the following coplanar?

13.  $Q, V, R$       14.  $X, V, R$       15.  $U, V, W, S$   
16.  $W, V, Q, T$       17. point  $X, \overleftrightarrow{QT}$       18.  $\overleftrightarrow{RS}$ , point  $X$   
19.  $\overleftrightarrow{XW}, \overleftrightarrow{UV}$       20.  $\overleftrightarrow{UX}, \overleftrightarrow{WS}$       21.  $\overleftrightarrow{UV}, \overleftrightarrow{WS}$

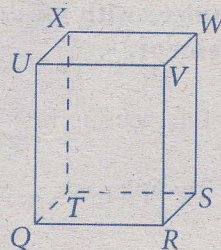
22. What is the intersection of plane  $QRST$  and plane  $RSWV$ ?

23. What is the intersection of  $\overleftrightarrow{UV}$  and plane  $QTXU$ ?

24. Name three lines that intersect at point  $S$ .

25. Name two planes that intersect at  $\overleftrightarrow{TS}$ .

26. Name another point that is in the same plane as points  $Q, T,$  and  $W$ .



Exs. 13–26

27. **Writing** Surveyors and photographers use a tripod, or three-legged stand, for their instruments. Use one of the postulates to explain why.

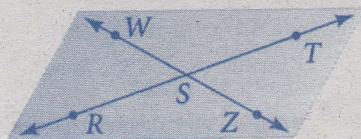
28. **Research** Find out more about Euclid's book *The Elements*. What made it such a significant book? Where did Euclid get his information?

29. How many planes contain three collinear points? Explain.

30. Which postulate is sometimes stated as "Two points determine a line"?

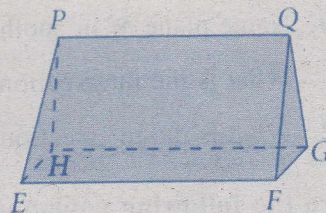
31. **Standardized Test Prep** Which of the following is *not* an acceptable name for the plane shown?

- A. plane  $RSZ$
- B. plane  $RSWZ$
- C. plane  $WSZ$
- D. plane  $RSTW$
- E. plane  $STZ$

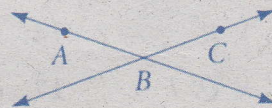


32. How many planes contain each line and point?

- a.  $\overleftrightarrow{EF}$  and point  $Q$
- b.  $\overleftrightarrow{PH}$  and point  $E$
- c.  $\overleftrightarrow{FG}$  and point  $P$
- d.  $\overleftrightarrow{EP}$  and point  $G$
- e. Use inductive reasoning. What do you think is true of a line and a point not on the line?



33. **Logical Reasoning** Suppose two lines intersect. How many planes do you think contain both lines? Use the diagram at the right to explain your answer.



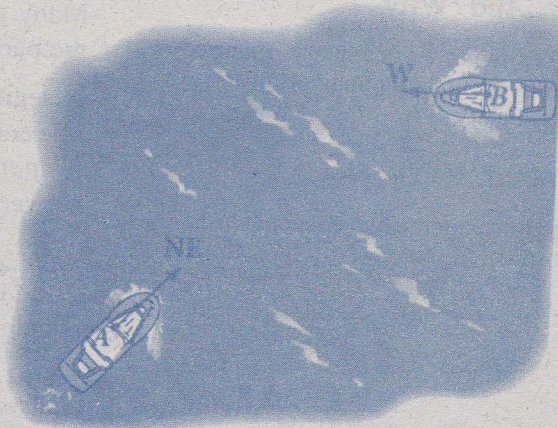
Complete with *always*, *sometimes*, or *never* to make a true statement.

- 34. Intersecting lines are \_\_\_\_\_ coplanar.
- 35. Two planes \_\_\_\_\_ intersect in exactly one point.



36. Three points are \_\_\_\_\_ coplanar.
37. A line and a point not on the line are \_\_\_\_\_ coplanar.
38. Four points are \_\_\_\_\_ coplanar.
39. Two lines \_\_\_\_\_ meet in more than one point.

40. **Navigation** Rescue teams use the principles in Postulates 1-1 and 1-2 to determine the location of a distress signal. In the diagram, a ship at point *A* receives a signal from the northeast. A ship at point *B* receives the same signal from due west. Trace the diagram and find the location of the distress signal. Explain how the two postulates help to find the location of the distress signal.

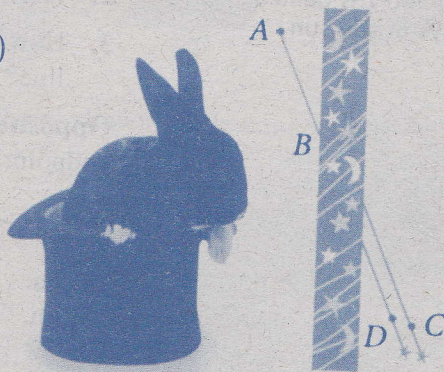


**Coordinate Geometry** Are the points collinear? Graph them to find out.

41.  $(1, 1), (4, 4), (-3, -3)$       42.  $(2, 4), (4, 6), (0, 2)$
43.  $(0, 0), (8, 10), (4, 6)$       44.  $(0, 0), (0, 3), (0, -10)$

45. **Open-ended** Give an example from your classroom or your home of three planes intersecting in one line.

46. **Optical Illusions** The diagram at the right is an optical illusion. Which points are collinear, *A, B, C* or *A, B, D*? Are you sure? Use a ruler to check your answer.



**Chapter Project**

**Find Out by Creating**

Some artists create origami by experimenting. They fold and unfold a piece of paper until they see a resemblance to the real world. Take your folded square from the Find Out question on page 9 (or make a new one). Use the existing creases to construct the dog and the flower pictured at the right. Now try to create your own origami, starting with a fresh square of paper.

