

**3.4****Proofs with Perpendicular Lines**

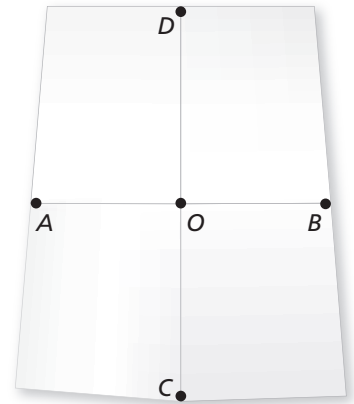
For use with Exploration 3.4

**Essential Question** What conjectures can you make about perpendicular lines?

**1 EXPLORATION: Writing Conjectures**

**Work with a partner.** Fold a piece of paper in half twice. Label points on the two creases, as shown.

- a. Write a conjecture about  $\overline{AB}$  and  $\overline{CD}$ . Justify your conjecture.

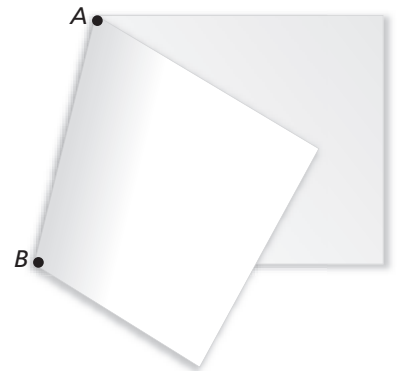


- b. Write a conjecture about  $\overline{AO}$  and  $\overline{OB}$ . Justify your conjecture.

**2 EXPLORATION: Exploring a Segment Bisector**

**Work with a partner.** Fold and crease a piece of paper, as shown. Label the ends of the crease as  $A$  and  $B$ .

- a. Fold the paper again so that point  $A$  coincides with point  $B$ . Crease the paper on that fold.
- b. Unfold the paper and examine the four angles formed by the two creases. What can you conclude about the four angles?

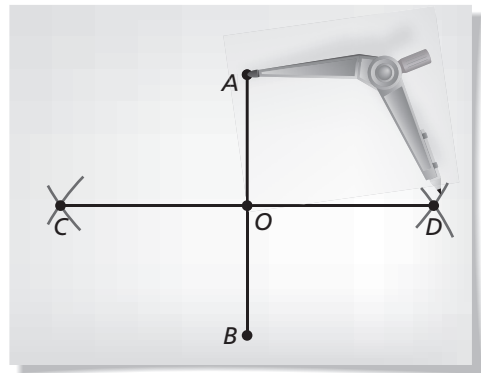


**3.4 Proofs with Perpendicular Lines (continued)****3 EXPLORATION:** Writing a Conjecture

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

- Draw  $\overline{AB}$ , as shown.
- Draw an arc with center  $A$  on each side of  $\overline{AB}$ . Using the same compass setting, draw an arc with center  $B$  on each side of  $\overline{AB}$ . Label the intersections of the arcs  $C$  and  $D$ .
- Draw  $\overline{CD}$ . Label its intersection with  $\overline{AB}$  as  $O$ . Write a conjecture about the resulting diagram. Justify your conjecture.

**Communicate Your Answer**

- What conjectures can you make about perpendicular lines?
- In Exploration 3, find  $AO$  and  $OB$  when  $AB = 4$  units.

**3.4****Notetaking with Vocabulary**

For use after Lesson 3.4

In your own words, write the meaning of each vocabulary term.

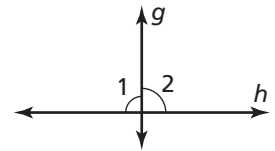
distance from a point to a line

perpendicular bisector

**Theorems****Theorem 3.10 Linear Pair Perpendicular Theorem**

If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

If  $\angle 1 \cong \angle 2$ , then  $g \perp h$ .

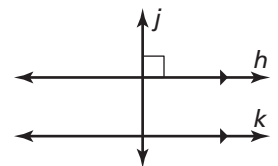


**Notes:**

**Theorem 3.11 Perpendicular Transversal Theorem**

In a plane, if a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other line.

If  $h \parallel k$  and  $j \perp h$ , then  $j \perp k$ .



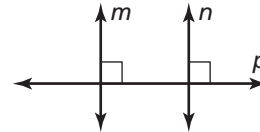
**Notes:**

**3.4** Notetaking with Vocabulary (continued)

**Theorem 3.12 Lines Perpendicular to a Transversal Theorem**

In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

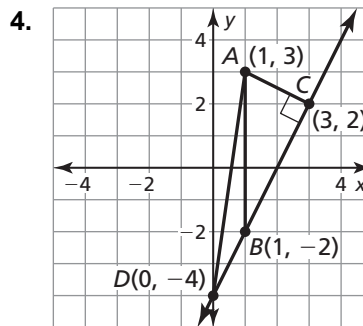
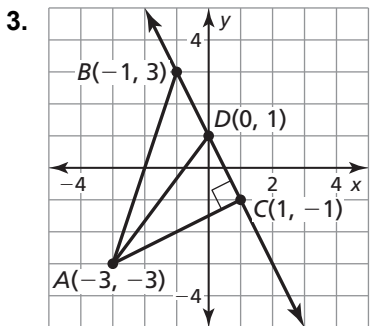
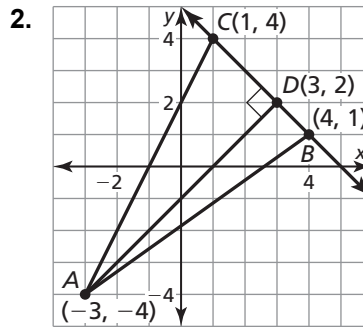
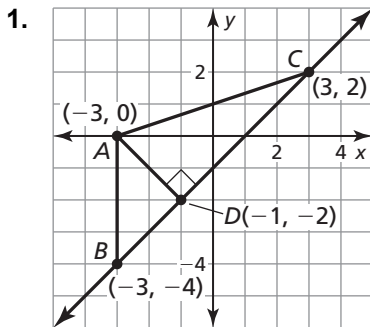
If  $m \perp p$  and  $n \perp p$ , then  $m \parallel n$ .



**Notes:**

**Extra Practice**

In Exercises 1–4, find the distance from point A to  $\overline{BC}$ .



**3.4** Notetaking with Vocabulary (continued)

In Exercises 5–8, determine which lines, if any, must be parallel. Explain your reasoning.

