CONCEPT SUMMARY **TYPES OF PROOFS**

You have now studied three types of proofs.

1. **TWO-COLUMN PROOF** This is the most formal type of proof. It lists numbered statements in the left column and a reason for each statement in the right column.
2. **PARAGRAPH PROOF** This type of proof describes the logical argument with sentences. It is more conversational than a two-column proof.
3. **FLOW PROOF** This type of proof uses the same statements and reasons as a two-column proof, but the logical flow connecting the statements is indicated by arrows.

GUIDED PRACTICE

Vocabulary Check ✓

1. Define *perpendicular lines*.

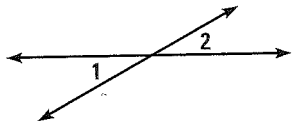
Concept Check ✓

2. Which postulate or theorem guarantees that there is only one line that can be constructed perpendicular to a given line from a given point not on the line?

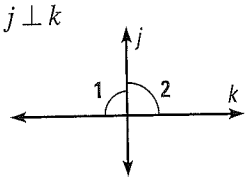
Skill Check ✓

Write the postulate or theorem that justifies the statement about the diagram.

3. $\angle 1 \cong \angle 2$

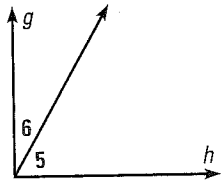


4. $j \perp k$

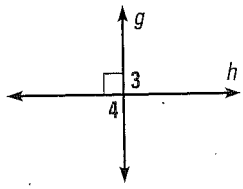


Write the postulate or theorem that justifies the statement, given that $g \perp h$.

5. $m\angle 5 + m\angle 6 = 90°$

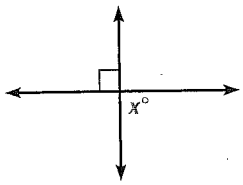


6. $\angle 3$ and $\angle 4$ are right angles.



Find the value of x.

7.



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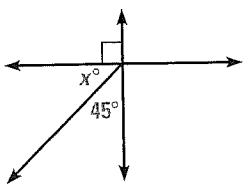

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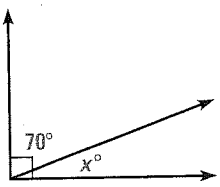


10. **ERROR ANALYSIS** It is given that $\angle ABC \cong \angle CBD$. A student concludes that because $\angle ABC$ and $\angle CBD$ are congruent adjacent angles, $\overleftrightarrow{AB} \perp \overleftrightarrow{CB}$. What is wrong with this reasoning? Draw a diagram to support your answer.

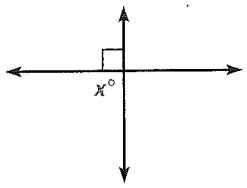
PRACTICE AND APPLICATIONS

STUDENT HELP

Extra Practice to help you master skills is on p. 807.

USING ALGEBRA **Find the value of x.**

11.



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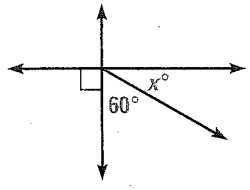

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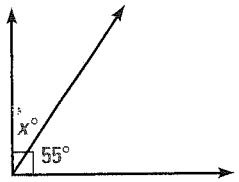
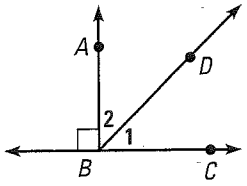
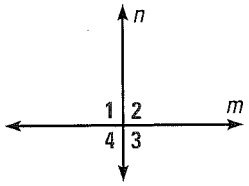


LOGICAL REASONING **What can you conclude about the labeled angles?**

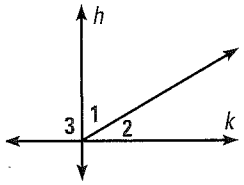
14. $\overline{AB} \perp \overline{CB}$



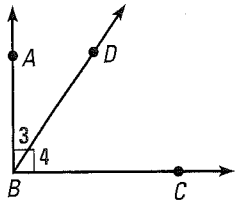
15. $n \perp m$



16. $h \perp k$



17. **DEVELOPING PARAGRAPH PROOF** Fill in the lettered blanks to complete the proof of Theorem 3.2.



GIVEN ▸ $\overrightarrow{BA} \perp \overrightarrow{BC}$

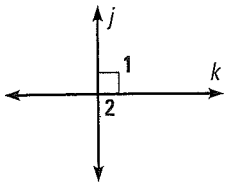
PROVE ▸ $\angle 3$ and $\angle 4$ are complementary.

Because $\overrightarrow{BA} \perp \overrightarrow{BC}$, $\angle ABC$ is a **a.** and $m\angle ABC =$ **b.**. According to the **c.** Postulate, $m\angle 3 + m\angle 4 = m\angle ABC$. So, by the substitution property of equality, **d.** + **e.** = **f.**. By definition, $\angle 3$ and $\angle 4$ are complementary.

18. **DEVELOPING FLOW PROOF** Fill in the lettered blanks to complete the proof of part of Theorem 3.3. Because the lines are perpendicular, they intersect to form a right angle. Call that $\angle 1$.

GIVEN ▸ $j \perp k$, $\angle 1$ and $\angle 2$ are a linear pair.

PROVE ▸ $\angle 2$ is a right angle.



∠1 and ∠2 are a linear pair. — Given

a. — Linear Pair Postulate

$m\angle 1 + m\angle 2 = 180°$

b.

$j \perp k$ — Given

∠1 is a right ∠. — Def. of ⊥ lines

$m\angle 1 = 90°$

c.

$90° + m\angle 2 = 180°$

d.

e. — Subtr. prop. of equality

∠2 is a right ∠.

f.

STUDENT HELP

HOMEWORK HELP

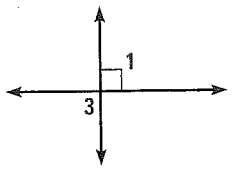
Example 1: Exs. 17–23

Example 2: Exs. 11–19, 24, 25

STUDENT HELP

HOMEWORK HELP
Visit our Web site www.mcdougallittell.com for help with writing proofs in Exs. 17–24.

19. DEVELOPING TWO-COLUMN PROOF Fill in the blanks to complete the proof of part of Theorem 3.3.



GIVEN ▸ $\angle 1$ is a right angle.

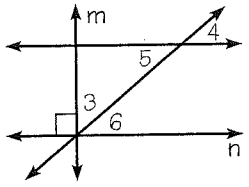
PROVE ▸ $\angle 3$ is a right angle.

Statements	Reasons
1. $\angle 1$ and $\angle 3$ are vertical angles.	1. Definition of vertical angles
2. ___?___	2. Vertical Angles Theorem
3. $m\angle 1 = m\angle 3$	3. ___?___
4. $\angle 1$ is a right angle.	4. ___?___
5. ___?___	5. Definition of right angle
6. ___?___	6. Substitution prop. of equality
7. ___?___	7. Definition of right angle

DEVELOPING PROOF In Exercises 20–23, use the following information.
Dan is trying to figure out how to prove that $\angle 5 \cong \angle 6$ below. First he wrote everything that he knew about the diagram, as shown below in blue.

GIVEN $m \perp n$, $\angle 3$ and $\angle 4$ are complementary.

PROVE $\angle 5 \cong \angle 6$



$m \perp n \rightarrow \angle 3$ and $\angle 6$ are complementary.

$\angle 3$ and $\angle 4$ are complementary.

$\angle 4$ and $\angle 5$ are vertical angles. $\rightarrow \angle 4 \cong \angle 5$

$\angle 4 \cong \angle 6 \rightarrow \angle 5 \cong \angle 6$

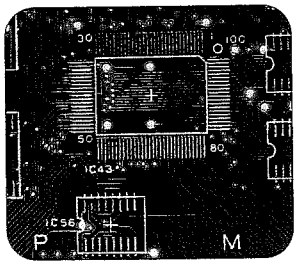
20. Write a justification for each statement Dan wrote in blue.

21. After writing all he knew, Dan wrote what he was supposed to prove in red. He also wrote $\angle 4 \cong \angle 6$ because he knew that if $\angle 4 \cong \angle 6$ and $\angle 4 \cong \angle 5$, then $\angle 5 \cong \angle 6$. Write a justification for this step.

22. How can you use Dan's blue statements to prove that $\angle 4 \cong \angle 6$?

23. Copy and complete Dan's flow proof.

FOCUS ON APPLICATIONS



REAL LIFE CIRCUIT BOARDS
The lines on circuit boards are made of metal and carry electricity. The lines must not touch each other or the electricity will flow to the wrong place, creating a *short circuit*.

24. CIRCUIT BOARDS The diagram shows part of a circuit board. Write any type of proof.

GIVEN ▸ $\overline{AB} \perp \overline{BC}$, $\overline{BC} \perp \overline{CD}$

PROVE ▸ $\angle 7 \cong \angle 8$

Plan for Proof Show that $\angle 7$ and $\angle 8$ are both right angles.