

EXERCISES

For more exercises, see *Extra Skill, Word Problem, and Proof Practice*.

Practice and Problem Solving

Practice by Example



Example 1
(page 280)

Write the negation of each statement.

- Two angles are congruent.
- You are not sixteen years old.
- The angle is not obtuse.
- The soccer game is on Friday.
- The figure is a triangle.
- $m\angle A < 90$

Example 2
(page 281)

Write (a) the inverse and (b) the contrapositive of each conditional statement.

- If you eat all of your vegetables, then you will grow.
- If a figure is a square, then all of its angles are right angles.
- If a figure is a rectangle, then it has four sides.

Example 3
(page 282)

Write the first step of an indirect proof.

- It is raining outside.
- $\triangle PEN$ is isosceles.
- $\overline{XY} \cong \overline{AB}$
- $\angle J$ is not a right angle.
- At least one angle is obtuse.
- $m\angle 2 > 90$

Example 4
(page 282)

Identify the two statements that contradict each other.

- I. $\triangle PQR$ is equilateral.
II. $\triangle PQR$ is a right triangle.
III. $\triangle PQR$ is isosceles.
- I. In right $\triangle ABC$, $m\angle A = 60$.
II. In right $\triangle ABC$, $\angle A \cong \angle C$.
III. In right $\triangle ABC$, $m\angle B = 90$.
- I. ℓ and m are skew.
II. ℓ and m do not intersect.
III. $\ell \parallel m$
- I. Each of the two items that Val bought costs more than \$10.
II. Val spent \$34 for the two items.
III. Neither of the two items that Val bought costs more than \$15.

Example 5
(page 282)

20. Developing Proof Fill in the blanks to prove the following statement.

If the Debate and Chess Clubs together have fewer than 20 members and the Chess Club has 10 members, then the Debate Club has fewer than 10 members.

Given: The total membership of the Debate Club and the Chess Club is fewer than 20. The Chess Club has 10 members.

Prove: The Debate Club has fewer than 10 members.

Proof: Assume that the Debate Club has 10 or more members.

This means that together the two clubs have **a.** ? members.

This contradicts the given information that **b.** ?.

The assumption is false. Therefore it is true that **c.** ?.

GO for Help

For a guide to solving Exercise 21, see page 287.

21. **Developing Proof** Fill in the blanks to prove the following statement. In a given triangle, $\triangle LMN$, there is at most one right angle.

Given: $\triangle LMN$

Prove: $\triangle LMN$ has at most one right angle.

Proof: Assume that $\triangle LMN$ has more than one a. ?. That is, assume that both $\angle M$ and $\angle N$ are b. ?. If $\angle M$ and $\angle N$ are both right angles, then $m\angle M = m\angle N =$ c. ?. By the Triangle Angle-Sum Theorem, $m\angle L + m\angle M + m\angle N =$ d. ?. Use substitution to find $m\angle L +$ e. ? + f. ? = 180. When you solve for $m\angle L$, you find that $m\angle L =$ g. ?. This means that there is no $\triangle LMN$, which contradicts the given statement. So the assumption that $\triangle LMN$ has h. ? must be false. Therefore, $\triangle LMN$ has i. ?.

Apply Your Skills

Write an indirect proof.

**Homework Video Tutor**

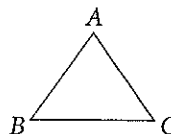
Visit: PHSchool.com
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- Proof** 22. **Given:** $\triangle ABC$ with $BC > AC$

Prove: $\angle A \neq \angle B$

- Proof** 23. **Given:** $\triangle XYZ$ is isosceles.

Prove: Neither base angle is a right angle.



Write (a) the inverse and (b) the contrapositive of each statement. Give the truth value of each.

24. If you live in El Paso, then you live in Texas.

25. If four points are collinear, then they are coplanar.

Open-Ended Write a true conditional statement for each given condition. If such a statement is not possible, tell why.

26. The inverse is false.

27. The inverse is true.

28. The contrapositive is false.

29. The contrapositive is true.

Writing For Exercises 30–33, write a convincing argument that uses indirect reasoning.

30. Fresh skid marks appear behind a green car at the scene of an accident. Show that the driver of the green car applied the brakes.

31. Ice is forming on the sidewalk in front of Toni's house. Show that the temperature of the sidewalk surface must be 32°F or lower.

32. An obtuse triangle cannot contain a right angle.

33. In a plane, a line has no more than one perpendicular at any of its points.

**Real-World Connection**

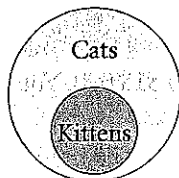
Water freezes at 32°F . Sidewalk "salt" lowers the freezing point of water.

GO for Help

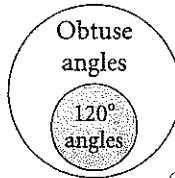
To review Venn diagrams, see page 81.

Write the conditional statement illustrated by each Venn diagram. Then write its contrapositive.

34.



35.



36.

