What You’ll Learn

Skim Lesson 5-1. Predict two things that you expect to learn based on the headings and figures in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Write the correct term next to each definition.

[ ] the place where three or more intersecting lines meet
[ ] a segment, line, or plane that intersects a segment at its midpoint and is perpendicular to the segment
[ ] the point of intersection of the perpendicular bisectors of the three sides of a triangle
[ ] three or more lines that intersect at a common point
[ ] the point of intersection of the angle bisectors of the three angles of a triangle

Vocabulary Link Look up the definition of *bisect*. Use it to write the meaning of an angle *bisector*.
Main Idea

**Perpendicular Bisectors**
pp. 322–324

Describe the Perpendicular Bisector Theorem in the box below. Then write a conditional statement using the figures to illustrate the theorem.

### Perpendicular Bisector Theorem

![Diagram of a triangle with a perpendicular bisector]

**Example:**

Solve for $x$ in the figure below.

![Diagram of an angle bisector problem]

$x = \underline{______}$

**Helping You Remember**

A good way to remember theorems and postulates in geometry is to explain them to other classmates in your own words. How would you describe the Angle Bisector Theorem to a classmate who is having difficulty understanding the theorem?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
What You’ll Learn

Skim the Examples for Lesson 5-2. Predict two things you think you will learn about medians and altitudes of triangles.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Label the diagram with the correct term. (Lesson 5-1)

New Vocabulary  Write the definition next to each term.

median  ▶
   ______________________________________________________
   ______________________________________________________

centroid  ▶
   ______________________________________________________
   ______________________________________________________

altitude  ▶
   ______________________________________________________
   ______________________________________________________

orthocenter  ▶
   ______________________________________________________
Main Idea

Medians
pp. 333–335

Point $O$ is the centroid of triangle $VTR$. Use the Centroid Theorem to complete each statement.

$TO = \underline{\hspace{2cm}} \quad TW \quad WR = \underline{\hspace{2cm}}$

$VS = \underline{\hspace{2cm}} \quad VO \quad 2 \quad RS = \underline{\hspace{2cm}}$

Altitudes
pp. 335–337

Name the orthocenter of $\triangle RST$.

Helping You Remember

A good way to remember something is to explain it to someone else. Suppose that a classmate is having trouble remembering whether the center of gravity of a triangle is the orthocenter, the centroid, the incenter, or the circumcenter of the triangle. Suggest a way to remember which point it is.
5-3 Inequalities in One Triangle

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Match the term with its definition by drawing a line to connect the two. (Lessons 5-1 and 5-2)

perpendicular bisector        the place where three or more intersecting lines meet
orthocenter                   the point of concurrency of the medians of a triangle
altitude                      a segment of a triangle from a vertex that is perpendicular to the line containing the opposite of the triangle
incenter                      the point of concurrency of the lines containing the altitudes of a triangle
point of concurrency          a segment with endpoints being a vertex of a triangle and the midpoint of the opposite side
median                        a segment, line, or plane that intersect a segment at its midpoint and is perpendicular to the segment
circumcenter                  three or more lines that intersect at a common point
concurrent lines              the point of intersection of the perpendicular bisectors of the three sides of a triangle
centroid                      the point of intersection of the angle bisectors of the three angles of a triangle
Main Idea

**Angle Inequalities**

pp. 342–343

Describe the Exterior Angle Inequality Theorem in your own words. Then use the figure below to write two inequalities.

\[ \angle A \quad \angle C \]

**Angle-Side Inequalities**

pp. 343–345

List the angles of \( \triangle LMN \) in order from least to greatest.

\[ \angle L \quad \angle M \quad \angle N \]

Helping You Remember

Explain how the Exterior Angle Inequality Theorem is related to the Exterior Angle Theorem, and why the Exterior Angle Inequality Theorem must be true if the Exterior Angle Theorem is true.

\[ \text{Helping You Remember} \]

Explain how the Exterior Angle Inequality Theorem is related to the Exterior Angle Theorem, and why the Exterior Angle Inequality Theorem must be true if the Exterior Angle Theorem is true.

\[ \text{Helping You Remember} \]

Explain how the Exterior Angle Inequality Theorem is related to the Exterior Angle Theorem, and why the Exterior Angle Inequality Theorem must be true if the Exterior Angle Theorem is true.

\[ \text{Helping You Remember} \]

Explain how the Exterior Angle Inequality Theorem is related to the Exterior Angle Theorem, and why the Exterior Angle Inequality Theorem must be true if the Exterior Angle Theorem is true.

\[ \text{Helping You Remember} \]

Explain how the Exterior Angle Inequality Theorem is related to the Exterior Angle Theorem, and why the Exterior Angle Inequality Theorem must be true if the Exterior Angle Theorem is true.
5-4 Indirect Proof

What You’ll Learn
Scan Lesson 5-4. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________

Active Vocabulary

New Vocabulary Fill in each blank with the correct term or phrase.

indirect reasoning ► Indirect reasoning is a method of thinking that assumes that a conclusion is ________________ and then showing that this assumption leads to a contradiction.

indirect proof ► In an indirect proof, you temporarily assume that what you are trying to prove is false. By showing this assumption to be logically impossible, you prove your assumption false and the ________________ true.

proof by contradiction ► To construct a proof by contradiction, the first step is to ________________ that the conclusion you want to prove is false.

Vocabulary Link Think of other times you have encountered the word indirect in mathematics. Describe any similarities to an indirect proof.

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________
Main Idea

Indirect Algebraic Proof
pp. 351–353

Details

Complete the table below showing the steps involved in constructing an indirect proof.

<table>
<thead>
<tr>
<th>How to Write an Indirect Proof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 ______________________</td>
</tr>
<tr>
<td>Step 2 ______________________</td>
</tr>
<tr>
<td>Step 3 ______________________</td>
</tr>
</tbody>
</table>

Indirect Proof with Geometry
pp. 353–354

Suppose you want to prove that the sum of interior angles of a triangle is equal to 180°. What assumption would you make to form an indirect proof of this statement?

Helping You Remember

A good way to remember a new concept in mathematics is to relate it to something you have already learned. How is the process of indirect proof related to the relationship between a conditional statement and its contrapositive?

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________
5-5 The Triangle Inequality

What You’ll Learn
Scan the text in Lesson 5-5. Write two facts you learned about the triangle inequality.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary Label each figure with the correct term.
(Lessons 5-1 and 5-2)
Main Idea

The Triangle Inequality  
If the measures of two sides of a triangle are 4 centimeters and 9 centimeters, what is the least possible whole number measure for the third side?

Step 1: Use the triangle inequality to write three inequalities for a triangle with sides 4, 9, and \( x \) centimeters.

Step 2: Solve each the inequalities.

Step 3: Use the inequalities to solve the problem.

Proofs Using the Triangle Inequality  
Given: \( \overline{FI} \cong \overline{FJ} \)  
Prove: \( FI + FH > HJ \)

Complete the two-column proof.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ________</td>
<td>1. __________</td>
</tr>
<tr>
<td>2. ________</td>
<td>2. __________</td>
</tr>
<tr>
<td>3. ________</td>
<td>3. __________</td>
</tr>
<tr>
<td>4. ________</td>
<td>4. __________</td>
</tr>
</tbody>
</table>

Helping You Remember  
A good way to remember a new theorem is to state it informally in different words. How could you restate the Triangle Inequality Theorem?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
What You’ll Learn

Skim the lesson. Write two things you already know about inequalities in two triangles.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Write the correct term next to each definition. (Lessons 5-1 and 5-2)

► a segment of a triangle from a vertex that is perpendicular to the line containing the opposite of the triangle

► a segment, line, or plane that intersect a segment at its midpoint and is perpendicular to the segment

► the point of intersection of the perpendicular bisectors of the three sides of a triangle

► the point of concurrency of the medians of a triangle

Vocabulary Link

Describe how the hinge of a door can be used to illustrate the Hinge Theorem.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Main Idea

Find the range of possible values for $x$ in the figure below.

\[ \begin{align*}
12 & \quad 14 \\
10 & \quad (3x - 5)^\circ \\
10 & \quad 61^\circ \\
\end{align*} \]

Write an inequality using the Converse of the Hinge Theorem.

Write an inequality given the angle is less than $180^\circ$.

Solve for $x$.

Solve for $x$.

What are the possible values of $x$?

---

Details

Describe how you could use the Hinge Theorem to complete the proof below.

Given: $AC = CD$

Prove: $BD > AB$

Helping You Remember

A good way to remember something is to think of it in concrete terms. How can you illustrate the Hinge Theorem with everyday objects?

____________________________

____________________________

____________________________