Big Ideas Math: Geometry

Chapter Summary

Chapter 5: Congruent Triangles

Learning Goals

Classify triangles by sides and angles.

Find interior and exterior angle measures of triangles.

Identify and use corresponding parts.

Use the Third Angles Theorem.

Use the Side-Angle Side (SAS) Congruence Theorem.

Solve real-life problems.

Use the Base Angles Theorem.

Use Isosceles and equilateral triangles.

Use the Side-Side-Side (SSS) Congruence Theorem.

Use the Hypotenuse-Leg (HL) Congruence Theorem.

Use the ASA and AAS Congruence Theorems.

Use congruent triangles.

Prove constructions.

Place figures in a coordinate plane.

Write coordinate proofs.

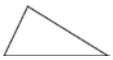
Standards

Common Core:
HSG-CO.B.7, HSG-CO.B.8, HSG-CO.C.10, HSG-CO.D.13, HSG-MG.A.1, HSG-MG.A.3, HSG-SRT.B.5, HSG-GPE.B.4

Core Concept

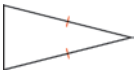
Classifying Triangles by Sides

Scalene Triangle



no congruent sides

Isosceles Triangle



at least 2 congruent sides

Equilateral Triangle

3 congruent sides

Classifying Triangles by Angles

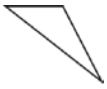
Acute Triangle

3 acute angles

Right Triangle

1 right angle

Obtuse Triangle



1 obtuse angle

Equiangular Triangle

3 congruent angles

Core Vocabulary

The angles of a polygon are the ***interior angles***.

The angles that form linear pairs with the interior angles of a polygon are the ***exterior angles***.

A ***corollary to a theorem*** is a statement that can be proved easily using the theorem.

A pair of sides or angles that have the same relative position in two congruent figures are ***corresponding parts***.

The two congruent sides of an isosceles triangle are the ***legs of an isosceles triangle***.

The angle formed by the legs of an isosceles triangle is the ***vertex angle***.

The side of an isosceles triangle that is not one of the legs is the ***base of a isosceles triangle***.

The two angles adjacent to the base of an isosceles triangle are called ***base angles***.

In a right triangle, the sides adjacent to the right angle are called the ***legs***.

In a right triangle, the side opposite the right angle is called the ***hypotenuse***.

A ***coordinate proof*** is a style of proof that involves placing geometric figures in a coordinate plane.

Corollaries

Corollary 5.1 Corollary to the Triangle Sum Theorem
The acute angles of a right triangle are complementary.

Corollary 5.2 Corollary to the Base Angles Theorem
If a triangle is equilateral, then it is equiangular.

Corollary 5.3 Corollary to the Converse of the Base Angles Theorem
If a triangle is equiangular, then it is equilateral.

Theorems

5.1 Triangle Sum Theorem
The sum of the measures of the interior angles of a triangle is 180°.

5.2 Exterior Angle Theorem
The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles

5.3 Properties of Triangle Congruence
Triangle congruence is reflexive, symmetric, and transitive.

Reflexive	For any triangle $\triangle ABC$, $\triangle ABC \cong \triangle ABC$.
Symmetric	If $\triangle ABC \cong \triangle DEF$, then $\triangle DEF \cong \triangle ABC$.
Transitive	If $\triangle ABC \cong \triangle DEF$ and $\triangle DEF \cong \triangle JKL$, then $\triangle ABC \cong \triangle JKL$.

5.4 Third Angles Theorem
If two angles of one triangle are congruent to two angles of another triangle, then the third angles are also congruent.

5.5 Side-Angle-Side (SAS) Congruence Theorem
If two sides and the included angle of one triangle are congruent to two sides and the included angle of a second triangle, then the two triangles are congruent.

5.6 Base Angles Theorem
If two sides of a triangle are congruent, then the angles opposite them are congruent.

5.7 Converse of the Base Angles Theorem
If two angles of a triangle are congruent, then the sides opposite them are congruent.

5.8 Side-Side-Side (SSS) Congruence Theorem
If three sides of one triangle are congruent to three sides of a second triangle, then the two triangles are congruent.

5.9 Hypotenuse-Leg (HL) Congruence Theorem
If the hypotenuse and a leg of a right triangle are congruent to the hypotenuse and a leg of a second right triangle, then the two triangles are congruent.

5.10 Angle-Side-Angle (ASA) Congruence Theorem
If two angles and the included side of one triangle are congruent to two angles and the included side of a second triangle, then the two triangles are congruent.

5.11 Angle-Angle-Side (AAS) Congruence Theorem
If two angles and a non-included side of one triangle are congruent to two angles and the corresponding non-included side of a second triangle, then the two triangles are congruent.

Essential Questions

How are the angle measures of a triangle related?

Given two congruent triangles, how can you use rigid motions to map one triangle to the other triangle?

What can you conclude about two triangles when you know that two pairs of corresponding sides and the corresponding included angles are congruent?

What conjectures can you make about the side lengths and angle measures of an isosceles triangle?

What can you conclude about two triangles when you know the corresponding sides are congruent?

What information is sufficient to determine whether two triangles are congruent?

How can you use congruent triangles to make an indirect measurement?

How can you use a coordinate plane to write a proof?

Additional Review

- Classifying Triangles by Sides, *p. 232*
- Classifying Triangles by Angles, *p. 232*
- Identifying and Using Corresponding Parts, *p. 240*
- Using Congruent Triangles, *p. 278*
- Proving Constructions, *p. 280*
- Placing Figures in a Coordinate Plane, *p. 284*
- Writing Coordinate Proofs, *p. 286*

What's the Point?

The STEM Videos available online show ways to use mathematics in real-life situations.
The Chapter 5: Hang Glider Challenge STEM Video is available online at www.bigideasmath.com.