Lesson 5.1 and 5.2 Angles of Triangles & Congruent Triangles

Tuesday, December 5, 2023 9:15 PM

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Lesson 5.1 and 5.2 A...

Lesson 5.1 Angles of Triangles &
Lesson 5.2 Congruent Triangles
Workbook pages 273-282

Content Objectives:

* Students will prove and apply the Triangle Angle-Sum Theorem, Exterior Angle Theorem, and Triangle Angle-Sum Theorem Corollaries.

- Students explain congruence between triangles based on their corresponding parts using *same, equal, corresponding,* and *congruent*.

Florida's B.E.S.T. Standards for Mathematics

MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.

MA.912.GR.1.6 Solve mathematical and real-world problems involving congruence or similarity in two-dimensional figures.

MA.912.GR.2.6 Apply rigid transformations to map one figure onto another to justify that the two figures are congruent.

are congruent.

Apply Example 1

Use the Triangle Angle-Sum Theorem

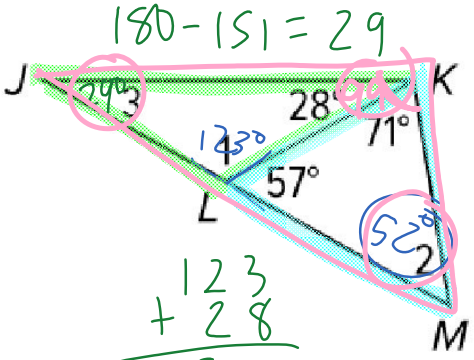
Theorem 5.1: Triangle Angle-Sum Theorem

The sum of the measures of the interior angles of a triangle is 180°.

Find the measure of each numbered angle.

$57 + 71 = 128$

$180 - 128 = 52°$



$123 + 28 = 151$

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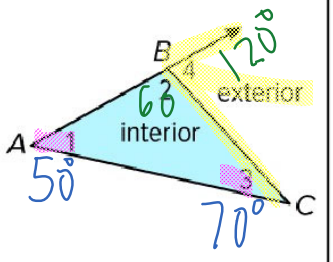
Learn

Exterior Angles of Triangles

exterior angles	An **exterior angle of a triangle** is an angle formed by one side of the triangle and the extension of an adjacent side. A triangle has three exterior angles. ∠4 is an exterior angle of △*ABC*.
remote interior angles	Each exterior angle of a triangle has two **remote interior angles** that are not adjacent to the exterior angle. ∠1 and ∠3 are the remote interior angles for ∠4.



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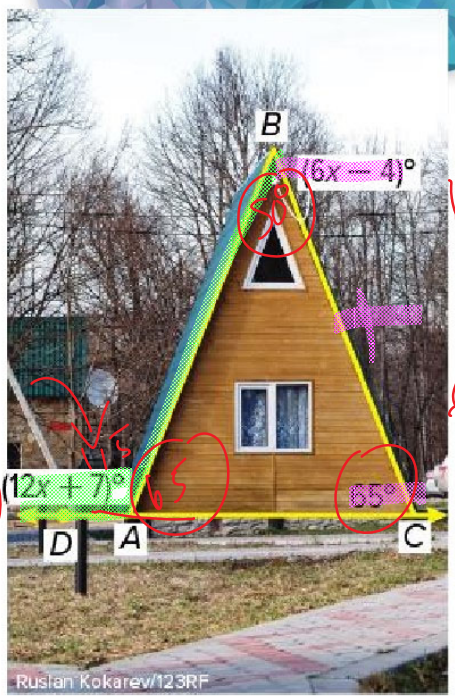
Example 2

Example 2
Use the Exterior Angle Theorem

ARCHITECTURE Find the measure of ∠DAB in the front face of the building.



$12x+7=6x-4+65$

$12x+7=6x+61$

$-7 \quad -7$

$12x=6x+54$

$-6x \quad -6x$

$6x=54$

$\frac{6x}{6}=\frac{54}{6}$ $x=9$

$6(9)-4$

$50°$

$6x-4=50$

$12(9)+7$

$115°$

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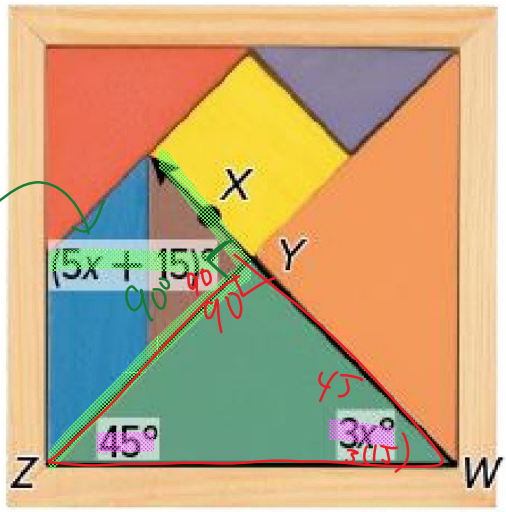
Example 2
Use the Exterior Angle Theorem

Check

PUZZLES Find the measure of ∠XYZ.



Olga Popova/Shutterstock

$5x+15=45+3x$

$-15 \quad -15$

$5x=30+3x$

$-3x \quad -3x$

$\frac{2x}{2}=\frac{30}{2}$ $x=15$

$5(15)+15$

$90°$

$45+90+3x=180$

$135+3x=180$

$-135 \quad -135$

$\frac{3x}{3}=\frac{45}{3}$ $x=15$

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Example 3
Find Angle Measures in Right Triangles

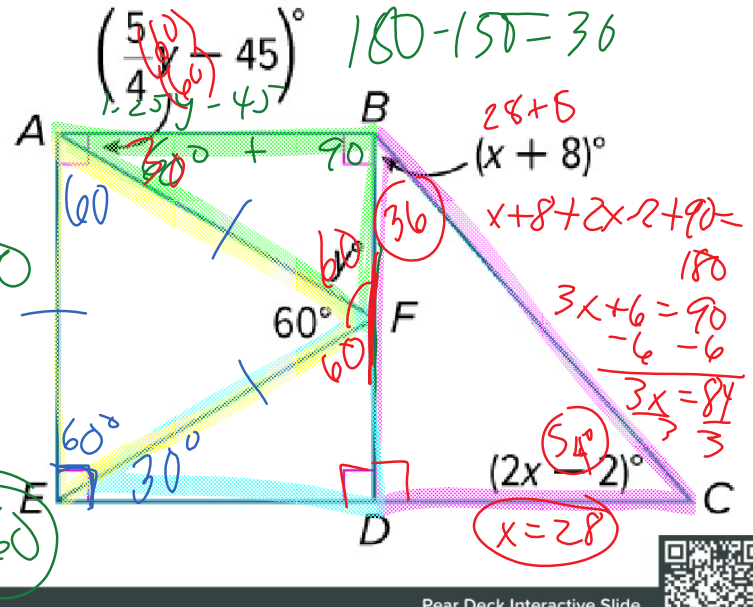
Find each measure.

Find Angle Measures in Right Triangles

Find each measure.

a. $m\angle BCD$ **b. $m\angle BAF$**

Find all angle measures!



$1.25y - 45 + 90 + y = 180$

$2.25y - 45 = 180$

$+45 \quad +45$

$2.25y = 135$

$\frac{2.25y}{2.25} = \frac{135}{2.25}$

$y = 60$

$180 - 150 = 30$

$28 + 8$

$x + 8 + 2x - 2 + 90 = 180$

$3x + 6 = 90$

$-6 \quad -6$

$3x = 84$

$\frac{3x}{3} = \frac{84}{3}$

$x = 28$

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Learn

Interior Angles of Triangles

Key Concept: Congruent Triangles

Two triangles are congruent if and only if their corresponding parts are congruent.

For triangles, we say *Corresponding parts of congruent triangles are congruent*, or CPCTC.

In two **congruent polygons**, all the parts of one polygon are congruent to the **corresponding parts,** or matching parts, of the other polygon. These corresponding parts include *corresponding angles* and *corresponding sides*.

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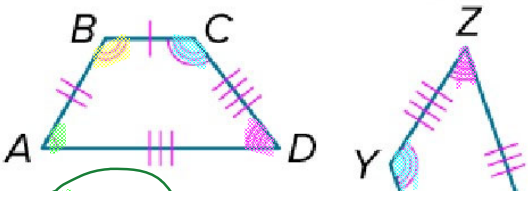
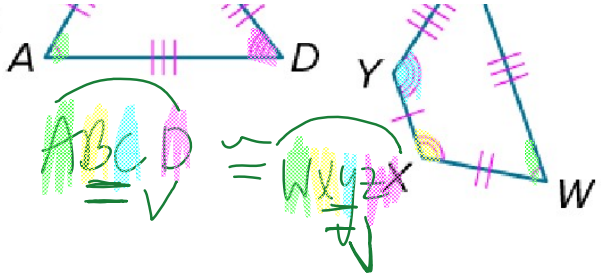
Example 1

Identify Corresponding Congruent Parts

Show that the polygons are congruent by identifying all the congruent



Show that the polygons are congruent by identifying all the congruent corresponding parts. Then write a congruence statement.



$\angle A \cong \angle W$ $\quad \overline{BC} \cong \overline{XY}$

$\angle B \cong \angle X$ $\quad \overline{AB} \cong \overline{WX}$

$\angle C \cong \angle Y$ $\quad \overline{AD} \cong \overline{WZ}$

$\angle D \cong \angle Z$ $\quad \overline{CD} \cong \overline{YZ}$

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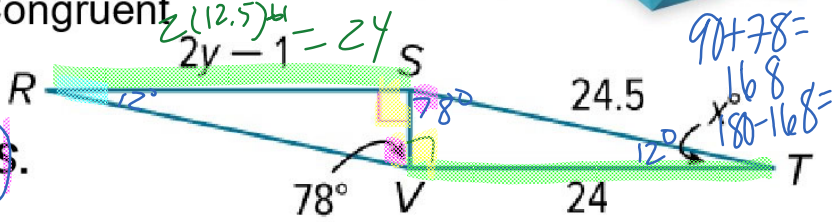
Example 2

Use Corresponding Parts of Congruent Triangles



In the diagram, $\triangle RSV \cong \triangle TVS$. Find the values of *x* and *y*.

$\angle SVR = \angle VST$

$\angle RVS = \angle TSV$

Part A Find the value of *x*.

Part B Find the value of *y*.

$y = 12.5$

$2y - 1 = 24$

$+1 \quad +1$

$\frac{2y}{2} = \frac{25}{2}$

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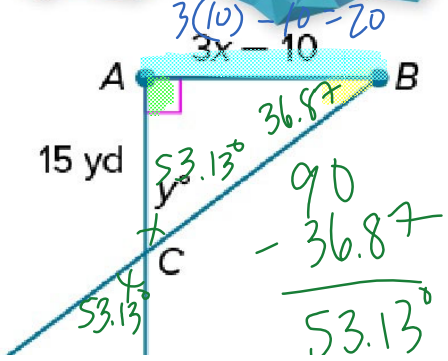
Example 2

Use Corresponding Parts of Congruent Triangles



Check

In the diagram, $\triangle ABC \cong \triangle EDC$. Find the values of *x* and *y*.

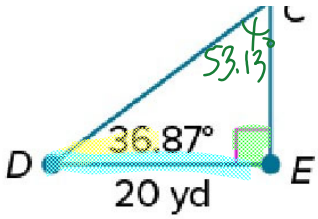
$3x - 10 = 20$

values of x and y.

$3x - 10 = 20$

$+10 \quad +10$

$\frac{3x}{3} = \frac{30}{3}$ $x = 10$



53.13°

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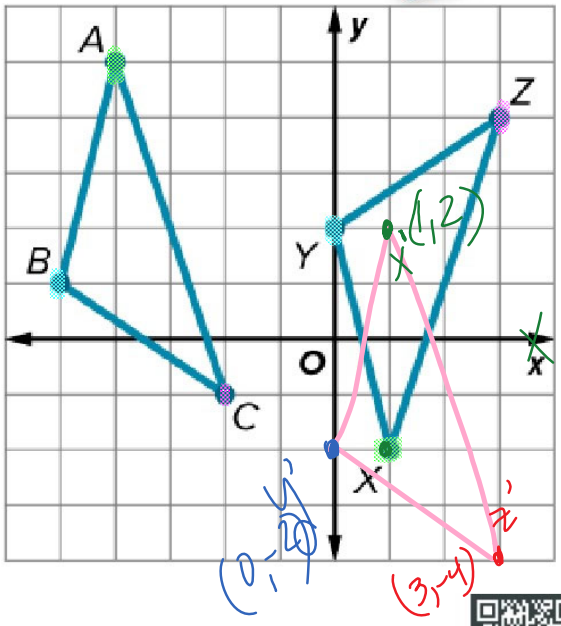
Example 3

Justify Congruence Using Rigid Transformations

Is $\triangle ABC \cong \triangle XYZ$? Justify your answer using rigid transformations.



① Reflection over the x-axis

② translation $(x-5, y+3)$

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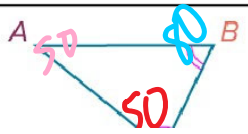
Learn

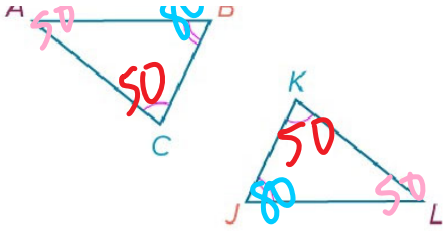
Third Angles Theorem and Triangle Congruence

Theorem 5.3: Third Angles Theorem

Words	If two angles of one triangle are congruent to two angles of a second triangle, then the third angles of the triangles are congruent.
	If $\angle C \cong \angle K$ and $\angle B \cong \angle J$, then $\angle A \cong \angle L$.



Example	If $\angle C \cong \angle K$ and $\angle B \cong \angle J$, then $\angle A \cong \angle L$.



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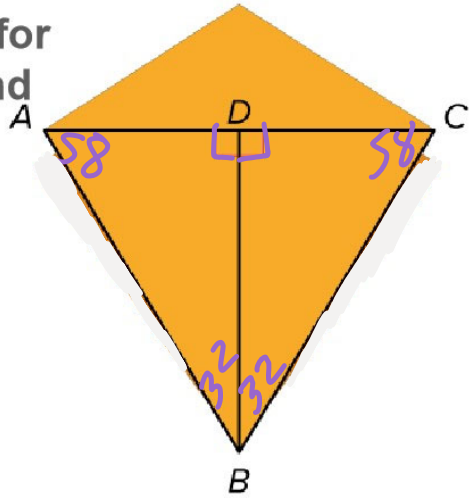
Example 4
Use the Third Angles Theorem

ORIGAMI Aika is folding origami dragons for a party she is hosting. If $\angle ABD \cong \angle CBD$ and $m\angle BAD = 58°$, find $m\angle CBD$.



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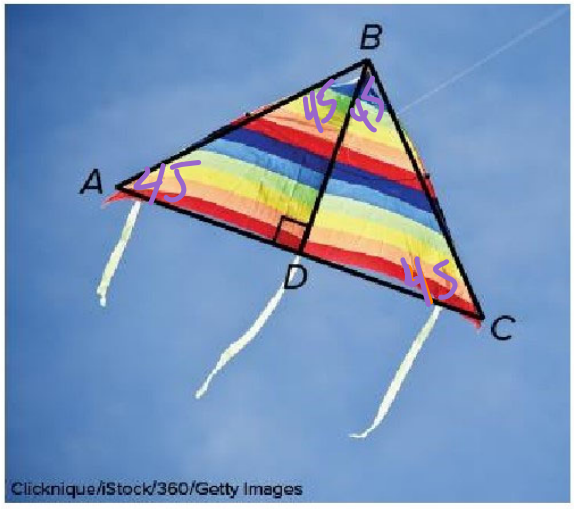
Example 4
Use the Third Angles Theorem

Check

KITES In the kite shown, $\angle BAD \cong \angle BCD$ and $m\angle BCD = 45°$. Find $m\angle ABD$.



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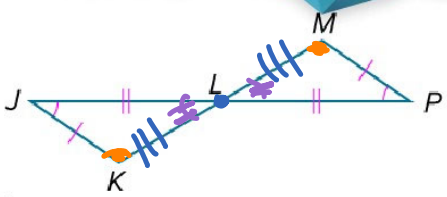
Example 5

Prove that Two Triangles Are Congruent

Write a two-column proof.

Given: $\angle J \cong \angle P$, $\overline{JK} \cong \overline{PM}$, $\overline{JL} \cong \overline{PL}$, and L bisects $\overline{KM}$.

Prove: $\triangle JLK \cong \triangle PLM$



Statements	Reasons
1. $\angle J \cong \angle P$, $\overline{JK} \cong \overline{PM}$, $\overline{JL} \cong \overline{PL}$, and L bisects $\overline{KM}$.	1. Given
2. $\angle JLK \cong \angle PLM$	2. Vertical angles are congruent.
3. $\overline{LK} \cong \overline{LM}$	3. Definition of segment bisector
4. $\angle JKL \cong \angle PML$	4. Third Angles Theorem
5. $\triangle JLK \cong \triangle PLM$	5. Definition of congruent triangles

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