Lesson 5.3: Proving Triangles Congruent SSS and SAS

Saturday, January 21, 2023 8:51 PM

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Lesson 5.3
SSS and

Lesson 5.3
Proving Triangles Congruent: SSS, SAS
Workbook pages 295-298

Content Objective
Students will use SSS and SAS to prove triangles congruent.

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

MA.912.GR.1.2 Prove triangle congruence or similarity using Side-Side-Side, Side-Angle-Side, Angle-Side-Angle, Angle-Angle-Side, Angle-Angle and Hypotenuse-Leg.

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-problems involving congruence or similarity in two dimensional figures.

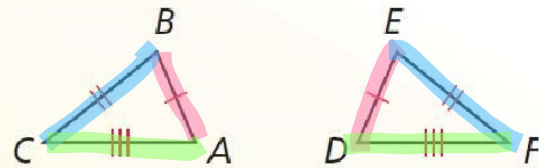
Learn
Proving Triangles Congruent: SSS

Theorem

Theorem 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.

If $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, and $\overline{AC} \cong \overline{DF}$, then $\triangle ABC \cong \triangle DEF$.



Learn
Proving Triangles Congruent: SAS

Theorem

Theorem 5.5 Side-Angle-Side (SAS) Congruence Theorem

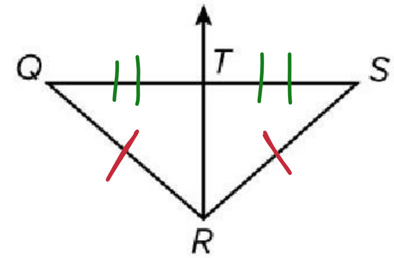
If two sides and the included angle of one triangle are congruent to two sides and the included angle of a second triangle, then the two triangles are congruent.

If $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\overline{AC} \cong \overline{DF}$, then $\triangle ABC \cong \triangle DEF$.

Proof p. 246

Example 1
Use SSS to Prove Triangles Congruent

Prove that $\triangle QRT \cong \triangle SRT$.



Given: $\triangle QRS$ is isosceles with $\overline{QR} \cong \overline{SR}$. $\overrightarrow{RT}$ bisects $\overline{QS}$ at point T.

Prove: $\triangle QRT \cong \triangle SRT$

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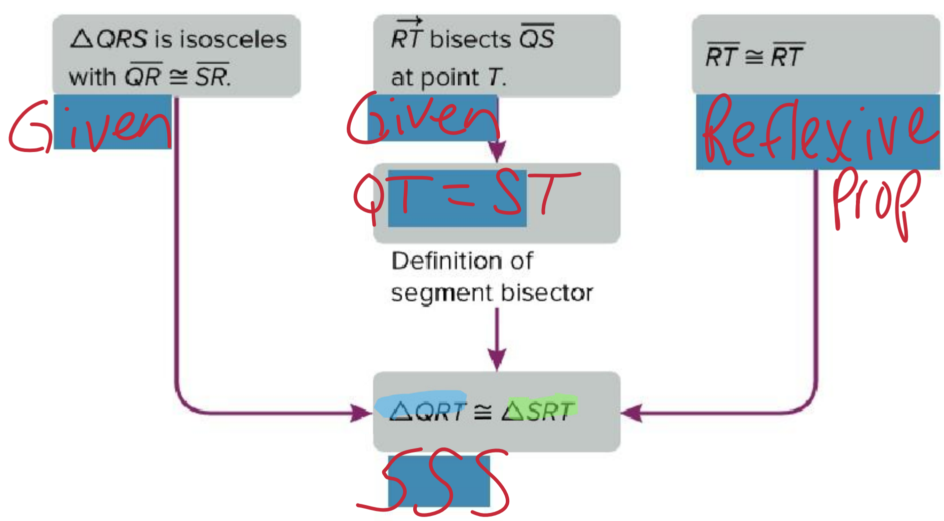
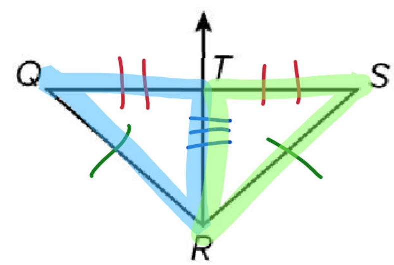
Example 1

Use SSS to Prove Triangles Congruent





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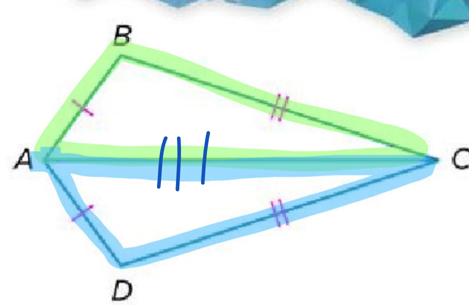
Example 1

Use SSS to Prove Triangles Congruent



Statements	Reasons
1. DA = BA and DC = BC	1. Given (in the diagram)

2. $AC = AC$	2. Reflexive Prop
3. $\triangle ABC \cong \triangle ADC$	3. SSS

Example 2
Use SSS on the Coordinate Plane

Triangle *JKL* has vertices *J*(2, 5), *K*(1, 1), and *L*(5, 2). Triangle *QNP* has vertices *Q*(−4, 4), *N*(−3, 0), and *P*(−7, 1). Is △*JKL* ≅ △*QNP*?

Part A Graph the triangles.

Part B Use the distance formula to prove if the triangles are congruent or not.

Example 2
Use SSS on the Coordinate Plane

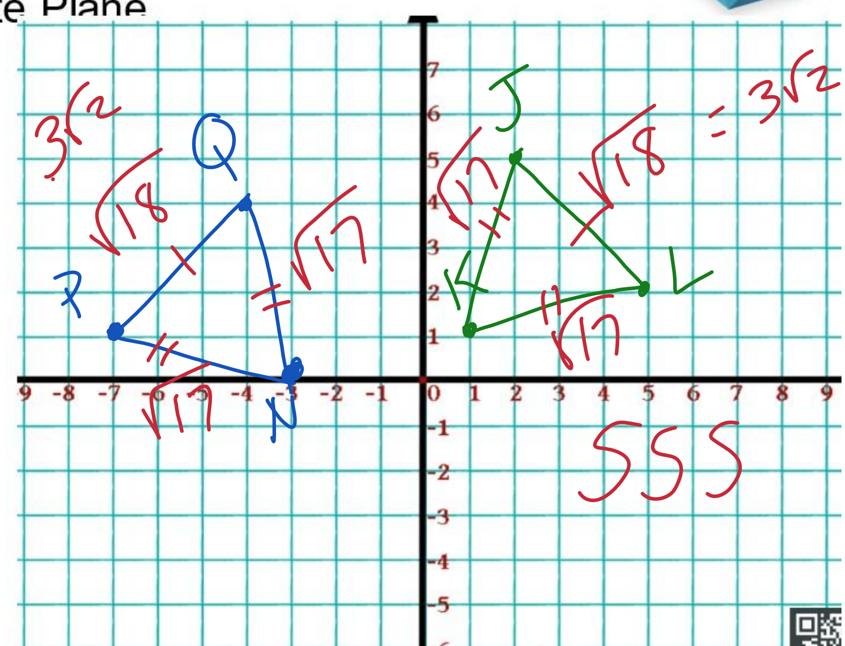
$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Part A Graph the triangles.

***J*(2, 5), *K*(1, 1), and *L*(5, 2).**

$\triangle KJL \cong \triangle NQP$

***Q*(−4, 4), *N*(−3, 0), and *P*(−7, 1)**



Part B Use the distance formula to prove if the triangles are congruent or not.

JL

$(2, 5)$ $(5, 2)$

$x_1\ y_1$ $x_2\ y_2$

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

$$\sqrt{(5-2)^2+(2-5)^2}$$

$$\sqrt{3^2+-3^2}$$

$$\sqrt{9+9}$$

$$\sqrt{18}$$

*See notes at the end!!

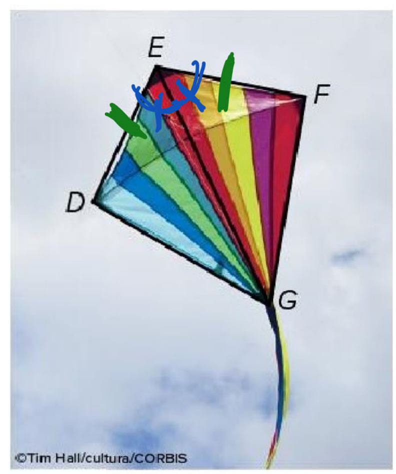
Example 3

Use SAS to Prove Triangles Congruent

Check

KITES The kite shown appears to be made up of congruent triangles. If $\overline{DE} \cong \overline{FE}$ and $\overline{EG}$ bisects $\angle DEF$, prove that $\triangle DEG \cong \triangle FEG$.

Complete the two-column proof.



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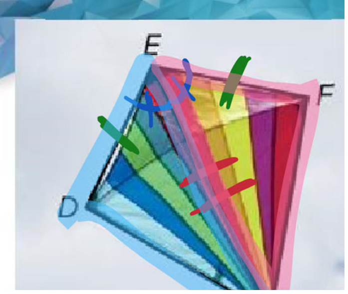
Given: $\overline{DE} \cong \overline{FE}$, $\overline{EG}$ bisects $\angle DEF$.

Prove: $\triangle DEG \cong \triangle FEG$

Example 3

Use SAS to Prove Triangles Congruent



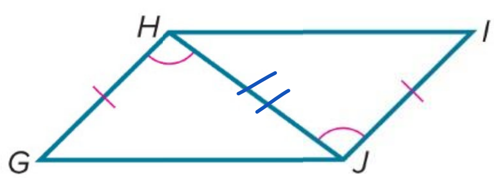
Proof:

Statements	Reasons
1. DE = FE	1. Given
2. $\overline{EG}$ bisects $\angle DEF$.	2. Given
3. ∠FEG = ∠EDG	3. Definition of angle bisector
4. EG = EG	4. Reflexive
5. $\triangle DEG \cong \triangle FEG$	5. SAS

Exit Ticket

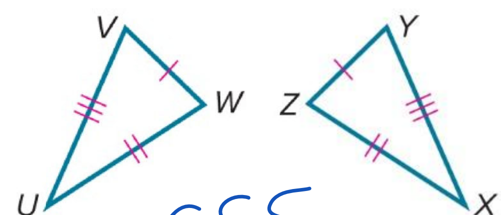
Which congruence criterion would you use to prove the two triangles congruent?

1.



SAS

2.

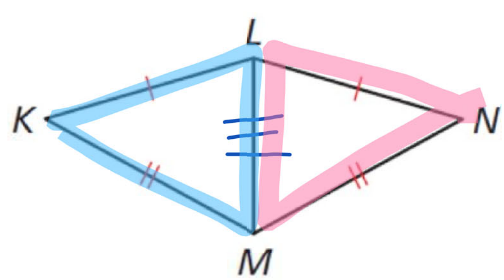


SSS

Write a proof.

Given $\overline{KL} \cong \overline{NL}$, $\overline{KM} \cong \overline{NM}$

Prove $\triangle KLM \cong \triangle NLM$

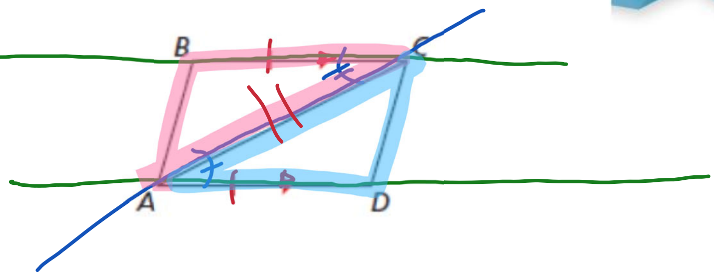


STATEMENTS	REASONS
1	Given
2 LM = LM	Reflexive
3 KLM = NLM	SSS

Write a proof.

Given $\overline{BC} \cong \overline{DA}$, $\overline{BC} \parallel \overline{AD}$

Prove $\triangle ABC \cong \triangle CDA$



STATEMENTS	REASONS
1 BC=DA BC||AD	Given
2 <CAD ≅ <ACB	Alt. Interior Angles
3 CA=CA	Reflexive
4 ΔABC = ΔCDA	SAS

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Part C Support your conjecture.

Use the Distance Formula to show that all corresponding sides have the same measure.

$JL = \sqrt{(5-2)^2 + (2-5)^2}$ $\quad QP = \sqrt{[-7-(-4)]^2 + (1-4)^2}$

$= \sqrt{9+9}$ or $3\sqrt{2}$ $\quad = \sqrt{9+9}$ or $3\sqrt{2}$

$LK = \sqrt{(1-5)^2 + (1-2)^2}$ $\quad PN = \sqrt{[-3-(-7)]^2 + (0-1)^2}$

$= \sqrt{16+1}$ or $\sqrt{17}$ $\quad = \sqrt{16+1}$ or $\sqrt{17}$

$KJ = \sqrt{(2-1)^2 + (5-1)^2}$ $\quad NQ = \sqrt{[-4-(-3)]^2 + (4-0)^2}$

$= \sqrt{1+16}$ or $\sqrt{17}$ $\quad = \sqrt{1+16}$ or $\sqrt{17}$