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Lesson 27: Triangle Congruency Proofs

**Student Outcomes**

* Students complete proofs requiring a synthesis of the skills learned in the last four lessons.

Classwork

Exercises 1–6 (40 minutes)


Exercises 1–6

1. Given: $AB=AC$, $RB=RC$.

Prove: $SB=SC$.

$AB=AC$, $RB=RC$ Given

$AR=AR$ Reflexive property

$△ARC≅△ARB$ SSS

$m∠ARC=m∠ARB$ *Corresponding angles of congruent triangles are equal in measure*

$m∠ARC+m∠SRC=180$*,* $m∠ARB+m∠SRB=180$ *Linear pairs form supplementary angles*

$m∠SRC=m∠SRB$ *Angles supplementary to either the same angle or to congruent angles are equal in measure*

$SR=SR$ Reflexive property

$△SRB≅△SRC$ SAS

$SB=SC$ Corresponding sides of congruent angles are equal in length

1. Given: Square $ABCS≅$ Square $EFGS$,

 $\overleftrightarrow{RAB}$, $\overleftrightarrow{REF}$.

Prove: $△ASR≅ESR$.

Square $ABCS≅$ Square $EFGS$ Given

$AS=ES$ Corresponding sides of congruent squares are equal in length

$SR=SR$ Reflexive property

$∠BAS $and$ ∠FES $are right angles Definition of square

$∠BAS$ and$ ∠SAR $form a linear pair Definition of linear pair

$∠FES $and$ ∠SER $form a linear pair Definition of linear pair

$∠SAR $and $∠SER $are right angles Two angles that are supplementary and congruent each measure $90°$ and are, therefore, right angles

$△ASR$ and $△ESR$ are right triangles Definition of right triangle

$△ASR≅ △ESR$ HL

1. Given: $JK=JL$,$ JX=JY$.

Prove: $KX=LY$.

$JX=JY$ *Given*

$m∠JXY=m∠JYX$ *Base angles of an isosceles triangle are equal in measure*

$m∠JXK+m∠JXY=180$*,*

$m∠JYL+m∠JYX=180$ *Linear pairs form supplementary angles.*

$m∠JXK+m∠JXY=m∠JYL+m∠JYX$ *Substitution property of equality*

$m∠JXK+m∠JXY=m∠JYL+m∠JXY$ *Substitution property of equality*

$m∠JXK=m∠JYL$ *Angles supplementary to either the same angle or congruent angles are equal in measure*

$JK=JL$ *Given*

$m∠K=m∠L $ *Base angles of an isosceles triangle are equal in measure*

$△JXK≅△JYL$ *AAS*

$KX=LY$ *Corresponding sides of congruent triangles are equal in length*



1. Given: $\overbar{AD}⊥\overbar{DR}, \overbar{AB}⊥\overbar{BR}$,

 $\overbar{AD}≅\overbar{AB}$.

Prove: $∠DCR≅∠BCR$.

$\overbar{AD}⊥\overbar{DR}$, $\overbar{AB}⊥\overbar{BR}$ Given

$△ADR$ and$△ABR$ are right triangles Definition of right triangle

$\overbar{AD}≅\overbar{AB}$ Given

$\overbar{AR}≅\overbar{AR}$ Reflexive property

$△ADR≅△ABR$ HL

$∠ARD≅ARB$ Corresponding angles of congruent triangles are congruent

$m∠ARD+m∠DRC=180$*,*

$m∠ARB+m∠BRC=180$ *Linear pairs form supplementary angles.*

$m∠ARD+m∠DRC=m∠ARB+m∠BRC$ *Transitive property*

$m∠DRC=m∠BRC$ *Angles supplementary to either the same angle or congruent angles are equal in measure*

$\overbar{DR}≅\overbar{BR}$ Corresponding sides of congruent triangles are congruent

$\overbar{RC}≅\overbar{RC}$ Reflexive property

$△DRC≅△BRC$ SAS

$∠DRC≅∠BRC$ Corresponding angles of congruent triangles are congruent

1. **Given: $AR=AS$, $BR=CS$,

 $\overbar{RX}⊥\overbar{AB}$,$ \overbar{SY}⊥\overbar{AC}$.

Prove: $BX=CY$.

$AR=AS$ *Given*

$m∠ARS=m∠ASR$ *Base angles of an isosceles triangle are equal in measure*

$m∠ARS+m∠ARB=180$*,*

$m∠ASR+m∠ASC=180$ *Linear pairs form supplementary angles*

$m∠ARS+m∠ARB=m∠ASR+m∠ASC$ *Transitive property*

$m∠ARB=m∠ASC$ *Subtraction*

$BR=CS$ *Given*

$△ARB≅ △ASC$ *SAS*

$∠ABR≅∠ACS$ *Corresponding angles of congruent triangles are congruent*

$\overbar{RX}⊥\overbar{AB}, \overbar{SY}⊥\overbar{AC}$ *Given*

$m∠RXB=90°=m∠SYC$ *Definition of perpendicular line segments.*

$△BRX≅ △SYC$ *AAS*

$BX=CY$ *Corresponding sides of congruent triangles are equal in length*

1. Given: $AX=BX$, $m∠AMB=m∠AYZ=90°$.

Prove: $NY=NM$.

$AX=BX$ *Given*

$m∠AMB=m∠AYZ=90°$ *Given*

$m∠BXM=m∠AXY$ *Vertical angles are equal in measure*

$△BXM≅△AXY$ *AAS*

$BX+XY=BY$*,* $AX+XM=AM$ *Segments add*

$XM=XY$ *Corresponding sides of congruent triangles are equal in length*

$BY=AM$ *Substitution property of equality*

$m∠BYN=90˚$ *Vertical angles are equal in measure*

$m∠AMB+m∠AMN=180°$ *Linear pairs form supplementary angles*

$m∠AMN=90°$ *Subtraction property of equality*

$m∠MNY=m∠MNY$ *Reflexive property*

$△BYN≅△AMN$ *AAS*

$NY=NM$ *Corresponding sides of congruent triangles are equal in length*

Exit Ticket (5 minutes)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lesson 27: Triangle Congruency Proofs

Exit Ticket

Given: $M$ is the midpoint of $GR$, ∠$G ≅$∠$R$.

Prove: $△GHM≅ △RPM$.

Exit Ticket Sample Solutions



Given: $M$ is the midpoint of $GR$, ∠$G =$ ∠$R$.

Prove: $△GHM≅△RPM$.

$M$ is the midpoint of GR Given

∠$G ≅ $∠$R$ Given

$GM = RM$ Definition of midpoint

∠$HMG ≅ $∠$PMR$ Vertical angles are congruent.

$△GHM≅△RPM$ ASA

Problem Set Sample Solutions

Use your knowledge of triangle congruence criteria to write a proof for the following:

In the figure $\overbar{BE}≅\overbar{CE}$, $\overbar{DC}⊥\overbar{AB}$,$ \overbar{BE}⊥\overbar{AC}$, prove $\overbar{AE}≅\overbar{RE}$.

$m∠ERC=m∠BRD$ *Vertical angles are equal in measure*

$\overbar{DC}⊥\overbar{AB},\overbar{BE}⊥\overbar{AC}$ *Given*

$m∠BDR=90°$*,*$ m∠REC=90°$ *Definition of perpendicular lines*

$m∠ABE=m∠RCE$ *Sum of the angle measures in a triangle is* $180°$

$m∠BAE=m∠BRD$ *Sum of the angle measures in a triangle is* $180°$

$m∠BAE=m∠ERC$ *Substitution property of equality*

$\overbar{BE}≅\overbar{CE}$ *Given*

$△BAE≅△CRE$ *AAS*

$\overbar{AE}≅\overbar{RE}$ *Corresponding sides of congruent triangles are congruent*