

Geometry Proof Workbook

3 lessons · printable · answer key at the back



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book

Name _____

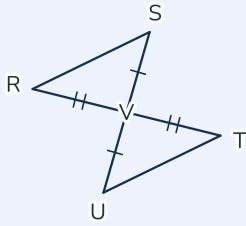
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Proofs with Triangles

WORKED EXAMPLE



Given V is the midpoint of SU; $RV \cong TV$

Prove $\triangle RVS \cong \triangle TVU$

Statements	Reasons
1. $SV \cong UV$	Definition of Midpoint
2. $\angle RVS \cong \angle TVU$	?
3. $RV \cong TV$	Given
4. $\triangle RVS \cong \triangle TVU$	SAS

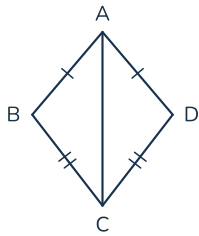
Reason for step 2:

-

1. Complete the triangle congruence proof

Read each proof and choose the missing reason.

1



Given $AB \cong AD$; $CB \cong CD$

Prove $\triangle ABC \cong \triangle ADC$

Statements	Reasons
1. $AB \cong AD$	Given
2. $CB \cong CD$	Given
3. $AC \cong AC$	?
4. $\triangle ABC \cong \triangle ADC$	SSS

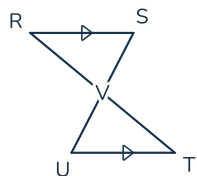
Reason for step 3:

-

1. Complete the triangle congruence proof (continued)

Read each proof and choose the missing reason.

2



Given $RS \parallel UT$; $RS \cong UT$

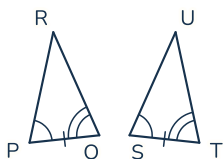
Prove $\triangle RSV \cong \triangle TUV$

Statements	Reasons
1. $\angle SRV \cong \angle UTV$	?
2. $\angle RSV \cong \angle TUV$	Alternate Interior Angles
3. $RS \cong UT$	Given
4. $\triangle RSV \cong \triangle TUV$	ASA

Reason for step 1:

-

3



Given $\angle P \cong \angle S$; $PQ \cong ST$; $\angle Q \cong \angle T$

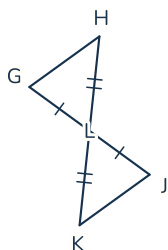
Prove $\triangle PQR \cong \triangle STU$

Statements	Reasons
1. $\angle P \cong \angle S$	Given
2. $PQ \cong ST$	Given
3. $\angle Q \cong \angle T$	Given
4. $\triangle PQR \cong \triangle STU$	?

Reason for step 4:

-

4



Given $GL \cong JL$; $HL \cong KL$

Prove $\triangle GLH \cong \triangle JLK$

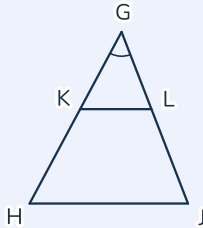
Statements	Reasons
1. $GL \cong JL$	Given
2. $\angle GLH \cong \angle JLK$	?
3. $HL \cong KL$	Given
4. $\triangle GLH \cong \triangle JLK$	SAS

Reason for step 2:

-

Proofs with Similar Triangles

WORKED EXAMPLE



Given $GK/GH = GL/GI$

Prove $\triangle GKL \sim \triangle GHI$

Statements

Reasons

1. $\angle G \cong \angle G$

?

2. $GK/GH = GL/GI$

Given

3. $\triangle GKL \sim \triangle GHI$

SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

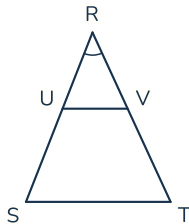
SAS ~

SSS ~

2. Complete the similar-triangle proof

Read each proof and choose the missing reason.

1



Given $RU/RS = RV/RT$

Prove $\triangle RUV \sim \triangle RST$

Statements

Reasons

1. $\angle R \cong \angle R$

?

2. $RU/RS = RV/RT$

Given

3. $\triangle RUV \sim \triangle RST$

SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

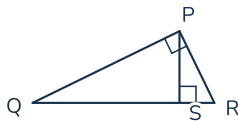
Alternate Interior Angles

AA ~

SAS ~

SSS ~

2



Given $\angle QPR$ is a right angle; $PS \perp QR$

Prove $\triangle SPR \sim \triangle PQR$

Statements

Reasons

1. $\angle R \cong \angle R$

Reflexive Property

2. $\angle PSR \cong \angle QPR$

Right angles are congruent

3. $\triangle SPR \sim \triangle PQR$

?

Reason for step 3:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

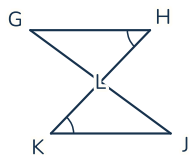
SAS ~

SSS ~

2. Complete the similar-triangle proof (continued)

Read each proof and choose the missing reason.

3



Given $\angle GHL \cong \angle JKL$

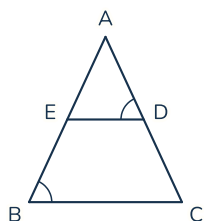
Prove $\triangle GHL \sim \triangle JKL$

Statements	Reasons
1. $\angle GHL \cong \angle JKL$	?
2. $\angle GLH \cong \angle JLK$	Vertical Angles
3. $\triangle GHL \sim \triangle JKL$	AA ~

Reason for step 1:

-

4



Given $\angle ADE \cong \angle B$

Prove $\triangle ADE \sim \triangle ABC$

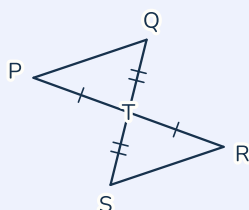
Statements	Reasons
1. $\angle A \cong \angle A$	Reflexive Property
2. $\angle ADE \cong \angle B$	?
3. $\triangle ADE \sim \triangle ABC$	AA ~

Reason for step 2:

-

Writing a Proof

WORKED EXAMPLE



Given $PT \cong RT$; $QT \cong ST$

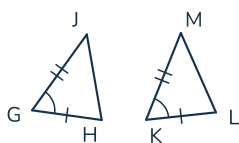
Prove $\triangle PTQ \cong \triangle RTS$

Statements	Reasons
1. $PT \cong RT$	Given
2. $\angle PTQ \cong \angle RTS$	Vertical Angles
3. $QT \cong ST$	Given
4. $\triangle PTQ \cong \triangle RTS$	SAS

3. Write a triangle proof

Write a full two-column proof for each. Reasons may be used more than once.

1

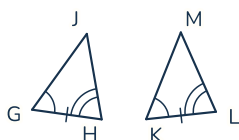


Given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$

Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

2



Given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$

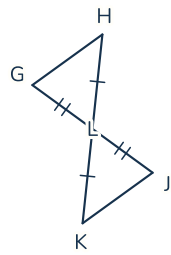
Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

3. Write a triangle proof (continued)

Write a full two-column proof for each. Reasons may be used more than once.

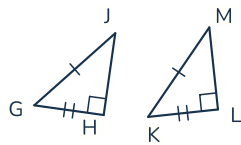
3



Given L is the midpoint of HK; $GL \cong JL$
Prove $\triangle GLH \cong \triangle JLK$

Statements	Reasons
1.	
2.	
3.	
4.	

4



Given $\angle H$ and $\angle L$ are right angles; $GJ \cong KM$; $GH \cong KL$
Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

Answer Key

Proofs with Triangles

Complete the triangle congruence proof

1. $\triangle ABC \cong \triangle ADC$ ($AB \cong AD$, $CB \cong CD$), step 3: Reflexive Property
2. $\triangle RSV \cong \triangle TUV$ ($RS \parallel UT$, $RS \cong UT$), step 1: Alternate Interior Angles
3. $\triangle PQR \cong \triangle STU$ ($\angle P \cong \angle S$, $PQ \cong ST$, $\angle Q \cong \angle T$), step 4: ASA
4. $\triangle GLH \cong \triangle JLK$ ($GL \cong JL$, $HL \cong KL$), step 2: Vertical Angles

Proofs with Similar Triangles

Complete the similar-triangle proof

1. $\triangle RUV \sim \triangle RST$ ($RU/RS = RV/RT$), step 1: Reflexive Property
2. $\triangle SPR \sim \triangle PQR$ ($\angle QPR$ is a right angle, $PS \perp QR$), step 3: AA ~
3. $\triangle GHL \sim \triangle JKL$ ($\angle GHL \cong \angle JKL$), step 1: Given
4. $\triangle ADE \sim \triangle ABC$ ($\angle ADE \cong \angle B$), step 2: Given

Writing a Proof

Write a triangle proof

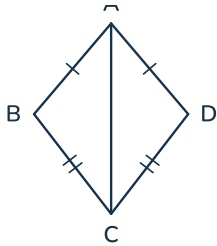
1. $\triangle GHJ \cong \triangle KLM$ — 1. $GH \cong KL$ — Given; 2. $\angle G \cong \angle K$ — Given; 3. $GJ \cong KM$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — SAS
2. $\triangle GHJ \cong \triangle KLM$ — 1. $\angle G \cong \angle K$ — Given; 2. $GH \cong KL$ — Given; 3. $\angle H \cong \angle L$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — ASA
3. $\triangle GLH \cong \triangle JLK$ — 1. $HL \cong KL$ — Definition of Midpoint; 2. $\angle GLH \cong \angle JLK$ — Vertical Angles; 3. $GL \cong JL$ — Given; 4. $\triangle GLH \cong \triangle JLK$ — SAS
4. $\triangle GHJ \cong \triangle KLM$ — 1. $\angle H \cong \angle L$ — Given; 2. $GJ \cong KM$ — Given; 3. $GH \cong KL$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — HL

Solutions (1 of 5)

Proofs with Triangles

Complete the triangle congruence proof

1.



Given $AB \cong AD$; $CB \cong CD$

Prove $\triangle ABC \cong \triangle ADC$

Statements	Reasons
1. $AB \cong AD$	Given
2. $CB \cong CD$	Given
3. $AC \cong AC$	?
4. $\triangle ABC \cong \triangle ADC$	SSS

Reason for step 3:

-

Step 3: $AC \cong AC$

$AC \cong AC \rightarrow$

Reflexive Property

Reflexive Property

The proof is missing the reason for step 3: " $AC \cong AC$ ". Read what that step claims.

A segment (or angle) is congruent to itself. The two triangles share this side, so it is equal in both by the reflexive property.

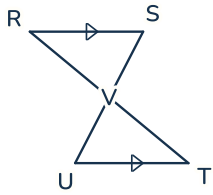
So the missing reason is Reflexive Property.

Solutions (2 of 5)

Proofs with Triangles (continued)

Complete the triangle congruence proof (continued)

2.



Given $RS \parallel UT$; $RS \cong UT$

Prove $\triangle RSV \cong \triangle TUV$

Statements	Reasons
1. $\angle SRV \cong \angle UTV$	?
2. $\angle RSV \cong \angle TUV$	Alternate Interior Angles
3. $RS \cong UT$	Given
4. $\triangle RSV \cong \triangle TUV$	ASA

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Alternate Interior Angles

Definition of Midpoint

SSS

SAS

ASA

AAS

HL

Definition of Perpendicular

Step 1: $\angle SRV \cong \angle UTV$

$\angle SRV \cong \angle UTV \rightarrow$

Alternate Interior Angles

Alternate Interior Angles

The proof is missing the reason for step 1: " $\angle SRV \cong \angle UTV$ ". Read what that step claims.

The two lines are parallel, so a transversal makes alternate interior angles congruent.

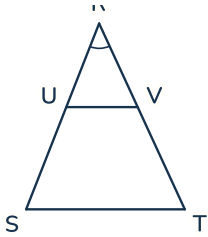
So the missing reason is Alternate Interior Angles.

Solutions (3 of 5)

Proofs with Similar Triangles

Complete the similar-triangle proof

1.



Given $RU/RS = RV/RT$

Prove $\triangle RUV \sim \triangle RST$

Statements

Reasons

1. $\angle R \cong \angle R$

?

2. $RU/RS = RV/RT$

Given

3. $\triangle RUV \sim \triangle RST$

SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

SAS ~

SSS ~

Step 1: $\angle R \cong \angle R$

$\angle R \cong \angle R \rightarrow$

Reflexive Property

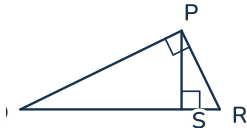
Reflexive Property

The proof is missing the reason for step 1: " $\angle R \cong \angle R$ ". Read what that step claims.

A segment (or angle) is congruent to itself. The two triangles share this side, so it is equal in both by the reflexive property.

So the missing reason is Reflexive Property.

2.



Given $\angle QPR$ is a right angle; $PS \perp QR$

Prove $\triangle SPR \sim \triangle PQR$

Statements

Reasons

1. $\angle R \cong \angle R$

Reflexive Property

2. $\angle PSR \cong \angle QPR$

Right angles are congruent

3. $\triangle SPR \sim \triangle PQR$

?

Reason for step 3:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

SAS ~

SSS ~

Step 3: $\triangle SPR \sim \triangle PQR$

$\triangle SPR \sim \triangle PQR \rightarrow$ AA ~

AA ~

The proof is missing the reason for step 3: " $\triangle SPR \sim \triangle PQR$ ". Read what that step claims.

Two pairs of angles are congruent, and two angles are enough to make triangles similar: AA.

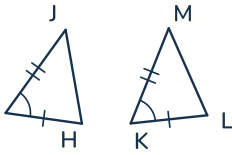
So the missing reason is AA ~.

Solutions (4 of 5)

Writing a Proof

Write a triangle proof

1.



Given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$

Prove $\triangle GHJ \cong \triangle KLM$

Statements

Reasons

1.

2.

3.

4.

Prove: $\triangle GHJ \cong \triangle KLM$

1. $GH \cong KL \rightarrow$ **Given**

2. $\angle G \cong \angle K \rightarrow$ **Given**

3. $GJ \cong KM \rightarrow$ **Given**

4. $\triangle GHJ \cong \triangle KLM \rightarrow$ **SAS**

You are given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$, and you have to prove $\triangle GHJ \cong \triangle KLM$. Build it one line at a time — each line is a statement and the reason it is true.

1. $GH \cong KL$ — This fact is handed to you in the Given — nothing has to justify it.

2. $\angle G \cong \angle K$ — This fact is handed to you in the Given — nothing has to justify it.

3. $GJ \cong KM$ — This fact is handed to you in the Given — nothing has to justify it.

4. $\triangle GHJ \cong \triangle KLM$ — Two pairs of sides and the angle between them are equal: SAS.

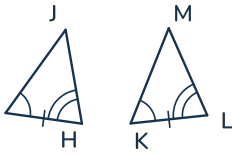
That is the whole proof: the last line, $\triangle GHJ \cong \triangle KLM$, follows by SAS.

Solutions (5 of 5)

Writing a Proof (continued)

Write a triangle proof (continued)

2.



Given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$

Prove $\triangle GHJ \cong \triangle KLM$

Statements

Reasons

1.

2.

3.

4.

Prove: **$\triangle GHJ \cong \triangle KLM$**

1. $\angle G \cong \angle K \rightarrow$ **Given**

2. $GH \cong KL \rightarrow$ **Given**

3. $\angle H \cong \angle L \rightarrow$ **Given**

4. $\triangle GHJ \cong \triangle KLM \rightarrow$ **ASA**

You are given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$, and you have to prove $\triangle GHJ \cong \triangle KLM$. Build it one line at a time — each line is a statement and the reason it is true.

1. $\angle G \cong \angle K$ — This fact is handed to you in the Given — nothing has to justify it.

2. $GH \cong KL$ — This fact is handed to you in the Given — nothing has to justify it.

3. $\angle H \cong \angle L$ — This fact is handed to you in the Given — nothing has to justify it.

4. $\triangle GHJ \cong \triangle KLM$ — Two pairs of angles and the side between them are equal: ASA.

That is the whole proof: the last line, $\triangle GHJ \cong \triangle KLM$, follows by ASA.